

Sustainability Performance of D-8 Countries from 2014 to 2020 in Environmental, Social, Economic, Financial and Governance Dimensions: An Analysis Using Integrated MCDM Methods

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Abstract: Today, environmental issues and climate change are among the top agenda items for countries, while the concept of sustainable development has expanded to include environmental, economic and social dimensions. Defined by the United Nations in 1987, sustainable development emphasizes the need to meet present needs without compromising the ability of future generations to meet theirs.

This study aims to evaluate the sustainability performance of D-8 Organization for Economic Cooperation member countries across five main dimensions: social, environmental, economic, governance, and financial. As sustainable development practices increase, D-8 countries, with their rapid economic growth and high population density, have the potential to adopt sustainability strategies to address the challenges they face. However, these countries are confronted with significant barriers such as poverty, health, education, and environmental challenges. This research seeks to provide substantial contributions to D-8 countries in the context of implementing sustainability dimensions.

The study covers the 2014-2020 period and analyzes the sustainability performance of D-8 countries using multi-criteria decision-making (MCDM) methods. In the analysis phase, the relative importance levels of sustainability performance indicators were first determined using the Lopcow method. Following this, based on these importance levels, the countries' sustainability performances were ranked using the Mabac, Mairca, and Codash methods. In the final stage, the performance scores calculated by these three methods were integrated into a single ranking using the Borda Count method. The analysis results show that Malaysia,

Indonesia, and Türkiye ranked as the top three countries, with the highest sustainability performance, while Egypt, Nigeria and Iran were the countries with the lowest performance.

Keywords: Sustainability; D-8 Countries; Lopcow; Mabac; Mairca; Codas; Borda Count Methods

1 Introduction

Environmental issues and climate change have become the primary agenda for countries. Nations are increasingly shifting towards renewable energy sources instead of fossil fuels and competing to recycle waste. In this race, it is essential for economic, social, and environmental dimensions to act together, as this synergy is crucial for achieving a rational balance necessary for sustainable development.

Sustainable development gained significance starting in the 1960s due to problems such as environmental pollution and the excessive use of natural resources, and its importance has persisted to this day. In 1987, the "Our Common Future" report prepared by the United Nations World Commission on Environment and Development defined sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs." This definition laid the foundation for the concept of sustainable development. Initially focused on environmental protection, this understanding has gradually expanded to encompass economic and social dimensions. The importance of the governmental aspect within the sustainable development literature has also grown over time [1]. It is expected that governments develop strategies supporting these three dimensions and play an active role in areas such as sustainable production, consumption, climate change, and the preservation of natural resources.

Studies highlight the complex structure of sustainable development and the difficulty of establishing a single measurement method or criterion. Therefore, the development of indices that measure sub-dimensions is often recommended. In recent years, elements such as finance and governance have been included within the scope of sustainable development [2], and accordingly, the concept of sustainability has evolved into a five-dimensional phenomenon that encompasses economic, social, environmental, financial, and governance domains [2].

With the expansion of sustainable development practices and literature, international collaborations are increasing and new organizations are being established. In this context, the D-8 Organization for Economic Cooperation (D-8 countries), established in 1997 in Istanbul by Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Türkiye, plays an important role in sustainable development cooperation without aiming at direct integration in countries with

Muslim populations. The intergovernmental D-8 organization aims to strengthen the global economic position of its member countries, diversify their trade relations, improve the living standards of their populations, and increase their participation in international decision-making processes.

In this regard, the D-8 countries, utilized within the scope of this study, have the potential for long-term growth and increased prosperity by adopting sustainable development strategies due to their rapidly growing economies. However, high population density contributes to issues such as poverty, malnutrition, health, education challenges, and gender inequality, while rapid urbanization leads to environmental difficulties. In this context, sustainability research is crucial for solving the existing problems in countries where financial potential is high, yet these issues are widespread.

This study, covering the period from 2014 to 2020, aims to measure sustainability performance in D-8 countries across five dimensions (social, environmental, economic, governance and financial). The research distinguishes itself by the fact that no other study has been found that examines sustainability performance in D-8 countries from these different dimensions, making this work original. Therefore, the focus on both the application of the five different dimensions of sustainability and conducting the study in the D-8 countries, which are in significant need of sustainability, makes this research particularly important.

The study is structured into five sections. The first section presents a literature review, while the second section provides information on the study's methodology. In the third section, the findings from the analyses conducted using the LOPCOW, MABAC, MAIRCA, CODAS, and Borda Count methods are presented. In the fourth section, the findings obtained from the analyses are evaluated comparatively on a country-by-country basis. Finally, section five offers conclusions and a related discussion.

2 Literature Review

Sustainability, one of the most crucial policy elements in today's world, is becoming increasingly important globally with its environmental, social, economic, governance, and financial dimensions. Research in this area is being examined in-depth through various methodological approaches and country-based performance evaluations. This literature review compiles studies that analyze sustainability performance using different methods and data, offering a comprehensive perspective on the current situation and trends.

Freeman and Chen [3] evaluated green supplier selection using AHP, Entropy, and TOPSIS methods. The study's findings revealed that top-level managers ranked traditional criteria higher than environmental criteria, indicating that fully

integrating environmental awareness into green supply chain management practices may take time.

In their study, Ding *et al.* [4] analyzed the sustainability performance of 287 cities in China between 2012 and 2016 using the Entropy-based TOPSIS method. The results showed that coastal cities in the east had the highest sustainability performance, cities in the central and northern regions had moderate performance, and cities in the west had the lowest sustainability performance.

Strezov *et al.* [5] evaluated the effectiveness of nine sustainability indices for three main dimensions (environmental, social, and economic) using cluster analysis. The results revealed that only two of the nine indices (the Genuine Savings Rate and the Sustainable Society Index) effectively represented all three dimensions of sustainable development. In contrast, two indices (the Welfare Change Index and the Ecological Footprint) were found to focus solely on either the economic or environmental sub-dimension.

Raut *et al.* [6] analyzed the performance of sustainability practices in banking services using a multi-stage integrated approach combining Balanced Scorecard, fuzzy AHP, and fuzzy TOPSIS methods. This approach aimed to evaluate sustainability from four perspectives: financial stability, customer relationship management, internal business processes and an environmentally friendly management system. The study, which involved a real-life application with six of the largest commercial banks in India, revealed that the environmentally friendly management system was given less priority compared to other criteria.

Bocutoğlu's [7] study analyzed the economies of D-8 Economic Cooperation Organization member countries from the perspective of sustainable and inclusive growth. Using data from the World Economic Forum, the study assessed the economic sustainability and inclusiveness of 112 countries. The findings showed that Malaysia, Türkiye, Indonesia, and Iran performed above average, while other D-8 countries generally lagged behind. Despite reaching a certain level of economic growth, the results highlighted that this growth has been insufficient in creating productive employment and reducing poverty. It was emphasized that D-8 countries need to make greater efforts to achieve their sustainable and inclusive growth targets.

Mateusz *et al.* [8] evaluated the sustainable development performance of 27 EU countries for the year 2016 using the TOPSIS and VIKOR methods. According to the TOPSIS results, Austria, Denmark, and Germany had the best performance, while VIKOR ranked Austria, France, and Germany as the top performers. Countries with lower performance were Romania, Bulgaria, and Cyprus (GKRY) according to TOPSIS, and Romania, Estonia, and Cyprus (GKRY) according to VIKOR.

Öztel *et al.* [9] assessed the corporate sustainability performance of Akenerji in Türkiye using the TOPSIS and Entropy weighting methods across three key

dimensions (economic, social, and environmental). The study revealed that while the company achieved high economic success, its environmental and social performance were lower.

Balcerzak and Pietrzak [10], in their analysis of sustainable development performance of 24 EU countries using 2013 Eurostat data and the TOPSIS method, found that Sweden, Denmark, the UK, the Netherlands, Ireland, France, and Germany had the highest performance, whereas Romania, Slovenia, and Poland were among the lowest performers.

Kayapınar Kaya [11] analyzed the sustainable development performance of 33 OECD countries for the years 2019 and 2020 using the MAIRCA and MARCOS methods based on eight SDG components. The results indicated that the top three countries with the highest sustainable development performance were the USA, Germany, and Japan, while Türkiye, Chile, and Lithuania ranked the lowest.

Doğan and Yılmaz [12] examined the progress of D-8 countries toward achieving the United Nations 2030 Sustainable Development Goals (SDGs). As of 2019, Malaysia, Türkiye, and Iran were identified as the most successful countries, whereas Bangladesh, Pakistan, and Nigeria were found to be the least successful. The study also highlighted that Türkiye has integrated its SDG targets into its development plans, Malaysia continues with its existing economic strategies, and Iran focuses on poverty and income inequality, while the other D-8 countries are developing their own strategies.

Abbasi et al. [13] analyzed the impact of natural resource depletion, economic growth, population growth, energy consumption, and industrial value-added on carbon emissions in the UK from 1970 to 2019 using the ARDL model. The study found that economic growth and natural resource depletion increased carbon emissions in the short term, while energy consumption and population growth led to higher emissions in the long term. Industrial value-added consistently contributed to emissions in both periods.

Mujtaba and Shahzad [14] examined the effect of renewable energy and carbon emissions on healthcare expenditures across 28 OECD countries from 2002 to 2018 using least squares and panel vector error correction methods. Their findings indicated a positive long-term relationship and causality between renewable energy, carbon emissions, and healthcare costs.

Lamichhane et al. [15] used over 90 indicators and applied the GS-PCA method to assess the performance of 35 OECD countries in achieving sustainable development goals (SDGs). The study showed improvements in group averages for certain targets, but also significant disparities in the rankings of countries with average or low performance.

In a study by Doğan and Delice [16], the development levels of D-8 countries (1997-2020) were examined using growth, human, environmental, and financial development criteria. The findings indicated that growth levels varied across the

countries, and the share of industrial production in value-added decreased in Indonesia, Iran, Malaysia, Nigeria, and Türkiye from 1997 to 2018, while it remained stable in Egypt and increased in Bangladesh and Pakistan. Human development improved in all countries except Nigeria, and while Malaysia and Türkiye showed strong financial development, other countries exhibited steady growth in this area.

Khan *et al.* [17] conducted a study analyzing the impact of eight components of sustainable development – economic growth, foreign direct investment, renewable energy, energy intensity, unemployment, and income inequality – on carbon emissions in 219 countries from 1990 to 2020 using dynamic difference and system generalized method of moments. The study found that sustainable development contributes positively to the reduction of carbon emissions.

A study by the European Commission [18] ranked the sustainable development performance of 72 countries for the year 2020. Switzerland, Denmark and Ireland were identified as the best performers, while Saudi Arabia, the United Arab Emirates and the United States were identified as the worst performers. Among the 27 EU countries, Denmark, Ireland and the Netherlands had the highest scores, while Bulgaria, Cyprus and Romania had the lowest. The analysis showed that countries such as Denmark, Ireland, the Netherlands, Germany, Sweden, Malta, Slovenia, Australia, France, Belgium, the Czech Republic, and Luxembourg performed above average, while Italy's performance was found to be at the average level.

Mathrani *et al.* [19] used Ward's method for cluster analysis to compare the sustainable development indicators of 45 Asian countries. Their study concluded that Southeast, Central and West Asia had better economic performance, while East and Central Asia had better social performance and West and South Asia had better environmental performance.

Kahreman [20] developed an integrated model called LOPCOW-AROMAN to measure the sustainable development performance of EU countries from 2008 to 2020, focusing on economic, social, financial, and governance indicators. The results identified Luxembourg and Germany as the countries with the best sustainable development performance, while Romania and Bulgaria were found to have the worst performance.

This section of the study deals with the issue of sustainability, focusing on different methodologies, especially multi-criteria decision making (MCDM), and their application in different dimensions around the world, especially in the D-8 member countries. When evaluating these studies as a whole, it is evident that while they share some commonalities, such as objectives, they also differ in terms of methods, scope, and time periods analyzed. In addition, although different analytical methods are used, it is often observed that sustainability performance is assessed using MDCM methods, which facilitate performance ranking.

It is also worth noting that studies analyzing sustainability performance in the D-8 countries are relatively limited. In this context, the current study integrates different analytical methods to examine sustainability performance in D-8 countries for the period 2014-2020, focusing on five different dimensions.

3 Methodology

2.1 Data Set

As previously mentioned, this study focuses on a comparative analysis of the multidimensional sustainability performances of D-8 countries (Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Türkiye). For this purpose, the data set for the period of 2014-2020 includes indicators covering social, environmental, economic, governance, and financial dimensions, compiled from the International Monetary Fund (Financial Development Index) and the World Bank (World Development Indicators and Worldwide Governance Indicators). The availability of data for the indicators determined within the scope of the study was decisive in selecting the research period. Information regarding these indicators is presented in Table 1.

Table 1
Criteria of the Study

Category	Criterion	Criterion Code	Direction
Social	Access to Clean Fuels and Technologies for Cooking (% of population)	C1	Benefit
	Compulsory Education. Duration (years)	C2	Benefit
	Life Expectancy at Birth. Total (years)	C3	Benefit
	Women Business and the Law Index Score (Scale 1-100)	C4	Benefit
Environmental	CO ₂ Emissions (metric tons per capita)	C5	Cost
	Forest Area (% of Land Area)	C6	Benefit
	Renewable Energy Consumption (% of Total Final Energy Consumption)	C7	Benefit
Economic	GDP per capita (constant 2015 US\$)	C8	Benefit
	GDP per capita growth (annual %)	C9	Benefit
	Unemployment. Total (% of Total Labor Force) (Modeled ILO Estimate)	C10	Cost
Governance	Control of Corruption: Estimate	C11	Benefit

	Government Effectiveness: Estimate	C12	Benefit
	Political Stability and Absence of Violence/Terrorism: Estimate	C13	Benefit
	Regulatory Quality: Estimate	C14	Benefit
	Rule of Law: Estimate	C15	Benefit
	Voice and Accountability: Estimate	C16	Benefit
Financial	Financial Development Index	C17	Benefit

As seen in Table 1, there are a total of 17 criteria across five different dimensions used in the study. Two of these criteria (C5 and C10) are cost-oriented, while the others are benefit-oriented.

2.1 Methodology

The multi-dimensional sustainability performance of the countries in the sample for the 2014–2020 period is analyzed using MCDM methods. It is well known that one of the most important steps in using these methods is determining the weightings of the selected criteria. In this context, in the first step, the criteria are weighted using the LOPCOW method. After the weighting process, MABAC, MAIRCA, and CODAS methods are applied to perform a comparative analysis of the sustainability performance of the countries in the sample.

The reason for conducting the study using multiple MCDM methods is to achieve more robust and consistent findings, as well as to evaluate any differences that may arise from the use of different methods. Additionally, since the results can vary in studies where multiple MCDM methods are applied simultaneously, it is beneficial to consolidate the findings into a singular structure to maintain the coherence of the results.

In studies conducted using multiple MCDM techniques, the Borda Count Method can be utilized to consolidate findings into a single result. This method, which is quite practical in its application, assigns points as follows: among n alternatives, the best alternative receives $n-1$ points, the second-best alternative receives $n-2$ points, and the last alternative receives 0 points. Ultimately, the points are summed to obtain the Borda score. The alternative with the highest score ranks first [21-23].

4 Analysis Findings

The first stage of the analyses conducted within the scope of the study involves calculating the importance weights of the criteria using the LOPCOW Method, introduced by Ecer and Pamučar [24]. By following the steps of the method, all criteria have been weighted for each year, and the results are presented in Table 2.

Table 2
Importance Weights of the Criteria

Criteria/ Years	2014	2015	2016	2017	2018	2019	2020
C1	0.06671	0.06924	0.07009	0.07132	0.07167	0.06897	0.07084
C2	0.06845	0.07000	0.07038	0.07183	0.07290	0.07122	0.07463
C3	0.09887	0.10176	0.10246	0.10473	0.10627	0.10381	0.10857
C4	0.05906	0.06452	0.06487	0.06859	0.07124	0.06960	0.07459
C5	0.06444	0.06623	0.06316	0.06489	0.06364	0.06544	0.06881
C6	0.04106	0.04189	0.04215	0.04320	0.04393	0.04299	0.04513
C7	0.03203	0.03198	0.03194	0.03052	0.03036	0.03089	0.03356
C8	0.03384	0.03295	0.03277	0.03186	0.03137	0.02967	0.03092
C9	0.09557	0.09500	0.09819	0.09039	0.08829	0.07928	0.07561
C10	0.07043	0.06981	0.05678	0.05863	0.06970	0.08712	0.09796
C11	0.05958	0.05524	0.04915	0.06064	0.04347	0.03582	0.03473
C12	0.04592	0.04099	0.05841	0.05613	0.05260	0.05844	0.04551
C13	0.06062	0.06560	0.06001	0.06050	0.05895	0.05734	0.04593
C14	0.05678	0.05268	0.04766	0.05008	0.06322	0.06198	0.06440
C15	0.03449	0.03438	0.05227	0.04116	0.04437	0.04452	0.03634
C16	0.07873	0.07727	0.06603	0.06126	0.05224	0.05610	0.05757
C17	0.03341	0.03044	0.03365	0.03425	0.03577	0.03681	0.03491

According to the criterion weights presented in Table 2, the criterion with the highest importance weight in 2020 and 2019 is C3 (Life Expectancy at Birth), while the criterion with the lowest importance weight is C8 (GDP per capita). In 2018, 2017, 2016, and 2014, the criterion with the highest importance weight is again C3, while the one with the lowest importance weight is C7 (Renewable Energy Consumption). In 2015, the criterion with the highest importance weight is once more C3, but the one with the lowest importance weight is C17 (Financial Development Index). When the importance weights of the criteria are considered together, it can be observed that C3 holds the highest importance weight in all years, whereas C17, and especially C7 and C8, generally have lower importance weights.

After the first stage of the analysis, which involved the weighting of the criteria, the second stage follows. In this stage, the sustainability performance of the countries in the sample is analyzed using the MABAC method, introduced into the literature by Pamučar and Čirović [25]. The findings from the analyses conducted with this method are presented in Table 3.

Table 3

Findings of MABAC Method

Countries/ Years	2014	2015	2016	2017	2018	2019	2020
Bangladesh	-0.01549	-0.02703	-0.04561	-0.04711	-0.03053	-0.02500	-
Egypt	-0.11796	-0.02144	-0.00163	-0.00297	0.03476	0.05497	0.02995
Indonesia	0.15888	0.15999	0.17059	0.18398	0.17366	0.17754	0.05447
Iran	-0.05740	-0.11945	-0.01012	-0.07861	-0.11831	-0.11305	0.15093
Malaysia	0.21379	0.19644	0.18964	0.20992	0.20867	0.20698	-
Nigeria	-0.07176	-0.08338	-0.14379	-0.13919	-0.10910	-0.08736	0.04367
Pakistan	-0.00863	-0.00368	0.00182	-0.00886	0.01928	-0.01280	0.13760
Türkiye	0.18780	0.19458	0.13836	0.18710	0.12332	0.09434	-
							0.08308
							0.00147
							0.12007

The scores presented in Table 3 show that in 2020, the country with the highest sustainability performance was Indonesia with a score of 0.15, while the lowest performance belonged to Nigeria with a score of -0.83. In 2019, the highest score was 0.20 in Malaysia, while the lowest score was -0.11 in Iran. In 2018, Malaysia again took the lead with a score of 0.20, while Iran ranked last with a score of -0.11. In 2017, Malaysia maintained its leading position in sustainability with 0.20 points, while Nigeria ranked last with -0.13 points. According to the 2016 data, Malaysia had the highest performance with 0.18 points, while Nigeria remained at the bottom with -0.14 points. In 2015, Malaysia again secured the highest score with 0.19 points, while Iran was at the bottom with -0.11 points. In 2014, Malaysia achieved the highest performance with 0.21 points, while Iran was at the bottom with -0.05 points.

After the performance ranking of the MABAC method in the second stage of the analysis, the third stage begins and the sustainability performance of countries is reassessed using the MAIRCA technique developed by Pamučar *et al.* [26]. Unlike the other two methods, the scores calculated here are ranked in ascending order, with the alternative with the lowest score being considered the best option. The results of the analysis using the MAIRCA method are presented in Table 4.

Table 4
Findings of MAIRCA Method

Countries/Years	2014	2015	2016	2017	2018	2019	2020
Bangladesh	0.06618	0.06693	0.07018	0.07078	0.06968	0.06839	0.06848
Egypt	0.08124	0.06932	0.06844	0.06882	0.06468	0.06082	0.05913
Indonesia	0.04237	0.04253	0.04153	0.03989	0.04104	0.03936	0.04119
Iran	0.07852	0.08507	0.07170	0.08097	0.08855	0.08714	0.07824
Malaysia	0.03042	0.03241	0.03481	0.03239	0.03187	0.03164	0.03948
Nigeria	0.07641	0.07766	0.08652	0.08655	0.08325	0.08002	0.07972
Pakistan	0.06758	0.06613	0.06657	0.06823	0.06552	0.06873	0.06721
Türkiye	0.03598	0.03542	0.04416	0.03939	0.04703	0.05015	0.04685

Based on the MAIRCA scores presented in Table 4, in 2020, Malaysia achieved the highest sustainability performance with a score of 0.03, while the lowest performance was recorded by Nigeria with a score of 0.07. In 2019, among the

sampled countries, Malaysia again received the highest score of 0.03, whereas Iran had the lowest sustainability performance with 0.08 points. By 2018, Malaysia displayed the highest performance with 0.03 points, and Iran remained at the bottom with 0.07 points. In 2017, Malaysia maintained its leadership in sustainability with 0.03 points, while Nigeria ranked last with 0.08 points. According to the 2016 data, Malaysia showed the highest performance with 0.03 points, while Iran had the lowest performance with 0.07 points. In 2015, Malaysia once again led with 0.03 points, while Iran took the last place with 0.08 points. In 2014, Malaysia reached the highest sustainability performance with 0.03 points, while Egypt ranked at the bottom with 0.08 points.

After completing the performance ranking with the MAIRCA Method in the third stage of the analysis, the fourth stage begins, where the sustainability performance of the countries is evaluated using the CODAS Method, developed by Keshavarz Ghorabae et al. [27]. The findings related to the CODAS Method are presented in Table 5.

Table 5
Findings of CODAS Method

Countries/ Years	2014	2015	2016	2017	2018	2019	2020
Bangladesh	0.12751	0.18074	-0.06361	-0.11557	0.07269	0.13169	0.06551
Egypt	-5.87236	-5.21770	-4.98030	-5.25096	-0.13067	-4.80283	0.03069
Indonesia	0.65090	0.67371	0.43339	0.84333	0.47508	1.04380	0.39908
Iran	-0.86962	-1.44106	0.22792	-0.93242	-1.45843	-1.38887	-0.25001
Malaysia	1.77823	1.60129	1.07747	1.43674	1.67571	1.68775	0.64853
Nigeria	-0.79374	-0.84673	-1.34075	-1.05473	-0.91935	-0.62188	-0.57947
Pakistan	-0.45621	-0.48488	-0.04801	-0.60489	-0.00698	-0.58513	-0.66294
Türkiye	0.86084	0.96999	0.12410	1.11603	0.29195	-0.01528	0.34861

In light of the data in Table 5, in 2020, the country with the highest sustainability performance was Malaysia with a score of 0.64 while Pakistan had the lowest performance with a score of -0.66 . By 2019, Malaysia exhibited the highest sustainability success with 1.68 points, and Egypt was the country with the lowest performance at -4.80 points. In 2018, Malaysia maintained the top position with 1.67 points, while Iran ranked last with -1.45 points. In 2017, Malaysia continued to demonstrate the highest sustainability performance with 1.43 points, while Egypt ranked lowest with -5.25 points. According to the 2016 data, Malaysia led with 1.07 points, whereas Egypt had the lowest performance at -4.98 points. In 2015, Malaysia again showed the highest performance with 1.60 points, while Egypt remained at the bottom with -5.21 points. In 2014, Malaysia reached the highest sustainability performance with 1.77 points, while Egypt ranked last with -5.87 points.

The sustainability performances of the D-8 countries were ranked and evaluated using different MCDM techniques. Although the findings from the MABAC, MAIRCA, and CODAS methods were quite similar, some differing results were also observed. Additionally, to evaluate the potential impact of the weighting

structure on the results, to enhance the consistency of the findings, and to enable a comparison with the LOPCOW-based results, all analyses conducted using the MABAC, MAIRCA, and CODAS methods were repeated under an equal-weights scheme. To address the differences in findings, the sixth stage of the analysis proceeds with the Borda Count technique, where the results are combined to form a unified performance ranking. The scores calculated using the Borda Count method for the years 2014 to 2020 are presented in Table 6.

According to the cumulative scores presented in Table 6, the inclusion of equal weighting in the analysis results in changes in the rankings only for Nigeria and Iran. Nevertheless, under both weighting structures, Malaysia consistently appears in the upper ranks throughout all years, maintaining its position as the country with the highest sustainability performance within the sample during the entire period. Iran and Nigeria, on the other hand, remain in the lower ranks in most years regardless of the weighting approach, and when all dimensions are considered together, they constitute the countries with the lowest overall sustainability performance throughout the analysis period.

The general pattern reflected in the table indicates a clear yet relatively stable ranking structure among the countries. Indonesia and Türkiye frequently occupy the higher positions under both weighting schemes, demonstrating relatively strong and consistent performance. Pakistan maintains a balanced profile by remaining mostly in the middle ranks over the years. In contrast, Bangladesh and Egypt exhibit a fluctuating performance pattern throughout the period, suggesting variability in their sustainability outcomes over time.

Table 6

Findings of Borda Count Method

	2014				2015				2016				2017				2018				2019				2020				CS							
	EQW		LPW		EQW		LPW		EQW		LPW		EQW		LPW		EQW		LPW		EQW		LPW		EQW		LPW		EQW		LPW					
	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R
Bangladesh	10P	4	11P	4	8P	5	9P	5	5P	7	5P	7	8P	5	8P	5	8P	4	8P	6	8P	4	10P	4	8P	4	8P	5	8P	4	8P	5	55P	5	59P	5
Egypt	0P	8	0P	8	5P	7	5P	6	6P	5	6P	6	6P	6	7P	6	8P	4	10P	4	8P	4	8P	5	8P	4	11P	4	41P	6	47P	6				
Indonesia	15P	3	15P	3	15P	3	15P	3	18P	2	18P	2	17P	2	15P	3	18P	2	18P	2	18P	2	18P	2	17P	2	19P	2	118P	2	118P	2				
Iran	3P	7	4P	7	1P	8	1P	8	6P	5	8P	5	1P	8	4P	7	1P	8	0P	8	1P	8	1P	8	2P	8	4P	7	15P	8	22P	7				
Malaysia	21P	1	21P	1	20P	1	147P	1	146P	1																										
Nigeria	7P	6	5P	6	6P	6	4P	7	1P	8	1P	8	4P	7	1P	8	5P	7	3P	7	5P	7	4P	7	5P	7	1P	8	33P	7	19P	8				
Pakistan	10P	4	10P	5	10P	4	11P	4	12P	4	11P	4	11P	4	10P	4	8P	4	9P	5	8P	4	8P	5	7P	6	6P	6	66P	4	65P	4				
Türkiye	18P	2	18P	2	18P	2	18P	2	15P	3	14P	3	16P	3	18P	2	15P	3	15P	3	15P	3	14P	3	16P	3	15P	3	113P	3	112P	3				

EQW : Equal Weighting Method

LPW : LOPCOW Weighting method

R : Rank

S : Score

CS : Cumulative Score

Conclusions and Discussion

As previously mentioned, sustainability is an increasingly significant issue globally, approached from social, environmental, economic, governance, and financial perspectives, and is a priority policy element. In this study, the sustainability performance of D-8 member countries was examined in a multidimensional manner for the period from 2014 to 2020, and important findings were reached through comparative analyses using various methods.

When evaluated on a country-by-country basis, the findings are as follows:

Malaysia, in terms of governance indicators (Control of Corruption, Government Effectiveness, Political Stability and Absence of Violence, Regulatory Quality, Rule of Law, Voice and Accountability), is in a relatively strong position compared to other countries, though there have been declines in these indicators in recent years. From a social perspective, the country ranks high with an average of approximately 90% in access to clean fuels and technologies for cooking, though this rate has slightly decreased in recent years. The fact that compulsory education lasts only 6 years in Malaysia is noteworthy. Regarding life expectancy at birth, Malaysia falls just behind Türkiye with an average of approximately 75.5 years. In terms of the Women, Business, and the Law Index Score, Malaysia ranks mid-level with an average score of 50. Environmentally, while Malaysia's per capita CO₂ emissions are relatively high at an average of 7.4, it has the highest share of forest area, at about 59%. The share of renewable energy consumption is around 4.9%, showing an upward trend. Economically, Malaysia's GDP per capita stands at approximately \$10,250 during the studied period, higher than many other D-8 countries and showing a steady upward trend. Its unemployment rate is relatively low at around 3.5%, though it has seen a slight increase over the years. In terms of financial development, Malaysia ranks highest among the countries studied, with an average score of 0.67. These points are supported by the findings of the analyses, as Malaysia consistently shows the best performance throughout the entire period studied.

Indonesia shows a slight positive change over the years in terms of governance indicators. Socially, life expectancy at birth is about 70 years, and compulsory education lasts 9 years. Access to clean fuels and technologies for cooking averages around 70%, and has increased over time. Indonesia ranks higher in the Women, Business, and the Law Index Score with about 65 points. Environmentally, Indonesia's per capita CO₂ emissions average 2.0, making it relatively strong compared to many other countries, although the share of forest area and renewable energy consumption has significantly declined over time. Economically, the unemployment rate averages around 4.2%, a good level compared to other countries. However, Indonesia's GDP per capita, at an average of \$3,570, is low relative to other countries. Financially, Indonesia ranks low, with an average score of 0.36, and there has been no significant improvement in the financial system over the years. According to the analysis results, Indonesia is the country with the

second-highest sustainability performance throughout the period under both the equal-weighting approach and the LOPCOW-based weighting approach.

Türkiye, when assessed by social indicators, has a compulsory education period of 12 years. Access to clean fuels and technologies for cooking is high, averaging around 95%. Türkiye ranks best among the countries in terms of life expectancy at birth (approximately 76 years) and the Women, Business, and the Law Index Score (about 83 points). However, significant declines have been observed in nearly all governance indicators during the period studied. Environmentally, per capita CO₂ emissions in Türkiye average around 4.9, placing the country in the mid-range. The share of forest area is about 29%, with no significant changes over time. The share of renewable energy consumption is approximately 12%, which is low compared to other countries. Economically, the unemployment rate in Türkiye is relatively high, averaging about 11.4%. However, the GDP per capita is the highest among the countries studied, averaging around \$11,600. Financially, Türkiye ranks second with an average score of 0.50. According to the analysis results, Türkiye ranks as the third-best performing country throughout the period under both the equal-weighting approach and the LOPCOW-based weighting approach.

Pakistan is evaluated in terms of social indicators, with the compulsory education period of 12 years. Access to clean fuels and technologies for cooking is relatively low, averaging around 44%. In terms of the Women, Business, and the Law Index Score, Pakistan ranks low-to-middle with an average of approximately 50 points, and life expectancy at birth is around 66 years, placing it among the lower-ranking group members. Like many other countries, Pakistan's governance indicators are generally negative. Environmentally, Pakistan's per capita CO₂ emissions average around 0.82, and the share of forest areas is low at around 5%, with a decrease observed over time. Renewable energy consumption accounts for around 44%, though it has declined over the years. Economically, although Pakistan's unemployment rate is low, its GDP per capita is also low, averaging around \$1,523, making it the second-lowest country in the group. Financially, Pakistan ranks last with an average financial development score of around 0.21. According to the analysis results, Pakistan ranks fourth cumulatively under both the equal-weighting approach and the LOPCOW weighting approach during the period.

Bangladesh is evaluated on social indicators, compulsory education is very short at only 5 years. Access to clean fuels and cooking technologies is extremely low, averaging about 20%. On the Women, Business and Law Index Score, Bangladesh ranks in the middle with an average score of about 49 points, while life expectancy at birth averages about 71 years, placing it in a moderate position. In the area of governance, almost all indicators declined over the period. Environmentally, Bangladesh's per capita CO₂ emissions are quite low, at about 0.51, and its forest cover is also low, averaging 14.5 percent. Renewable energy consumption is about 29%, which places Bangladesh in the middle of the pack compared to other countries. Economically, Bangladesh's unemployment rate is relatively low at about 4.6%, but it has the lowest GDP per capita during the period, averaging about

\$1,387. Financially, Bangladesh ranks second to last, with an average financial development score of about 0.25. According to the analysis results, Bangladesh ranks fifth cumulatively under both the equal-weighting approach and the LOPCOW weighting approach during the period.

Egypt, has governance indicators that are mostly negative, as with many group members, and no significant positive change has been observed over time. Socially, the compulsory education period in Egypt is 9 years. Access to clean fuels and technologies for cooking is extremely high, averaging around 99.8%. In terms of the Women, Business, and the Law Index Score, Egypt ranks low-to-middle with an average of approximately 44 points, and life expectancy at birth averages around 71 years. Environmentally, Egypt's per capita CO₂ emissions are low at around 2.24, but the share of forest areas is also quite low and has decreased over time. The share of renewable energy consumption is approximately 5.5%, which is very low compared to other countries. Economically, Egypt's GDP per capita has steadily increased, averaging around \$3,553 over the period studied. However, the unemployment rate averages around 10.8%, making it relatively high compared to other countries. Financially, Egypt's development is moderate, averaging around 0.29, with no significant improvement observed over time. The analysis results indicate that Egypt ranks sixth cumulatively under both the equal-weighting approach and the LOPCOW weighting approach during the period.

Nigeria, like other countries, generally receives negative scores for governance indicators, with many showing negative changes over time. When evaluated in terms of social factors, the compulsory education period is 9 years. Access to clean fuels and technologies for cooking is very low, averaging around 10.8%, and Nigeria ranks last among group members in life expectancy at birth, with an average of 52.3 years. However, in terms of the Women, Business, and the Law Index Score, Nigeria ranks in the upper-middle range, averaging around 63 points. Environmentally, Nigeria ranks first among the group members in renewable energy consumption, with an average share of approximately 80%. Per capita CO₂ emissions are very low, averaging around 0.58 compared to other countries. The share of forest areas in Nigeria is relatively stable, averaging around 24% during the period studied, with no significant changes observed over time. Economically, Nigeria's GDP per capita is relatively low, averaging around \$2,553, and the country has generally experienced negative growth rates over time. The unemployment rate is relatively low, averaging around 4.7%, which can be considered low compared to other countries. However, Nigeria's financial development level is very low, averaging around 0.22. The analysis results indicate that Nigeria ranks seventh cumulatively under the equal-weighting approach, while it ranks eighth under the LOPCOW weighting approach during the period.

Iran, the last member of the group, also generally receives negative scores for governance indicators during the period, similar to other countries, with many indicators showing negative changes over time. When evaluated in terms of social factors, the compulsory education period is nine years. Iran ranks second in access

to clean fuels and technologies for cooking, with an average of approximately 96.7%. In terms of life expectancy at birth, the country ranks among the top of the group members with 75.5 years. However, with an average score of 31 points, Iran ranks last in the group in the Women, Business, and the Law Index. Economically, the country's GDP per capita is approximately \$5,185 on average, and it has experienced positive growth in all but two years of the period. The unemployment rate, however, is quite high compared to the other group members, averaging around 11%. From an environmental perspective, Iran has a relatively high per capita CO₂ emissions rate, averaging around 7.33, much higher than the other countries. On the other hand, the shares of renewable energy consumption and forest areas in the country are quite low. The country's financial development level is at 0.40 during the period studied, which can be considered relatively high compared to other countries. According to the findings of the analysis, Iran ranked sixth in sustainability performance in 2016 and seventh in 2014 and 2017. According to the analysis findings, the country ranks eighth cumulatively under the equal-weighting approach and seventh under the LOPCOW weighting approach.

The findings indicate that between 2014 and 2020, the D-8 member countries demonstrated the highest sustainability performance in the following order: Malaysia, Indonesia, and Türkiye. In contrast, the lowest performance was observed in Egypt, Nigeria, and Iran. These results are consistent with previous studies, particularly those by Bocutoğlu [7] and Doğan and Yılmaz [12], which reached similar conclusions regarding Malaysia, Türkiye, Indonesia, and Nigeria.

The detailed findings underscore several important points. Firstly, the performance of the member countries in various dimensions of sustainability shows significant divergence. For example, a country may perform relatively better in environmental aspects while underperforming in other areas. Secondly, nearly 80% of the group members exhibit quite low performance in governance and financial dimensions. This highlights the importance of addressing sustainability comprehensively across different dimensions.

Based on the findings of this study, it is recommended that policymakers in the relevant countries, develop policies that promote sustainability in all dimensions, with a particular focus on areas where the performance is lower. One such critical dimension is financial sustainability, as it directly relates to the need for resource mobilization and impacts other dimensions as well. Therefore, it is advisable for relevant authorities to implement regulations that promote financial development and enhance financial inclusion, ensuring that the entire society is integrated into the financial system. Researchers could also conduct comparative studies using various indicators and methods.

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