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ANALYSIS OF ESG PERFORMANCE INDICATORS OF WESTERN BALKAN COUNTRIES

Abstract

Recently, due to its importance, more and more attention has been paid to the effects of applying the concept of sustainable development at the level of the national economy, sectors, and companies. A set of sustainable development indicators (Sustainability indicators - SIs), i.e. ESG (Environmental, Social, and Governance) performance indicators, was developed. ESG performance indicators are continuously analyzed to achieve the target of sustainable development. Bearing in mind the importance of ESG performance indicators, in this study they are analyzed in the context of achieving the target sustainable development of the countries of the Western Balkans based on the AHP-MABAC method.

The analysis of ESG performance indicators of the countries of the Western Balkans based on the AHP-MABAC method showed that in this particular case, Albania is in first place. Followed by: Montenegro, Bosnia and Herzegovina, Serbia, and North Macedonia. To improve the performance of sustainable development of any country in the Western Balkans, it is necessary to partially or integrate improve the environmental, social, and state performance. Thus, for example, the reduction of corruption through better overall financial and other control affects not the improvement of state performance. Or, increasing the participation of women in the management structure at all levels affects the improvement of social performance. Furthermore, increasing the share of renewable energy sources in total consumption or reducing carbon dioxide emissions with greenhouse effects affects the improvement of environmental performance. Etc. Ultimately, all this has a positive effect on the effects of applying the concept of sustainable development, and improving ESG performance, in the specific case of the Western Balkan countries.

Keywords: ESG, Sustainable Development Goals, AHP, MABAC, Sustainability Reporting

JEL Classification : G15, G18, G21, G28, G32, K23, M14, M48, O31, O36, Q56

1. INTRODUCTION

It is a very challenging problem to analyze environmental, social, and state (Environmental, Social and Governance - ESG) performance indicators from different angles. Research in practice has established that the application of ESG indicators at the level of the national economy, in all sectors and companies, significantly contributes to the improvement of the quality of reporting, overall performance, and the target of sustainable development. Bearing this in mind, this study analyzes the application of ESG performance indicators in the countries of the Western Balkans to achieve the target sustainable development based on the AHP and MABAC methods. The goal of this is to select and rank the countries of the Western Balkans in terms of the scope of application of ESG indicators in the function of achieving the target sustainable development, based on the given methods.

2.LITERATURE REVIEW

In the literature, as far as we know, there are few works devoted to the analysis of ESG performance indicators based on multi-criteria decision-making methods (Matemane et al., 2022; Prasad et al., 2023; Özdağoğlu et al., 2024). The application of multi-criteria decision-making methods in the analysis of ESG indicators contributes to a better understanding and improvement of the quality of reporting and the overall performance of the national economy, sectors, and companies. That is why they should be used as much as possible in the evaluation of ESG performance indicators. In this study, consequently, we will show the importance of applying the AHP and MABAC methods in the analysis of ESG performance indicators, in the case of the countries of the Western Balkans.

ESG performance indicators are extremely important. A complex system of ESG indicators has been developed (Jílková & Kotěšovcová, 2023; Amir & Anvai Rostami, Ali Asghar, 2015). They are studied and analyzed from different angles (Lukic, 2012, 2013, 2017, 2023; Ahmed et al., 2023). In this study, in the context of the literature review, we will point out some significant aspects. Thus, for example, in the literature, special attention is paid to the specifics and effects of the application of ESG indicators on the performance of the national economy of the Western Balkan countries (Antolín-López & Ortiz-de-Mandojana, 2023; Nielsen, 2023; Puška et al., 2024; Sica et al. al., 2023). ESG indicators were analyzed from the perspective of the capital market (Bassen & Kovács, 2008). The disclosure of ESG indicators in reports is significant for the target of sustainable development (Chopra et al., 2024; Costantiello & Leogrande, 2024; Datar et al., 2024; Domanović, 2022). The quality of financial reporting is influenced by ESG performance (Şeker, Yasin, & Dilek Şengür, Evren 2021). The impact of ESG indicators on the profitability and financial performance of companies is significant (Loew et al., 2024; Park et al., 2024). The concept of supplier sustainability is based on ESG indicators (Lou et al., 2024). In the literature, the specific effects of the application of ESG performance indicators in different sectors have been particularly pointed out due to significant differences in the very nature of their operations. Significant attention in the literature is, for example, devoted to the specifics of ESG indicators in the aviation industry (Caraveo Gomez Llanos et al., 2023). There is an increasing use of ESG indicators in banks (Szewczyk, & Szustak, 2023). Szewczyk, Ł., & Szustak, G. (2023). The very nature of the sector's operations thus influences the choice of ESG indicators. It is specific to the application of ESG indicators in conditions of digitization (Hou et al., 2024). It is increasing due to the importance of legal regulation of ESG indicators (Singhania et al., 2024; Stavros Gadinis & Amelia Miazad, 2024).

In the literature, we come across numerous indicators of sustainable development, i.e. ESG performance indicators. For the sake of illustration, ESG indicators with application to all industrial groups include E Environmental: ESG 1 Energy efficiency, ESG 2 GHG emissions; S Social: ESG 3 Staff turnover, ESG 4 Training & qualification, ESG 5 Maturity of Workforce, ESG 6 Absenteeism rate; G Governance: ESG 7 Litigation risks, ESG 8 Corruption; V Longterm Viability: ESG 9 Revenues from new products (Bassen & Kovács, 2008). Table 1 shows, for the sake of the whole, one of the more detailed structures of sustainable indicators. It enables a better understanding of the set of sustainable indicators (SI), i.e. ESG performance indicators.

In summary, it can be said that in contemporary literature, the issue of ESG performance is being investigated from different angles due to its increasing importance. It is investigated from the point of view of measurement, reporting, presentation and disclosure. Special emphasis is placed on ESG indicators from the perspective of the capital market. Regulatory frameworks for reporting on ESG performance occupy a significant place in the literature. The specificity of the ESG system in conditions of digitization was pointed out. In the literature, the relationship between ESG indicators and financial indicators has been specifically analyzed. The impact of ESG performance on company pro-

fitability and financial results is also indicated. Considerable attention in the literature is devoted to the specifics and effects of the implementation of the ESG information system by individual countries and sectors (banks, public sector, aviation industry, etc.). In the literature, the problem of optimizing ESG performance has been analyzed mathematically. In the future, the problem of ESG performance analysis will certainly be studied more and more from different angles. In this study, it is studied from the perspective of optimization on the example of the countries of the Western Balkans using the AHP-MABAC method.

Table 1. ESG construct that was yielded from the extraction process

Sustainability indicators (SIs) Construct (Code)									
Environmental (E)			**Social (S)**				**Governance (G)**		
General (E1)	Nature (E2)	Management (E3)	General (S1)	Management Systems (S2)	Human (S3)	Society (S4)	General (G1)	Board and Committees (G2)	Compliance and Legislation (G3)
Risk Assessment (E11)	Climate Change (E21)	EMS [ISO 14000, 26000] (E31)	Socially, Responsible Investment (S11)	Product Safety (S21)	Employees and Labor (S31)	Community Development and Philanthropy (S41)	Financial Stability, Management, and Policy (G11)	Board Composition (G21)	Compliance (G31)
Environmental Education (E12)	Biodiversity (E22)	Energy, Efficiency & Water (E32)	Social Education & Training (S12)	Customers and Supply Chain (S22)	Health and Safety (S32)	Stakeholders (S42)	Governance and Risk Management (G12)	Committees (G21)	Ethics, Corruption & Code of Conduct (G322)
Disclosure, Transparency, and Reporting (E13)	Emission Pollution & Waste (E23)	Products, Services & Supply Chain (E33)	Disclosure, Transparency, and Reporting (S13)	Branding & Anticompetitive Behavior (S23)	Human Rights (S33)	Non-discrimination & Social inclusion (S43)	Disclosure, Transparency, and Reporting (G13)	Compensation (G23)	Shareholder Activism & Ownership Structure (G33)

Note: Rahdari, Amir & Anwai Rostami, Ali Asghar, (2015)

It has been improved considering the significance of ESG indicator statistics. Empirical data on ESG indicators are available in OECD, Eurostat, The Word Bank, and national statistics. In this study, for comparative analysis of ESG performance indicators of the countries of the Western Balkans, empirical data from The World Bank statistics are used.

3. RESEARCH METHODOLOGY

In this study, we will perform a comparative analysis of ESG performance indicators of the countries of the Western Balkans using the AHP and MABAC methods. Their theoretical and methodological characteristics are briefly presented below.

Analytic Hierarchy Process (AHP) method

Given that the weighting coefficients of criteria are determined using the AHP method, we will briefly refer to its theoretical and methodological characteristics.

The Analytical Hierarchy Process (AHP) method proceeds through the following steps (Saaty, 2008):

Step 1: Forming a matrix of comparison pairs

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (1)$$

Step 2: Normalization of the comparison pair matrix

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, \ldots, n \quad (2)$$

Step 3: Determination of relative importance, i.e. vector weights

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^{*}}{n}, i, j = 1, \ldots, n \quad (3)$$

Consistency index - *CI* (consistency index) is a measure of the deviation of *n* from λmax and can be represented by the following formula:

$$CI = \frac{\lambda_{max} - n}{n} \quad (4)$$

If $CI < 0.1$, the estimated values of the coefficients a_{ij} are consistent, and the deviation of λmax from *n* is negligible. This means, in other words, that the AHP method accepts an inconsistency of less than 10%.

$CR = CI/RI$ can be calculated, where *RI* is the random index.

MABAC method

MABAC (Multi-Attributive Border Approximation area Comparison) is a newer multicriteria decision-making method developed by (Pamučar & Čirović 2015). The main feature of this method is in defining the distance of the criterion function of each observed alternative from the limit approximate value. The mathematical formulation of the MABAC method consists of the following steps (Pamučar& Čirović, 2015; Lukić, 2021a,b; Puška et al., 2024):

Step 1: Formation of the initial decision matrix (*X*).

In this phase, *m* alternatives are evaluated according to *n* criteria. Alternatives are shown by vectors, ..., $Ai = (x_{i1,} x_{i2}, x_{in})$, where x_{ij} is the value of the *i*-th alternative according to the *j* -th criterion *(i = 1, 2, ..., m; j = 1, 2, ..., n).*

$$X = \begin{array}{c} \\ A_1 \\ A_2 \\ \cdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \ldots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & \ldots & x_{1n} \\ x_{21} & x_{22} & \ldots & x_{2n} \\ \cdots & \cdots & \ldots & \cdots \\ x_{m1} & x_{m2} & \ldots & x_{mn} \end{bmatrix} \end{array} \quad (5)$$

where *m* is the total number of alternatives, *n* is the total number of criteria.

Step 2: Normalization of the elements of the initial matrix (*X*).

$$N = \begin{array}{c} \\ A_1 \\ A_2 \\ \cdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \ldots & C_n \end{array} \\ \begin{bmatrix} n_{11} & n_{12} & \ldots & n_{1n} \\ n_{21} & n_{22} & \ldots & n_{2n} \\ \cdots & \cdots & \ldots & \cdots \\ n_{m1} & n_{m2} & \ldots & n_{mn} \end{bmatrix} \end{array} \quad (6)$$

The elements of the normalized matrix (*N*) are obtained using the following equations:

a) For benefit (income) types of criteria (a high value of the criteria is preferred)

$$n_{ij} = \frac{x_{ij} - x_i^{-}}{x_i^{+} - x_i^{-}} \quad 7)$$

b) For cost criteria types (a lower criterion value is preferred)

$$n_{ij} = \frac{x_{ij} - x_i^{+}}{x_i^{-} - x_i^{+}} \quad (8)$$

where x_{ij}, x_i^{+} and x_i^{-} are the elements of the initial decision matrix (*X*), and are x_i^{+} defined x_i^{-} as:

$x_i^{+} = max(x_1, x_2, \ldots, x_m)$ and represent the maximum values of the observed criterion by alternatives.

$x_i^{-} = \min(x_1, x_2, \ldots, x_m)$ and represents the minimum values of the observed criterion by alternatives.

Step 3: Calculation of weight matrix elements (*V*).

The elements of the weight matrix (*V*) are calculated as follows:

$$V_{ij} = w_i g(n_{ij} + 1) \quad (9)$$

where n_{ij} the elements of the normalized matrix (*N*) are w_ith weighting coefficients of the criteria.

Based on the previous equation, the following weight matrix *V* is obtained

$$V = \begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1n} \\ v_{21} & v_{22} & \cdots & v_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ v_{m1} & v_{m2} & \cdots & v_{mn} \end{bmatrix} = \begin{bmatrix} w_1 g(n_{11}+1) & w_2 g(n_{12}+1) & \cdots & w_n g(n_{1n}+1) \\ w_1 g(n_{21}+1) & w_2 g(n_{22}+1) & \cdots & w_n g(n_{2n}+1) \\ \cdots & \cdots & \cdots & \cdots \\ w_1 g(n_{m1}+1) & w_2 g(n_{m2}+1) & \cdots & w_n g(n_{mn}+1) \end{bmatrix} \quad (10)$$

where *n is* the total number of criteria, *and m is* the total number of alternatives.

Step 4: Determination of the matrix of bounded approximate areas (*G*).

The Boundary Approximate Area (*BAA*) for each criterion is determined according to the following expression:

$$g_i = \left(\prod_{j=1}^{m} v_{ij} \right)^{1/m} \quad (11)$$

where v_{ij} is the elements of the weight matrix (*V*), and m is the total number of alternatives.

G) of the format *n x 1* is formed (*n* represents the total number of criteria by which the choice of the offered alternatives is made):

$$G = \begin{matrix} C_1 & C_2 & \cdots & C_n \end{matrix} \\ \begin{bmatrix} g_1 & g_2 & \cdots & g_n \end{bmatrix} \quad (12)$$

Step 5: Calculate the elements of the distance matrix of alternatives from the boundary approximate area (*Q*).

$$Q = \begin{bmatrix} q_{11} & q_{12} & \cdots & q_{1n} \\ q_{21} & q_{22} & \cdots & q_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ q_{m1} & q_{m2} & \cdots & q_{mn} \end{bmatrix} \quad (13)$$

The distance of the alternatives from the border approximate area (q_{ij}) is determined as the difference between the elements of the weight matrix (*V*) and the values of the border approximate areas (*G*).

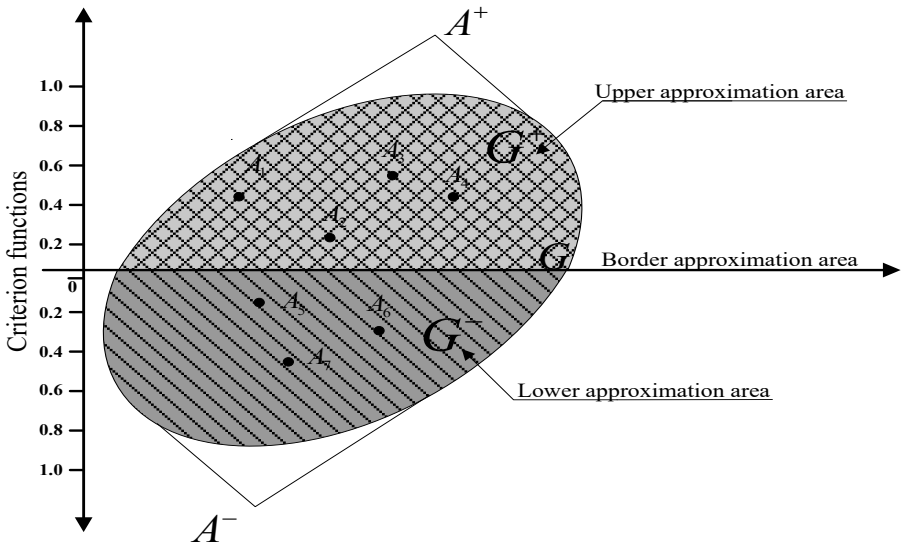
$$Q = V - G = \begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1n} \\ v_{21} & v_{22} & \cdots & v_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ v_{m1} & v_{m2} & \cdots & v_{mn} \end{bmatrix} - \begin{bmatrix} q_1 & q_2 & \cdots & q_n \\ q_1 & q_2 & \cdots & q_n \\ \cdots & \cdots & \cdots & \cdots \\ q_1 & q_2 & \cdots & q_n \end{bmatrix} \quad (14)$$

$$Q \begin{bmatrix} v_{11}-g_1 & v_{12}-g_2 & \cdots & v_{1n}-g_n \\ v_{21}-g_1 & v_{22}-g_2 & \cdots & v_{2n}-g_n \\ \cdots & \cdots & \cdots & \cdots \\ v_{m1}-g_1 & v_{m2}-g_2 & \cdots & v_{mn}-g_n \end{bmatrix} - \begin{bmatrix} q_{11} & q_{12} & \cdots & q_{1n} \\ q_{21} & q_{22} & \cdots & q_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ q_{m1} & q_{m2} & \cdots & q_{mn} \end{bmatrix} \quad (15)$$

where g_i are the boundary approximate area for criterion C_{ij}, v_{ij} elements of the weight matrix (*V*), *n* number of criteria, *m* number of alternatives.

The alternative *Ai* can belong to the border approximate area (*G*), the upper approximate area (G^+), or the lower approximate area (G^-), i.e. $A_i \in \{G \vee G^+ \vee G^-\}$. The upper approximate area (G^+) is the area where the ideal alternative (*A+*) is located, and the lower approximate area is the area where the anti-ideal alternative (A^-) is located (Figure 1).

Figure 1. Shows the upper (G^+), lower (G^-), and approximate areas



Source: Pamučar & Čirović, 2015

Belonging to the alternative A_i the approximate area (G, G^+ *or* G^-) is determined based on the following equation:

$$A_i \in \begin{cases} G^+ & if \quad q_{ij} > 0 \\ G & if \quad q_{ij} = 0 \\ G^- & if \quad q_{ij} < 0 \end{cases} \qquad (16)$$

For alternative A to be chosen as the best from the set, it must belong to the upper approximate area (G^+) according to as many criteria as possible. If, for example, alternative A belongs to the upper approximate area according to 5 criteria (out of a total of 6 criteria), and according to one criterion it belongs to the lower approximate area (G^-), this means, in other words, that according to 5 criteria, the alternative is close to or equal to the ideal alternative, while according to one criterion, it is close or equal to the anti-ideal alternative. If the value $qij > 0$, *i.e.* $q_{ij} \in G^+$, then the alternative Ai is close to or equal to the ideal alternative. However, if $qij < 0$, *i.e.* , then the alternative A_i is close to or equal to the anti-ideal alternative (Pamučar & Čirović, 2015).

Step 6: Ranking the alternatives.

The calculation of the value of the criterion function by alternatives is obtained as the sum of the distances of the alternatives from the boundary approximate areas (q). By summing the elements of the matrix Q by row, the final values of the criterion functions of the alternatives are obtained:

$$S_i = \sum_{j=1}^{n} q_{ij} \;\; j = 1, 2, \dots, n \;\; i = 1, 2, \dots, m \quad (17)$$

where n is the number of criteria, and m is the number of alternatives.

4. RESULTS

A very important issue is the correct selection of ESG performance indicators for the most accurate results of the analysis. A set of ESG performance indicators has been developed in literature, theory, and practice. In this study, the selection of ESG performance indicators (C1 - C17) was made according to the available empirical data in The Word Bank statistics for the countries of the Western Balkans as alternatives (A1 - A5). They are shown in Table 2 for 2022.

Table 2. EDG indicators, Western Balkans, 2022

	Agriculture, forestry, and fishing, value added (% of GDP)	Control of Corruption: Estimate	GDP growth (annual %)	Government Effectiveness: Estimate	Individuals using the Internet (% of the population)	Literacy rate, adult total (% of people ages 15 and above)	People using safely managed drinking water services (% of population)	People using safely managed sanitation services (% of population)	Political Stability and Absence of Violence/Terrorism: Estimates	The proportion of seats held by women in national parliaments (%)	The ratio of female to male labor force participation rate (%) (modeled ILO estimate)	Regulatory Quality: Estimate	Rule of Law: Estimate	School enrollment, primary (% gross)	Terrestrial and marine protected areas (% of total territorial area)	Unemployment, total (% of total labor force) (modeled ILO estimate)	Voice and Accountability: Estimate
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
Albania (A1)	18.6	-0.4	4.9	0.1	82.6	98.5	70.7	56.3	0.1	35.7	78.5	0.2	-0.2	95.6	14.2	11.8	0.1
Bosnia and Herzegovina (A2)	4.8	0.7	4.1	-1.1	78.8	98.3	87.0	0.0	-0.4	16.7	65.3	-0.2	-0.3	87.8	4.1	14.1	-0.3
Montenegro (A3)	6.0	-0.1	6.4	0.0	88.2	0.0	85.1	57.4	-0.1	27.2	77.6	0.5	-0.1	100.7	9.2	15.4	0.3
Northern Macedonia (A4)	8.1	-0.3	2.1	-0.1	0.0	0.0	80.4	12.2	0.1	41.7	66.2	0.5	-0.1	0.0	15.4	15.1	0.2
Serbia (A5)	6.5	-0.5	2.5	0.1	83.5	0.0	75.1	25.4	-0.2	36.6	74.3	0.1	-0.1	96.6	8.1	9.5	-0.1
Statistics																	
Mean	8.8000	-.1200	4.0000	-.2000	66.6200	39.3600	79.6600	30.2600	-.1000	31.5800	72.3800	.2200	-.1600	76.1400	10.2000	13.1800	.0400
Median	6.5000	-.3000	4.1000	.0000	82.6000	.0000	80.4000	25.4000	-.1000	35.7000	74.3000	.2000	-.1000	95.6000	9.2000	14.1000	.1000
Std. Deviation	5.60491	.48166	1.76352	.50990	37.39174	53.89595	6.80243	25.88490	.21213	9.81310	6.25915	.29496	.08944	42.81866	4.62763	2.49540	.24083
The minimum	4.80	-.50	2.10	-1.10	.00	.00	70.70	.00	-.40	16.70	65.30	-.20	-.30	.00	4.10	9.50	-.30
Maximum	18.60	.70	6.40	.10	88.20	98.50	87.00	57.40	.10	41.70	78.50	.50	-.10	100.70	15.40	15.40	.30

Note: Author's statistics
Source: The Word Bank: Environment Social and Governance (ESG) Data.

Table 3 shows the correlation matrix of the criteria. In this case, there is a strong correlation between criteria C2 and C4, C2 and C10, C4 and C3, C9 and C11, C10 and C2, C11 and C8, C13 and C6, C14 and C5, C15 and C9, and at the level of statistical significance. For the other criteria, the correlation is weak, moderate, or strong, but not at the level of statistical significance.

Table 3. Correlation matrix of criteria

Correlations																		
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
C1	Pearson Correlation	1	-.470	.164	.457	.066	.473	-.803	.558	.683	.425	.524	.118	-.090	.085	.651	-.291	.265
	Sig. (2-tailed)		.424	.792	.440	.916	.421	.102	.328	.203	.475	.364	.850	.886	.892	.2 3 4	.634	.667
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C2	Pearson Correlation	-.470	1	.233	-.967**	.160	.511	.781	-.531	-.734	-.908*	-.583	-.595	-.789	.128	-.704	.465	-.573
	Sig. (2-tailed)	.424		.707	.007	.797	.379	.119	.358	.158	.033	.302	.290	.112	.838	.184	.429	.312
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C3	Pearson Correlation	.164	.233	1	.006	.639	.259	.233	.696	-.053	-.506	.593	.125	-.174	.634	-.188	.344	.324
	Sig. (2-tailed)	.792	.707		.993	.245	.674	.707	.191	.932	.384	.292	.841	.779	.250	.762	.571	.595
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C4	Pearson Correlation	.457	-.967**	.006	1	-.045	-.536	-.685	.705	.740	.813	.721	.698	.822	-.014	.676	-.336	.713
	Sig. (2-tailed)	.440	.007	.993		.942	.352	.202	.184	.153	.094	.169	.190	.088	.982	.210	.580	.177
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C 5	Pearson Correlation	.066	.160	.639	-.045	1	.344	-.062	.453	-.488	-.545	.607	-.455	-.302	.999**	-.598	-.410	-.294
	Sig. (2-tailed)	.916	.797	.245	.942		.571	.922	.443	.405	.343	.278	.441	.622	.000	.287	.493	.631
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C6	Pearson Correlation	.473	.511	.259	-.536	.344	1	-.110	-.073	-.214	-.500	-.069	-.680	-.918*	.332	-.206	-.085	-.530
	Sig. (2-tailed)	.421	.379	.674	.352	.571		.860	.907	.730	.391	.912	.206	.028	.585	.739	.892	.358
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Correlations																		
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
C7	Pearson Correlation	-.803	.781	.233	-.685	-.062	-.110	1	-.425	-.587	-.694	-.539	-.078	-.235	-.090	-.577	.727	-.132
	Sig. (2-tailed)	.102	.119	.707	.202	.922	.860		.476	.298	.193	.349	.901	.704	.886	.309	.164	.833
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C8	Pearson Correlation	.558	-.531	.696	.705	.453	-.073	-.425	1	.508	.228	.953*	.501	.372	.473	.371	-.079	.670
	Sig. (2-tailed)	.328	.358	.191	.184	.443	.907	.476		.382	.712	.012	.389	.537	.421	.538	.900	.216
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C9	Pearson Correlation	.683	-.734	-.053	.740	-.488	-.214	-.587	.508	1	.818	.362	.759	.527	-.465	.988**	.094	.783
	Sig. (2-tailed)	.203	.158	.932	.153	.405	.730	.298	.382		.091	.550	.137	.361	.430	.002	.880	.117
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C10	Pearson Correlation	.425	-.908*	-.506	.813	-.545	-.500	-.694	.228	.818	1	.223	.619	.730	-.517	.846	-.287	.538
	Sig. (2-tailed)	.475	.033	.384	.094	.343	.391	.193	.712	.091		.718	.265	.161	.373	.071	.639	.350
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C11	Pearson Correlation	.524	-.583	.593	.721	.607	-.069	-.539	.953*	.362	.223	1	.318	.359	.629	.227	-.357	.477
	Sig. (2-tailed)	.364	.302	.292	.169	.278	.912	.349	.012	.550	.718		.601	.553	.255	.714	.555	.417
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C12	Pearson Correlation	.118	-.595	.125	.698	-.455	-.680	-.078	.501	.759	.619	.318	1	.815	-.439	.716	.422	.971**
	Sig. (2-tailed)	.850	.290	.841	.190	.441	.206	.901	.389	.137	.265	.601		.093	.459	.174	.479	.006
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Correlations																	
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
C13	Pearson Correlation	-.090	-.789	-.174	.822	-.302	-.918*	-.235	.372	.527	.730	.359	.815	1	-.279	.495	-.052	.720
	Sig. (2-tailed)	.886	.112	.779	.088	.622	.028	.704	.537	.361	.161	.553	.093		.649	.396	.934	.171
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C14	Pearson Correlation	.085	.128	.634	-.014	.999**	.332	-.090	.473	-.465	-.517	.629	-.439	-.279	1	-.576	-.428	-.278
	Sig. (2-tailed)	.892	.838	.250	.982	.000	.585	.886	.421	.430	.373	.255	.459	.649		.309	.472	.651
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C15	Pearson Correlation	.651	-.704	-.188	.676	-.598	-.206	-.577	.371	.988**	.846	.227	.716	.495	-.576	1	.094	.713
	Sig. (2-tailed)	.2 3 4	.184	.762	.210	.287	.739	.309	.538	.002	.071	.714	.174	.396	.309		.880	.176
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C16	Pearson Correlation	-.291	.465	.344	-.336	-.410	-.085	.727	-.079	.094	-.287	-.357	.422	-.052	-.428	.094	1	.418
	Sig. (2-tailed)	.634	.429	.571	.580	.493	.892	.164	.900	.880	.639	.555	.479	.934	.472	.880		.484
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C17	Pearson Correlation	.265	-.573	.324	.713	-.294	-.530	-.132	.670	.783	.538	.477	.971**	.720	-.278	.713	.418	1
	Sig. (2-tailed)	.667	.312	.595	.177	.631	.358	.833	.216	.117	.350	.417	.006	.171	.651	.176	.484	
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Note: Author's calculation

Table 4 shows the weight coefficient criteria calculated using the AHP method.

Table 4. Weight coefficients criteria

C1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	WEIGHTS	
		C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17			
1	C1	1.00	1.00	1.50	2.00	1.00	2.00	3.00	2.00	4.00	1.00	2.00	3.00	4.00	2.00	1.00	2.00	3.00	0.1006	
2	C2	1.00	1.00	2.00	2.50	2.00	3.00	4.00	3.00	2.00	1.00	3.00	2.00	2.00	3.00	3.00	3.00	2.00	0.1157	
3	C3	0.67	0.50	1.00	2.00	1.00	2.00	3.00	2.00	2.00	1.00	4.00	2.00	2.00	4.00	3.00	3.00	1.00	0.0921	
4	C4	0.50	0.40	0.50	1.00	2.00	1.00	2.00	3.00	2.00	1.00	1.00	3.00	2.00	3.00	3.00	1.00	1.00	0.0722	
5	C5	1.00	0.50	1.00	0.50	1.00	2.00	1.00	1.00	3.00	1.00	2.00	3.00	2.00	5.00	2.00	1.00	1.00	0.0750	
6	C6	0.50	0.33	0.50	1.00	0.50	1.00	3.00	2.00	4.00	1.00	3.00	4.00	3.00	2.00	2.00	1.00	1.00	0.0760	
7	C7	0.33	0.25	0.33	0.50	1.00	0.33	1.00	2.00	1.00	2.00	4.00	1.00	3.00	2.00	1.00	1.00	1.00	0.0550	
8	C8	0.50	0.33	0.50	0.33	1.00	0.50	0.50	1.00	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	0.0430	
9	C9	0.25	0.50	0.50	0.50	0.33	0.25	1.00	1.00	1.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	0.0429	
10	C10	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	1.00	1.00	1.00	2.00	1.00	2.00	1.00	1.00	0.0536	
11	C11	0.50	0.33	0.25	1.00	0.50	0.33	0.25	1.00	1.00	1.00	1.00	1.00	2.00	2.00	3.00	1.00	1.00	0.0434	
12	C12	0.33	0.50	0.50	0.33	0.33	0.25	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	3.00	1.00	1.00	0.0416	
13	C13	0.25	0.50	0.50	0.50	0.50	0.33	0.33	0.50	0.50	0.50	0.50	0.50	1.00	1.00	2.00	1.00	1.00	0.0313	
14	C14	0.50	0.33	0.25	0.33	0.20	0.50	0.50	1.00	0.50	1.00	0.50	1.00	1.00	1.00	2.00	1.00	1.00	0.0334	
15	C15	1.00	0.33	0.33	0.33	0.50	0.50	1.00	1.00	1.00	0.50	0.33	0.33	0.50	0.50	1.00	1.00	1.00	0.0335	
16	C16	0.50	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0437	
17	C17	0.33	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0471	
																			1.0000	
																			Consistency Ratio	0.0609

Note: Author's calculation

Table 5 and Figure 2 show the calculation procedure and the results of applying the AHP-MABAC method in a specific case.

Table 5. Calculation procedure and results of the AHP-MABAC method

Initial Matrix																	
weights of criteria	0.1006	0.1157	0.0921	0.0722	0.075	0.076	0.055	0.043	0.0429	0.0536	0.0434	0.0416	0.0313	0.0334	0.0335	0.0437	0.0471
kind of criteria	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
A1	18.6	-0.4	4.9	0.1	82.6	98.5	70.7	56.3	0.1	35.7	78.5	0.2	-0.2	95.6	14.2	11.8	0.1
A2	4.8	0.7	4.1	-1.1	78.8	98.3	87	0	-0.4	16.7	65.3	-0.2	-0.3	87.8	4.1	14.1	-0.3
A3	6	-0.1	6.4	0	88.2	0	85.1	57.4	-0.1	27.2	77.6	0.5	-0.1	100.7	9.2	15.4	0.3
A4	8.1	-0.3	2.1	-0.1	0	0	80.4	12.2	0.1	41.7	66.2	0.5	-0.1	0	15.4	15.1	0.2
A5	6.5	-0.5	2.5	0.1	83.5	0	75.1	25.4	-0.2	36.6	74.3	0.1	-0.1	96.6	8.1	9.5	-0.1
MAX	18.6	0.7	6.4	0.1	88.2	98.5	87	57.4	0.1	41.7	78.5	0.5	-0.1	100.7	15.4	15.4	0.3
MIN	4.8	-0.5	2.1	-1.1	0	0	70.7	0	-0.4	16.7	65.3	-0.2	-0.3	0	4.1	9.5	-0.3

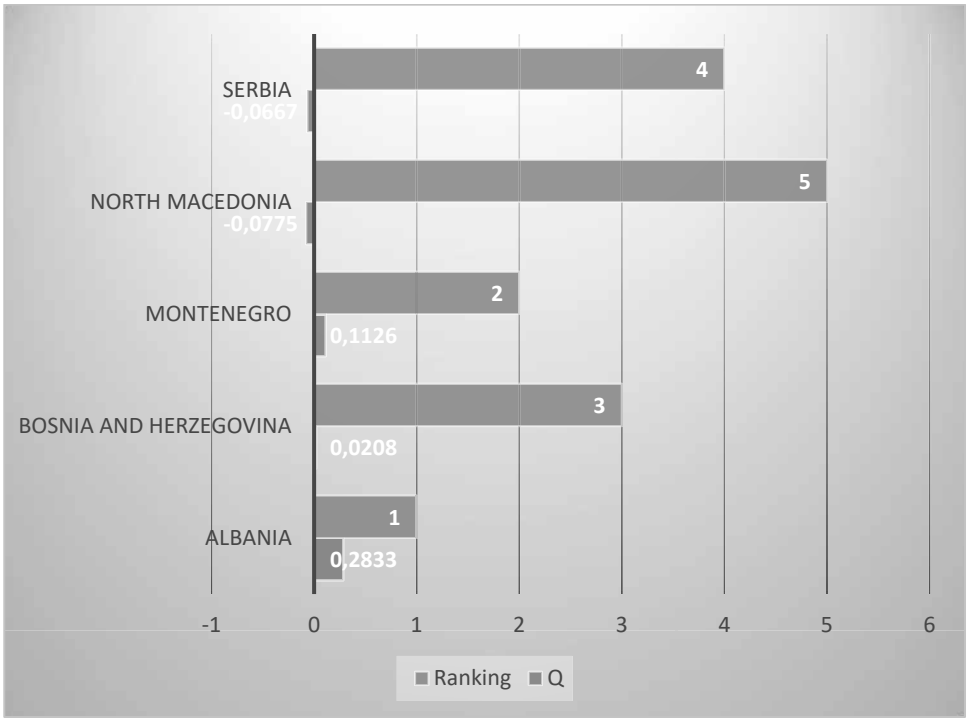
Normalized Matrix																	
weights of criteria	0.1006	0.1157	0.0921	0.0722	0.075	0.076	0.055	0.043	0.0429	0.0536	0.0434	0.0416	0.0313	0.0334	0.0335	0.0437	0.0471
kind of criteria	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
A1	1.0000	0.0000	0.6512	1.0000	0.9365	1.0000	0.0000	0.9808	1.0000	0.7600	1.0000	0.5714	0.0000	0.9494	0.8938	0.3898	0.6667
A2	0.0000	1.0000	0.4651	0.0000	0.8934	0.9980	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8719	0.0000	0.7797	0.0000
A3	0.0870	0.0000	1.0000	0.0000	1.0000	0.0000	0.8834	1.0000	0.0000	0.4200	0.9318	1.0000	0.0000	1.0000	0.4513	1.0000	1.0000
A4	0.2391	0.0000	0.0000	0.0000	0.0000	0.0000	0.5951	0.2125	1.0000	1.0000	0.0682	1.0000	0.0000	0.0000	1.0000	0.9492	0.8333
A5	0.1232	0.0000	0.0930	1.0000	0.9467	0.0000	0.2699	0.4425	0.0000	0.7960	0.6818	0.4286	0.0000	0.9593	0.3540	0.0000	0.0000

Normalized Weighted Matrix (C)																	
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
A1	0.2012	0.1157	0.1521	0.1444	0.1452	0.1520	0.0550	0.0852	0.0858	0.0943	0.0868	0.0654	0.0313	0.0651	0.0634	0.0607	0.0785
A2	0.1006	0.2314	0.1349	0.0722	0.1420	0.1518	0.1100	0.0430	0.0429	0.0536	0.0434	0.0416	0.0313	0.0625	0.0335	0.0778	0.0471
A3	0.1093	0.1157	0.1842	0.0722	0.1500	0.0760	0.1036	0.0860	0.0429	0.0761	0.0838	0.0832	0.0313	0.0668	0.0486	0.0874	0.0942
A4	0.1247	0.1157	0.0921	0.0722	0.0750	0.0760	0.0877	0.0521	0.0858	0.1072	0.0464	0.0832	0.0313	0.0334	0.0670	0.0852	0.0864
A5	0.1130	0.1157	0.1007	0.1444	0.1460	0.0760	0.0698	0.0620	0.0429	0.0963	0.0730	0.0594	0.0313	0.0654	0.0454	0.0437	0.0471
Border Approximation Area Matrix (G)	0.1255	0.1329	0.1285	0.0953	0.1276	0.1003	0.0826	0.0633	0.0566	0.0831	0.0639	0.0645	0.0313	0.0569	0.0500	0.0688	0.0676

Distance of Alternatives from BAA matrix (Q)																	
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
A1	0.0757	-0.0172	0.0236	0.0491	0.0176	0.0517	-0.0276	0.0218	0.0292	0.0112	0.0229	0.0008	0.0000	0.0082	0.0134	-0.0080	0.0109
A2	-0.0249	0.0985	0.0064	-0.0231	0.0144	0.0516	0.0274	-0.0203	-0.0137	-0.0295	-0.0205	-0.0229	0.0000	0.0057	-0.0165	0.0090	-0.0205
A3	-0.0162	-0.0172	0.0557	-0.0231	0.0224	-0.0243	0.0210	0.0227	-0.0137	-0.0070	0.0199	0.0187	0.0000	0.0099	-0.0014	0.0186	0.0266
A4	-0.0009	-0.0172	-0.0364	-0.0231	-0.0526	-0.0243	0.0052	-0.0112	0.0292	0.0241	-0.0176	0.0187	0.0000	-0.0235	0.0170	0.0164	0.0187
A5	-0.0125	-0.0172	-0.0278	0.0491	0.0184	-0.0243	-0.0127	-0.0013	-0.0137	0.0131	0.0091	-0.0051	0.0000	0.0086	-0.0047	-0.0251	-0.0205

	Alternatives	Q	Q	Ranking
Albania	**A1**	0.2833	0.2833	**1**
Bosnia and Herzegovina	**A2**	0.0208	0.0208	**3**
Montenegro	**A3**	0.1126	0.1126	**2**
North Macedonia	**A4**	-0.0775	-0.0775	**5**
Serbia	**A5**	-0.0667	-0.0667	**4**

Figure 2. Ranking



Source: Author's picture

In further presentations of the treated issues, we will perform a dynamic analysis of the ESG performance indicators of Serbia. Table 6 shows the relevant selected ESG performance indicators and their weighting coefficients.

Table 6. ESG indicators, Serbia, 2018-2022

		Agriculture, forestry, and fishing, value added (% of GDP)	GDP growth (annual %)	People using safely managed drinking water services (% of population)	The proportion of seats held by women in national parliaments (%)	The ratio of female to male labor force participation rate (%) (modeled ILO estimate)	Unemployment, total (% of total labor force) (modeled ILO estimate) (	Individuals using the Internet (% of the population)	School enrollment, primary (% gross)	Terrestrial and marine protected areas (% of total territorial area)	
		C1	C2	C3	C4	C5	C6	C7	C8	C9	
A1	2018	6.3	4.5	74.9	34.4	73.2	12.7	73.4	99.9	6.6	
A2	2019	6.0	4.3	75.0	37.7	73.8	10.4	77.4	99.5	7.6	
A3	2020	6.3	-0.9	75.0	38.8	73.6	9.0	78.4	97.7	7.6	
A4	2021	6.3	7.7	75.0	39.2	74.0	10.1	81.2	96.4	7.6	
A5	2022	6.5	2.5	75.1	36.6	74.3	9.5	83.5	96.6	8.1	
	Statistics										
	Mean	6.2800	3.6200	75.0000	37.3400	73.7800	10.3400	78.7800	98.0200	7.5000	
	Std. Deviation	.17889	3.14516	.07071	1.93080	.41473	1.42583	3.84474	1.61771	.54772	
	Minimum	6:00	-.90	74.90	34.40	73.20	9.00	73.40	96.40	6.60	
	Maximum	6.50	7.70	75.10	39.20	74.30	12.70	83.50	99.90	8.10	
	WEIGHTS	0.1575	0.1566	0.1317	0.1046	0.1119	0.0868	0.0749	0.1161	0.0598	1.0000
										Consistency Ratio	0.0552

Note: Author's statistics. The author's calculation of the weighting coefficients of the criteria
Source: The Word Bank: Environment Social and Governance (ESG) Data.

The most significant ESG performance indicator in this particular case is C1 (Agriculture, forestry, and fishing, value added (% of GDP). With an increase in the added value of agriculture, forestry, and fishing, the improvement of Serbia's environmental performance can be influenced. The target sustainable development of Serbia can be achieved through efficient management of environmental, social, and state performance, for example by reducing corruption, etc.

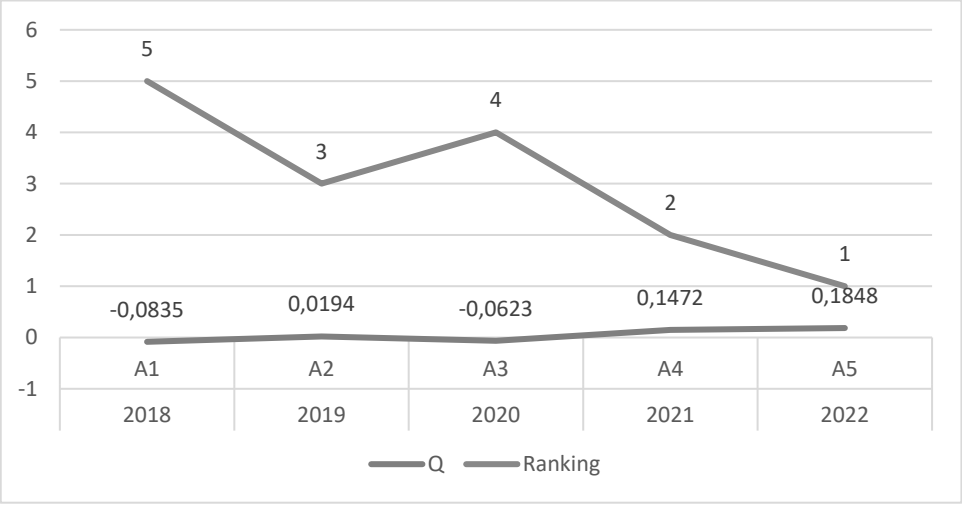
Table 7 and Figure 3 show the results of the analysis of ESG performance indicators of Serbia using the AHP-MABAC method.

Table 7. Ranking, Serbia, AHP-MABAC method

	Alternatives	Q	Q	Ranking
2018	**A1**	-0.0835	-0.0835	**5**
2019	**A2**	0.0194	0.0194	**3**
2020	**A3**	-0.0623	-0.0623	**4**
2021	**A4**	0.1472	0.1472	**2**
2022	**A5**	0.1848	0.1848	**1**

Note: Author's calculation

Figure 3. Ranking, Serbia, 2018-2022



Source: Author's picture

5. DISCUSSION

The analysis of the ESG performance indicators of the countries of the Western Balkans based on the AHP-MABAC method showed that Albania is in the first place in the specific case. Followed by: Montenegro, Bosnia and Herzegovina, Serbia, and North Macedonia. To improve the performance position of sustainable development of any country in the Western Balkans, it is necessary to partially or integrate improve environmental, social, and state performance. Thus, for example, the reduction of corruption through better overall control does not the improvement of state performance. Or, increasing

the participation of women in the management structure at all levels affects the improvement of social performance. Furthermore, increasing the share of renewable energy sources in total consumption or reducing carbon dioxide emissions with greenhouse effects affects the improvement of environmental performance. Etc. Ultimately, all this has a positive effect on the effects of applying the concept of sustainable development, in the specific case of the countries of the Western Balkans.

In Serbia, the best ESG performance was achieved in 2022. The following are 2021, 2019, 2020 and 1018. Therefore, ESG performance in Serbia has improved recently. This was influenced by the increasing application of the concept of sustainable development in Serbia. To achieve the target of sustainable development in Serbia, it is necessary to continuously manage efficiently individually and integrate with ESG performance.

6. CONCLUSION

This study is an empirical investigation of the application of indicators of sustainable development, i.e. ESG performance indicators in the countries of the Western Balkans. The research was carried out using the AHP-MABAC method. The empirical results of the analysis of the ESG performance indicators of the countries of the Western Balkans based on the AHP-MABC method show that Albania is in the first place in the specific analysis. Followed by: Montenegro, Bosnia and Herzegovina, Serbia, and North Macedonia. To improve the position of any Western Balkan country in terms of sustainable development performance, it is necessary to partially or integrate improve environmental, social, and state performance. For example, the reduction of corruption through better overall control affects the improvement of state performance. Increasing the participation of women in the management structure at all levels affects the improvement of social performance. Increasing the share of renewable energy sources in total consumption or reducing carbon dioxide emissions with greenhouse effects affects the improvement of environmental performance. Etc. Ultimately, all this has a positive effect on the effects of applying the concept of sustainable development, and improving ESG performance, in the specific case of the Western Balkan countries. It is recommended that, due to its importance, the ESG information system is increasingly applied, at all levels (global, country, sector, company). It is necessary to continuously improve the regulatory framework for the ESG information system. When analyzing ESG performance, it is very important to use, in addition to classical analysis, different methods of multi-criteria decision-making, as learned in this study using the AHP-MABAC method, on the example of the countries of the Western Balkans. In this way, among other things, the level of implementation of the ESG information system can be better understood.

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ANALIZA ESG POKAZATELJA UČINKA ZEMALJA ZAPADNOG BALKANA

Sažetak

U posljednje vrijeme, zbog svoje važnosti, sve se više pažnje posvećuje učincima primjene koncepta održivog razvoja na razini nacionalnog gospodarstva, sektora i poduzeća. Razvijen je skup indikatora održivog razvoja (Sustainability indicators - SIs), odnosno ESG (Environmental, Social, and Governance) indikatora uspješnosti. Pokazatelji učinka ESG kontinuirano se analiziraju kako bi se postigao cilj održivog razvoja. Imajući u vidu važnost ESG indikatora uspješnosti, u ovoj studiji oni se analiziraju u kontekstu postizanja ciljnog održivog razvoja zemalja Zapadnog Balkana temeljenog na AHP-MABAC metodi.

Analiza ESG indikatora uspješnosti zemalja Zapadnog Balkana temeljena na AHP-MABAC metodi pokazala je da je u konkretnom slučaju Albanija na prvom mjestu. Slijede: Crna Gora, Bosna i Hercegovina, Srbija i Sjeverna Makedonija. Za poboljšanje učinka održivog razvoja bilo koje zemlje Zapadnog Balkana potrebno je djelomično ili integrirati poboljšanje ekološkog, društvenog i državnog učinka. Tako npr. smanjenje korupcije boljom ukupnom financijskom i drugom kontrolom utječe na poboljšanje rada države. Ili, povećanje sudjelovanja žena u upravljačkoj strukturi na svim razinama utječe na poboljšanje društvenog učinka. Nadalje, povećanje udjela obnovljivih izvora energije u ukupnoj potrošnji ili smanjenje emisije ugljičnog dioksida s efektima staklenika utječe na poboljšanje ekološke učinkovitosti. itd. U konačnici, sve to pozitivno utječe na učinke primjene koncepta održivog razvoja, te poboljšanja ESG performansi, u konkretnom slučaju zemalja Zapadnog Balkana.

Ključne riječi: ESG, ciljevi održivog razvoja, AHP, MABC, izvješćivanje o održivosti

JEL klasifikacija: G15, G18, G21, G28, G32, K23, M14, M48, O31, O36, Q56