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APPLICATION OF THE PROMETHEE METHOD FOR THE ENVIRONMENTAL PERFORMANCE EVALUATION OF THE EASTERN EUROPEAN REGION

Abstract

The paper presents a comparative analysis of the environmental performance in Eastern European countries, utilizing a dataset comprising fourteen indicators and data for the year 2022. A composite index was created using PROMETHEE and cluster techniques to show how well the environment is doing in the selected countries. Correlation analysis examined the relationship between the Human Development Index and the newly created Environmental Performance Index, which includes three dimensions: atmosphere, water and land. The ranking results showed that, among the 19 observed countries, Slovenia was ranked best, while Turkey achieved the lowest results. Eastern European countries are divided into three groups, according to the Environmental Performance Index, based on the results of a cluster analysis. The correlation analysis's findings indicated that Human Development Index and Environmental Performance Index had a moderately positive relationship. Based on the empirical findings of this paper, policymakers should consider improvements with a focus on environmental performance and human development.

Key words: *composite index, atmosphere, water, land*

JEL classification: *R11, Q20, C43, C44*

ПРИМЕНА ПРОМЕТЕ МЕТОДЕ ЗА ОЦЕНУ ЕКОЛОШКИХ ПЕРФОРМАНСИ РЕГИОНА ИСТОЧНЕ ЕВРОПЕ

Апстракт

Рад представља компаративну анализу еколошких перформанси земаља Источне Европе, користећи скуп података који обухвата четрнаест индикатора и податке за 2022. годину. Композитни индекс је креиран применом

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Промете методе и кластер техника како би се приказало стање животне средине у одабраним земљама. Корелациона анализа испитивала је однос између Индекса хуманог развоја и новокреираног Индекса еколошких перформанси, који обухвата три димензије: атмосферу, воду и земљиште. Резултати рангирања показали су да је, међу 19 посматраних земаља, Словенија заузела најбоље место, док је Турска остварила најслабије резултате. Земље Источне Европе подељене су у три групе према Индексу еколошких перформанси, на основу резултата кластер анализе. Налази корелационе анализе указали су на умерено позитивну повезаност између Индекса хуманог развоја и Индекса еколошких перформанси. На основу емпиријских резултата овог рада, креатори политика треба да размотре унапређења са фокусом на еколошке перформансе и хумани развој.

Кључне речи: *композитни индекс, атмосфера, вода, земљиште*

Introduction

Every organism modifies its surroundings during its life, development, and reproduction. Organisms adapt throughout millennia to cope with shifting environmental conditions. Extinct organisms are those that cannot adapt. Natural selection shapes the survivors as the surroundings shift. Long-term environmental conditions, to which organisms adapt, include even atypical or seemingly catastrophic events like volcanic eruptions (Chu & Karr, 2017). The notion of “environment” has undergone substantial transformation throughout the final three decades of the 20th century and the initial decade of the 21st century. The idea has expanded since it was first connected to the contamination of environmental systems alone (Environmental Dimension, 2016). Our future is determined by how we engage with the environment in the here and now, which makes it a crucial aspect of our existence, and life-changing inventions have become more common and more successful since the industrial revolution, yet environmental quality has suffered as a result of these advancements (Arltová & Kot, 2023). In particular, environmental pollution, excessive waste generation, and the growing exploitation of natural resources have significantly contributed to ecological imbalance and environmental degradation worldwide (Zbiljić et al., 2026). This increasing environmental pressure has led to the development of various policy instruments aimed at mitigating its effects. Within this context, carbon markets and green certificate systems are policy instruments aimed at reducing greenhouse gas emissions and promoting sustainability, with effectiveness varying across countries (Sandu et al., 2026).

Considering the multitude of elements influencing environmental performance, inclusive decision-making is necessary. In these circumstances, it is possible to apply multi-criteria decision-making techniques and composite indices. Previous studies have employed MCDM methods and composite indicators to address practical issues in the environmental domain and related fields (Ali Shah et al., 2021; Alshehri et al., 2021; Kumar et al., 2021; Lee & Chang, 2018; Marković et al., 2023; Stanković et al., 2021, Stanković et al., 2024, 2024a; Wu & Liao, 2021). Following a review of the pertinent literature, it was discovered that while environmental studies have recently polarized the qualitative research method to offer new concepts, tools, and methods related to this field (Caggiano & Weber, 2023; Fu & Sun, 2023; Hristov et al., 2021; Mansur & Tangl, 2018), very few of these studies have quantified its importance and role (Barros et al., 2022; Karahan et al., 2025; Kirda & Aytekin, 2023). In terms of environmental considerations, most research uses indicators based on emissions of greenhouse gases and the potential for global warming (Calzolari et al., 2022; Chavez & Sharma, 2018; Taleizadeh et al., 2019). Natural resources, ecological goals, and the positive and negative influences of the environment on society are the basic elements of the biosphere, which represents the environmental dimension in the conceptual model proposed by Rios et al. (2022). Based on the EPI Framework (2024), 58 indicators make up the environmental index, which is based on the study of 11 sub-criteria in the context of three primary criteria (climate change, environmental health, and ecosystem vitality). However, by reviewing the relevant literature, it can be noted that there is still not enough research when talking about the dimensions of the environment, as one of the dimensions of sustainability. In this sense, the current research can contribute to the existing gap in the literature.

The potential use of the PROMETHEE method to evaluate environmental indicators in Eastern European countries is the subject of the paper. The paper focuses on building a new methodology based on multi-criteria decision-making methods (MCDM) to assess environmental performance at the national level while respecting the variety of existing measures. According to Bogdanov et al. (2019), a given event's multidimensionality makes the construction of composite indicators as a measurement strategy crucial. The aim of the research is to provide a methodological framework for the creation of the composite index of environmental performance, that is, to consider the possibility of applying the PROMETHEE method in the evaluation of environmental performance in the countries of Eastern Europe. It is anticipated that the acquired data will validate the feasibility of utilizing the suggested model for evaluating environmental performance in selected countries.

Materials and Methods

Sample and Data Sources in Research

Eastern European countries - Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Montenegro, North Macedonia, Poland, Romania, Serbia, Slovakia, Slovenia, and Turkey - are included in the study. The most recent information has been gathered for research purposes from the *Environmental Performance Index 2022* publication, and a number of various official websites. These are 2022-related data. Appendix provides more specific information about the data sources.

Variables in Research

The atmosphere, water, and land are the three dimensions that make up the environment, according to Abdalla (2015) and Hasanuzzaman & Kumar (2019). As a result, fourteen indicators are used to evaluate environmental performance, and these indicators are categorized into three areas: atmosphere, water, and land. Five indicators are present in the atmospheric area, three indicators in the water area, and six indicators in the land area.

Composite Indexes Configuration

Composite indices measure multidimensional ideas by aggregating separate indicator data and weighting it according to a suitable quantitative approach (González-Laxe et al. 2016, Greco et al. 2019). Because composite indices are much simpler to understand and analyze than indicators, which quantify specific aspects of the observed phenomenon, they are widely used because they offer a thorough assessment of a complex phenomenon and can be used to inform the public and inform decision-making. When constructing composite indexes, a hierarchical structure is built, with individual indicators grouped into dimensions at the bottom, and then further grouped to produce the composite index. Applying composite indices is convenient since it makes it possible to compare various entities and make appropriate, fact-based decisions.

The technique of creating composite indexes involves several steps (González-Laxe et al., 2016; Öztürk et al., 2024): 1) The first stage involves gathering data and creating a hierarchically structured database, where each indicator has a definition, a description of the measurement unit, a fit for the provided dimension, and the source of the information; 2) The weights of the indicators and dimensions are determined in the second phase; 3) Using the proper aggregation approach, the indicators are grouped into dimensions and the dimensions into a composite index in the third step.

Methods

In the empirical part of the work, the data set, which consists of 14 indicators, will be analyzed using the PROMETHEE method. Because of its simplicity and ease of comprehension, the preference ranking organization method for evulation enrichment, or Promothee, is one of the many multi-criteria methods that is gaining popularity (Wu et al., 2020). This technique is a member of the outranking method family. Barnes et al. (1984) introduced the Promethee approach, which Brans & Vincke (1985) expanded upon. Between and within the criteria, information is needed for the assessment process. According to Behzadian et al. (2010), the information between the criteria is expressed as their relative relevance and is made up of weights that are not reliant on the measurement scale.

The Promethee ranking approach is enhanced by the visualization technique known as geometric analysis for interactive aid (GAIA). This is a helpful graphical tool that shows the relationship between criteria, alternatives, and the decision axis by converting ordinal values into a graphical output for decision-making problems. The ideal solution's direction is shown by the decision axis. Options that are adjacent to and on the same side as the decision axis are highly ranked and indicate the best options. Similar preferences are directed in the same direction in the GAIA plane, whereas opposing criteria are directed in opposite directions (Gunawardena et al., 2015). Using the gait weight function, decision makers can quickly acquire the results of a new Promethee II ranking by making modifications to the criterion weights (Brans & Mareschal, 2005). Furthermore, it establishes stability intervals, wherein the ranking stays constant provided that the values stay inside the interval's bounds. Sensitivity analysis is essential for comprehending how a change in weight affects the overall ranking (Kabir & Sumi, 2015). The rank-overtaking net flows are broken down to create the GA matrix. A principal component analysis algorithm is then used to process the matrix data, and the results are shown on a GAIA biplot (Keller et al., 1991). In order to minimize information loss and reduce the number of dimensions, principal component analysis is employed. The multi-criteria problem is given a new perspective despite the inevitable loss of some relational characteristics due to the transformation of the problem into a two-dimensional space and the geometric representation of relations between alternatives and criteria (Vego et al., 2008). It measures the amount of information saved in the GAIA plane (values more than 70% correspond to dependable GAIA planes) in order to control its quality.

In order to gather data within criteria, each criterion needs to have a preference function that expresses how alternative *a* performs differently from alternative *b*. As a result, a pairwise comparison strategy is used (Belton & Stewart, 2002). Six fundamental preference functions can be applied, depending on the criteria's features (Brans & Mareschal, 2005): usual criterion, U-shape criterion, V-shape criterion, level criterion, V-shape with indiference criterion, and Gaussian criterion.

The setting of criteria weights is a major issue in multi-criteria analysis models, as it can have a substantial impact on the decision-making process's outcome. The entropy method, whose main component is the assessment of information uncertainty, is one of the techniques that falls under the objective approaches to deciding the weight of the criterion. The entropy technique takes into account a collection of *m* items and *n* criteria for each object when assessing the significance of criteria (Wang & Zhan, 2012). The definition of the entropy of the *j*-th criterion is:

$$H_j = -k \sum_{i=1}^{m} f_{ij} \ln f_{ij}, \qquad i = 1,2, \dots m, j = 1,2, \dots n$$

For the ith alternative, $k = \frac{1}{\ln m,}$ and $f_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}}$ represent the *j*-th and *i*-th criteria, respectively. It is ensured that all entropy values (H_j) are in the interval [0,1] by adding the constant $k = \frac{1}{\ln m,}$. The relative relevance of the criterion is implied to be higher by a lower entropy score and vice versa. Simple additive normalization yields the final relative weight of the *j*-th criterion:

$$w_j = \frac{1 - H_j}{\sum_{j=1}^{n} (1 - H_j)}$$

According to Brans & de Smet (2016), applying the Prometheus II technique entails giving the decision-maker two pieces of information: 1) relative relevance and 2) preference function for each criterion.

A collection of criteria $G = \{g_1 \dots g_n\}$ and a set of options $A = \{a_1 \dots a_m\}$ are taken into consideration in order to formulate the choice problem. As per Brans & Vincke (1985), the Promethee II calculating process has multiple steps:

Step 1: For each criterion g_k, decide which alternative a_i, is preferred above, a_j:

$$d_k(a_i, a_j) = g_k(a_i) - g_k(a_j)$$

Where the value of the criterion g_k for the *i*-th choice is represented by $g_k(a_i)$, and the value for the *j*-th alternative is represented by a $g_k(a_j)$.

Step 2: P_k preferred function selection. The standard preference function will be used in the work framework for the sake of research simplicity:

$$P_k(a_i, a_j) = P_k[d_k(a_i, a_j)]$$

$$0 \leq P_k(a_i, a_j) \leq 1$$

Step 3: The global preference index $\pi(a_i, a_j)$ is calculated. It denotes the weighted total of all preferences P_k, with w_k denoting the jth criterion relative relevance:

$$\pi(a_i, a_j) = \sum_{k=1}^{j} P_k[d_k(a_i, a_j)].w_k$$

$$w_k \geq 0, \sum_{k=1}^{j} w_k = 1$$

Step 4: Determine the overtaking flows of each option, where the symbols ϕ+ and ϕ− stand for the corresponding positive and negative flow results:

$$\varphi^+(a_i)\frac{1}{n-1}\sum_{x \in A} \pi(a_i, x)$$

$$\varphi^-(a_i)\frac{1}{n-1}\sum_{x \in A} \pi(a_i, x)$$

When an alternative has a larger positive flow score than all other alternatives, it is considered better. Alternative a_i is preferred globally when this score is positive. The global score, where a lower score indicates a better alternative (Lopes et al., 2018).

Step 5: Compute net overtaking flows, which serve as the foundation for ranking the options:

$$\varphi(a_i) = \varphi^+(a_i) - \varphi^+(a_i)$$

Cluster analysis is a useful tool for organizing heterogeneous components into relatively homogeneous groupings by determining the linkages between them. The first step in performing a cluster analysis is choosing a suitable cluster technique. This paper used agglomerative hierarchical cluster analysis.

Correlation analysis was used to determine the strength of the relationship, or the relative importance, between Environment performance index and Human development index. The degree of quantitative agreement (interdependence) between two random variables (*x* and *y*) is indicated by the correlation coefficient (*r*).

Results

Determining the Weighting Criteria for the Assessment of Environmental Dimensions

The variables that play a major part in the composite index and have the biggest impact on its value are determined by the weighting results. It is evident from the weight coefficients that the environmental composite index is most influenced by per capita CO_2 emissions, which are within the atmosphere dimension. Using the PROMETHEE approach, a Usual preference function was chosen to create a composite indicator in the second portion of the analysis. Using the proper multi-criteria model, an overall assessment of performances in three environmental areas - each with several indicators - is used to determine the rankings of each country. The analysis of how sensitive the outcomes were to variations in the preference function selection was done. The results are shown in Table 1.

Table 1. Environmental dimensions, indicator weights and weight stability interval

Dimension (area)	Indicator	Indicator weights	Dimension weights	Weight stability interval
Atmopshere	C1	0.0054	0.7800	77.93% - 79.19%
	C2	0.0028		
	C3	0.0130		
	C4	0.7440		
	C5	0.0149		
Water	C6	0.0038	0.0966	4.14% - 9.74%
	C7	0.0047		
	C8	0.0881		
Land	C9	0.0172	0.1235	11.50% - 12.42%
	C10	0.0157		
	C11	0.0421		
	C12	0.0127		
	C13	0.0157		
	C14	0.0201		

Source: Authors

Eastern European Countries Ranking According to Environmental Index

Table 2 displays the ranking results produced by using PROMOTHEE II methods for the observation year, together with the values of net overtaking flow (ϕ). Slovenia is ranked highest among the observed group countries, followed by Cyprus, Albania, Croatia, North Macedonia, Slovakia, Latvia, Romania, Estonia, the Czech Republic, Hungary, Lithuania, Greece, Bulgaria, Montenegro, Poland, Serbia, Bosnia and Herzegovina, and Turkey, which comes in last. These rankings are based on the computation of outranking flows, positive and negative flows, and the complete Net Flow Φ.

Table 2. Ranking of alternatives according to environmental indicators in 2022

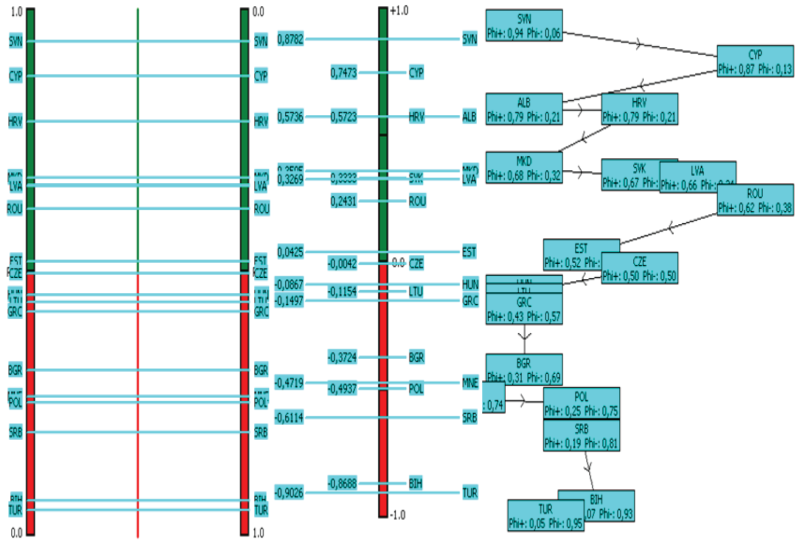
Country	Φ	Φ+	Φ-	Rank
Slovenia	0.8782	0.9391	0.0609	1
Cyprus	0.7473	0.8737	0.1263	2
Albania	0.5736	0.7868	0.2132	3
Croatia	0.5723	0.7861	0.2132	4
North Macedonia	0,3595	0.6798	0.3202	5
Slovakia	0.3333	0.6667	0.3333	6
Latvia	0.3269	0.6635	0.3365	7
Romania	0.2431	0.6216	0.3784	8
Estonia	0.0425	0.5213	0.4787	9
Czech Republic	-0.0042	0.4979	0,5021	10
Hungary	-0.0867	0.4567	0.5433	11

Lithuania	-0.1154	0.4423	0.5577	12
Greece	-0.1497	0.4252	0.5748	13
Bulgaria	-0.3724	0.3138	0.6862	14
Montenegro	-0.4719	0.2641	0.7359	15
Poland	-0.4937	0.2531	0.7469	16
Serbia	-0.6114	0.1943	0.8057	17
Bosnia and Herzegovina	-0.8688	0.0656	0.9344	18
Turkey	-0.9026	0.0487	0.9513	19

Source: Authors

The results of the partial and final ranking, as well as the network of alternative flows, are illustrated in Figure 1. The first and second figures show the partial and final ranking of alternatives, based on the net flow of alternatives, while the third figure represents the final result of the positive and negative flow of alternatives. This ranking provides an overview of all alternatives, including their preference scores. The ranking score is the final result of the net preference flow PROMETHEE analysis, which combines weights, preference functions, and criteria values per alternative. Among the alternatives, Slovenia (0.94) ranks first in terms of enviromental, followed by Cyprus (0.87), Albania (0.79), Croatia (0.79), North Macedonia (0.68), Slovakia (0.67), Latvia (0.66), Romania (0.62), Estonia (0.52), Czech Republic (0.50), Hungary (0.46), Lithuania (0.44), Greece (0.43), Bulgaria (0.31), Montenegro (0.26), Poland (0.25), and Serbia (0.19), while Bosnia and Herzegovina (0.07) and Turkey (0.05) ranked lowest. Based on the graphically illustrated presentation, it can be concluded that Slovenia prefers it compared to other alternatives in the PROMETEE I range (picture on the left). This is also confirmed by PROMETHEE II (picture on the right). Slovenia has the highest Phi (φ) score, while Turkey has the lowest score, which is why it is at the bottom of the PROMETHEE II scale.

Figure 1. PROMETHEE I partial ranking, PROMETHEE II final ranking and alternative stream network, based on criteria values and weighting.



Source: Authors

Cluster Analysis Results

Hierarchical cluster analysis was used to identify groups of Eastern European countries with similar environmental performance. The clusters' significant geographic heterogeneity is revealed by the cluster analysis's findings. In terms of how well the cluster's member countries are doing with their environmental performance, it is evident that the counties in the first cluster have the highest, while the countries in the third cluster have the lowest indicator values (Table 3).The variables that play a major part in the composite index and have the biggest impact on its value are determined by the weighting results.

Table 3. Cluster analysis results of environmental performance

Cluster 1	Albania, Croatia, Cyprus, Slovenia
Cluster 2	Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, North Macedonia, Romania, Slovakia
Cluster 3	Bosnia and Herzegovina, Bulgaria, Montenegro, Poland, Serbia, Tukey

Source: Authors

Correlation Analysis Results

Determining the relationship between environmental and socioeconomic growth was the f focus of additional analysis. Data on the Human Development Index (HDI) was used to conduct this analysis. According to the value of the Spearman's coefficient, there is a moderate and positive correlation between the HDI and the environment (Table 4).

Table 4. Correlation coefficients

	HDI 2022
Environmental 2022	0.701*

Note: * - Significant at a level of 0.01

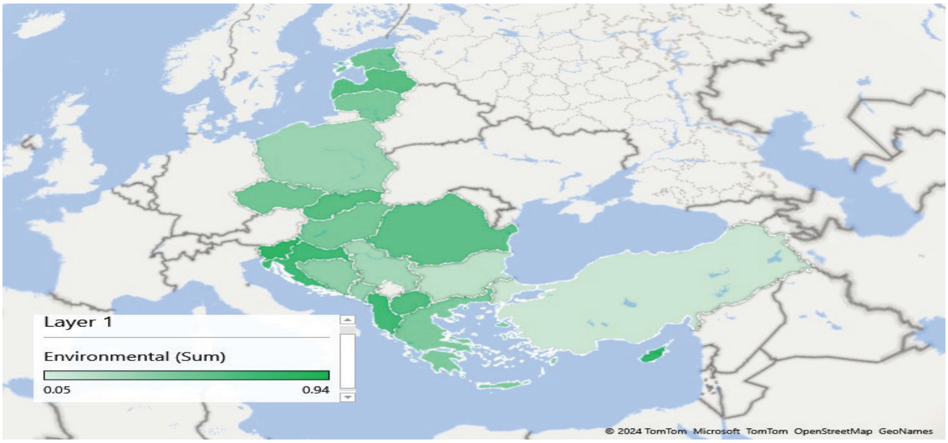
Source: Authors

Discussion

The model created in the research paper was built with the understanding that environmental evaluation is a multidimensional and complex issue, requiring a particular type of index that is derived from the summation of its constituent variables. This model was used to assess the environmental performances of Eastern European countries. As a result, the model that has been suggested includes fourteen indicators that address the atmosphere, water, and land facets of the environmental dimension of sustainability.

The study's findings suggest that there are substantial disparities between Eastern European countries regarding environmental performance (Figure 2). Slovenia is the best alternative in terms of environmental performance, which is not surprising since, according to Lee et al. (2017), Slovenia was named the green capital of Europe in 2016. In addition, according to the research results of Marković et al. (2023), among the EU countries, Slovenia is in the third position, just behind Belgium and the Netherlands, according to the composite index of waste management. It is noticeable that better results are recorded by EU member states, except for Poland, which was at the bottom of the ranking list, primarily due to poor results in the atmosphere dimension. On the other hand, Albania, which is not a member of the EU, is in third place among 19 alternatives, primarily due to the excellent results recorded in the atmosphere dimension. Similar results, based on the PROMETHEE approach, 11 indicators, and three dimensions (climate change, environmental health, and ecosystem vitality) were also obtained by Karahan et al. (2025). The above confirms the possibility of applying the PROMETHEE method for environmental performance index evaluation.

Figure 2. An overview of the results: environmental performance in 2022

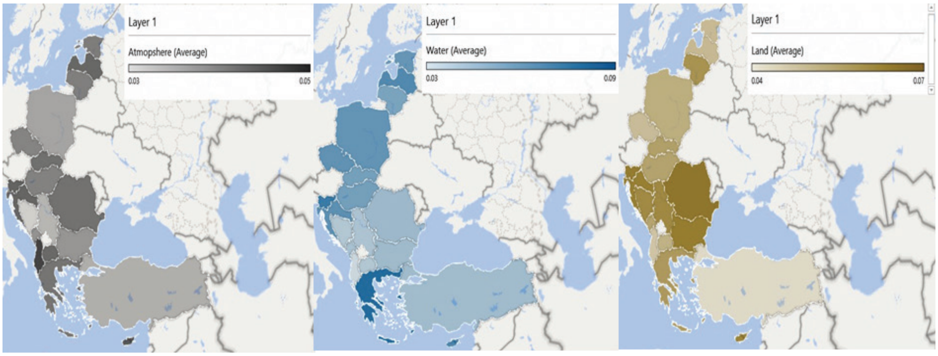


Source: Authors

The average values (Figure 3) reveal that all countries, except for Slovenia, Cyprus, Croatia, and Slovakia, achieve lower results in certain dimensions. In addition, the largest differences between the observed countries are recorded by the indicator, which refers to the dimension of water, then land, and the least atmosphere. The potential increase or reduction in the weights value that will not affect the given ranking results is computed using the sensitivity analysis tool (walking weights). It is interesting to note that increasing the relative importance of indicators relative to the water dimension to 5.6% will not affect the change in rank obtained using the integrated Entropy-PROMETHEE approach, indicating that the water dimension's indicator is less important when compared to the average values of indicators from the atmosphere and land dimensions. Loganathan et al. (2022) suggested that because air quality varies over time due to the presence of chemical contaminants in the atmosphere and shifting meteorological conditions, analysis of air quality is crucial for all areas on Earth.

Eastern European nations can be divided into three categories based on the findings of the cluster analysis. The countries with the highest achieved values of the newly developed environmental performance index are Slovenia, Cyprus, Albania, and Croatia; the countries with lower observed index values are Bulgaria, Montenegro, Poland, Serbia, Bosnia and Herzegovina, and Turkey. The obtained results indicate significant disparities when it comes to the achieved level of environmental performance.

Figure 3. Environmental dimensions average value in Eastern European countries



Source: Authors

The study's findings indicate a positive correlation between the HDI and the composite environmental index. The explanation for the positive correlation between the HDI and the environment is that countries with low HDI levels prioritize addressing all of their citizens' social needs, while designing an inclusive growth strategy that supports development economies while staying within the nation's ecological bounds represents a challenge in the environmental context. However, countries that have already attained high levels of citizen satisfaction have frequently done so at a considerable environmental cost, and they now need to reconsider their consumption patterns, make better use of their resources, lessen pollution of the land and water, and decarbonize economies. This is consistent with the Environmental Kuznets Curve (EKC) hypothesis (Kuznets, 1955). EKC hypothesis states that there is an inverse U-shaped relationship between environmental pollution and economic growth. Specifically, it states that environmental pollution increases up to a point in the first stage with economic growth, but after the turning point is reached, environmental pollution tends to decrease (Panayotou 1993). In the environmental context, Polat & Çil (2025), showed an inverted U-shaped relationship between CO_2 emissions and the HDI index.

Conclusion

Natural resources depletion and environmental degradation are two of the biggest issues that humanity will likely have to deal with in the near future. In particular, these issues have significantly worsened in the last few years. New environmental policy measures have been sparked by this aspect, both domestically and globally. Concerns regarding greenhouse gas (GHG) emissions, air and water pollution, deforestation, and the production and disposal of garbage have been brought up by environmental indicators. All of these possible pollutants can be tracked using the environmental indicator to guarantee the protection of people's health and safety. However, the absence of measurements that would enable sufficient monitoring of progress towards environmental goals frequently makes it difficult to adopt effective regulations.

Therefore, this paper provides a model for a multi-criteria approach to environmental performance assessment at the national level. To assess the nation's environmental performance, 14 indicators are used. They are categorized into the following areas: (1) the atmosphere; (2) water; and (3) land in 2022. The Entropy-PROMETHEE and cluster-based methodologies were utilized in the development of the composite measure, which encompasses multiple facets of environmental performance. The proposed methodology, which enhances the current methods for assessing environmental performance at the national level, therefore expresses the theoretical contribution of the paper. Empirically, except that it evaluates the environmental performance dimensional level, by providing a new method for evaluating environmental performance using Eastern European countries as an example, this paper adds to the body of knowledge already available on environmental performance metrics.

The study found a statistically significant relationship between the environmental performance index and the HDI. These findings highlight the significance of protecting the environment for knowledge, a long and healthy life, and a reasonable standard of living.

The research that was done contains certain limitations, which can be interpreted as recommendations for future research on the subject. Firstly, the data refer only to the year 2022, while future research could cover a longer period and follow the trend of the development of environmental performance. Next, the current research used data for Eastern European countries, while future research could apply data for other regions and compare the obtained results with the results of the current research. The Entropy method was used to determine the weight coefficients, while the PROMETHEE method was used to calculate the index based on 14 indicators. Future research could also use other methods (such as the CRITICAL-GRA approach) and additional indicators.

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Appendix: Data sources

Dimension	Variable	Source
Atmopshere	C1 Climate Change	Environmental Performance Index 2022, p. 27. https://epi.yale.edu/downloads/epi2022report06062022.pdf
	C2 Acid Rain	Environmental Performance Index 2022, p. 132
	C3 Air Quality	Environmental Performance Index 2022, p.71
	C4 Per capita CO_2 emissions	https://ourworldindata.org/co2-and-greenhouse-gas-emissions
	C5 Greenhouse gas emissions per capita	https://epi.yale.edu/epi-results/2022/component/ghp

Water	C6 Sanitation & Drinking Water	Environmental Performance Index 2022, p. 80
	C7 Water quality	https://worldpopulationreview.com/country-rankings/water-quality-by-country
	C8 Wastewater treatment	https://epi.yale.edu/epi-results/2022/component/wwt
Land	C9 Waste Management	Environmental Performance Index 2022, p. 95
	C10 Biodiversity & Habitat	Environmental Performance Index 2022, p. 105
	C11 Tree cover loss	https://epi.yale.edu/epi-results/2022/component/tcl
	C12 Ecosystem Services	Environmental Performance Index 2022, p. 116
	C13 Agriculture	Environmental Performance Index 2022, p. 141
	C14 Grassland loss	https://epi.yale.edu/epi-results/2022/component/grl
HDI	Human Development Index	Human development report 2023/24, pp. 274-275 https://hdr.undp.org/system/files/documents/global-report-document/hdr2023-24reporten.pdf