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Sustainable Development Goals Analysis with Ordered Weighted Average Operators

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Abstract: The present research proposes a new method to analyze the sustainable development goals (SDGs) index using ordered weighted average (OWA) operators. To develop this method, five experts evaluated and designated the relative importance of each of the 17 SDGs defined by the United Nations (UN), and with the use of the OWA and prioritized OWA (POWA) operators, rankings were generated. With the results, it is possible to visualize that the ranking of countries can change depending on the weights related to each SDG because the OWA and POWA operator methods can capture the uncertainty of the phenomenon.

Keywords: sustainable development goals; OWA operator; uncertainty

Citation: Ruiz-Morales, B.; Espitia-Moreno, I.C.; Alfaro-Garcia, V.G.; Leon-Castro, E. Sustainable Development Goals Analysis with Ordered Weighted Average Operators. *Sustainability* **2021**, *13*, 5240. https://doi.org/10.3390/su13095240

Academic Editors: Marc A. Rosen and Sławomir Francik

Received: 10 March 2021
Accepted: 3 May 2021
Published: 7 May 2021

1. Introduction

One of the earliest definitions of sustainability is attributed to Hicks [1], who stated that sustainability is the maximum income that a person or a nation can consume over some period while retaining as many resources at the end of the period as they had at the beginning. Hicks further argued that income should be calculated to provide a guide as to how much can be consumed annually without becoming impoverished at the end [2]. Later, in 1987, the World Commission on Environment and Development (WCED) popularized the term sustainable development in its report [3]. According to the WCED [4], sustainability is development that meets the needs of the present without compromising the ability of future generations to meet their own needs and requires the simultaneous adoption of environmental, economic and equity principles. Ten years later, [5] showed that many multinationals accept the argument that the three principles of sustainable development are internally consistent [6].

Currently, the term sustainability refers to a tripartite integration of social issues, environmental responsibilities and economic responsibilities [7]. This concept is an increasing concern in the literature on business disciplines [8]. Additionally, companies are rapidly adopting the term sustainability; for example, approximately 68% of the 250 major global companies generate an annual sustainability report [9].

Sustainability requires a holistic approach that is able to address demographic [10], economic [11], agricultural [12], ecological [13] and ethical [14] issues for the correct evaluation of different strategies and policies, distinguishing three hierarchical levels of human activity, i.e., economy, society and the level of ecology or environment [15], with the objective of improving the quality of human life. This approach involves the management and even the transformation of ecosystems [16], taking advantage of their goods and services, reducing the problems caused by their overexploitation [17] and distributing the ecological costs and benefits among the populations involved [18].

The adoption of the SDGs included in the 2030 Agenda for Sustainable Development of the UN encourages countries to align efforts centered on 17 objectives designed to assess

sustainability efforts to reduce world poverty, inequality, injustice and environmental degradation [19]. With less than a decade remaining until the time target objective, the current complex challenges that humanity faces set additional pressure on decision and policy makers to achieve the defined goals [20]. Nonetheless, the wide-ranging topics contained in the SDGs are a necessary call to maintain the availability of current and future generations' necessities. These results are especially relevant as the world population is approaching eight billion people, and the growth rate and life expectancy are constantly increasing [21].

The 169 targets included in the SDGs act as a shared vision and a plan for the signees to generate actions toward wealth creation and distribution, environmental and human sustainability and inclusivity [22]. These targets are measured according to 231 unique indicators tracked by the UN Statistics Division [23]. There is a clear necessity for these indicators to be relevant, clear and unambiguous [24]; moreover, a solid, integrated and effective indicator framework should convert the SDGs and their corresponding targets into a tool for the assessment of a domestic strategy for the 2030 Agenda participants and the corresponding set of resources allocated for their accomplishment [25].

Correct measurement of the efforts that nations have expended for the achievement of the SDGs is essential to evaluate their progress, along with guiding and amending, if necessary, the corresponding courses of action. The purpose of sustainability assessment and measurement is to provide decision makers with an evaluation of the integrated global and local systems of nature and society from short- and long-term perspectives [26] in order to help them judge what actions should or should not be taken to make society sustainable [27].

Several studies have recently focused on the measurement, monitoring and tracking of these efforts—e.g., in the tracking of early implementations of the SDGs in health-related issues to highlight threats and opportunities [28], the contribution of the motor vehicle and parts industry to the SDGs [29], the application of relational network data envelopment analyses for the quality of education and its relation to the SDGs [30], the measurement and modeling of sustainable well-being towards societal change [31] and a measure of the baseline agriculture-related index for Southern Africa [32].

Even with the continuous contributions to the measurement of the efforts toward achieving the SDGs, some challenges are yet to be considered, mainly in the adopted information fusion mechanism [33]; for example, [34] found that about 60% of the measures set to monitor the progress of the 2030 Agenda for the SDGs were not useful due to the lack of information. The scarce availability of information on key SDG indicators requires the adoption of tools able to assess missing information [35]. Secondly, [36] argues that cultural aesthetic, political institutional and religious/spiritual dimensions have been traditionally excluded from the SDGs due to their intangible or intersubjective nature. Human values, ethics and cosmovision are subjective [35]appreciations that require special treatment for their evaluation. Finally, [37] observed possible pitfalls in the interpretation of progress toward the SDGs, especially when using diverse evaluation methods. Here, a transversal consistent measuring technique is required to correctly assess the meaning and tracking of the actors' efforts. The OWA operator [38] provides a parameterized family of results between the minimum and maximum values of a series of information. The design of OWA operators has proven to be effective when assessing phenomena in uncertain environments [39,40] or with missing information [41], subjective data [42] or multiple criteria, expectations or attitudes [43]. The characteristic mechanism of OWA operators is, therefore, interesting to consider when assessing the identified challenges of SDG measurement.

The OWA operator is an increasingly applied information fusion technique [44] that has been used in several fields of knowledge, e.g., financial decision making [45], projects [46], innovation management engineering [47] and the categorization of multi-region aggregation information [48]. Some studies applied the OWA operator in the measurement of sustainable efforts, which included measuring water security aligned

to the SDGs [49] and evaluating clean energy alternatives [50], ecotourism development capability [51] and traffic management [52].

The objective of this paper is to evaluate the measurement of sustainability indicators based on the weighted criteria of five sustainability experts. The criteria are centered on the 17 SDGs of the UN. With this information, a new method will be proposed by using aggregation operators. The aim is to provide robust alternatives for the evaluation of sustainability described as a rating, including OWA operators designed to address some of the main challenges seen in the current assessment of SDGs.

The structure of this paper is as follows: Section 2 presents the methodology and the OWA operator. Section 3 presents the SDG analysis with the OWA operators and the results. Finally, Section 4 presents the discussion and results, and Section 5 presents the conclusions.

2. The OWA Operator

The OWA operator introduced by Yager [38] is an aggregation operator that provides a parameterized family of aggregation operators between the minimum and the maximum. It can be defined as follows.

Definition 1. *An OWA operator of dimension n is an application $F : R^n \to R$ with a weight vector $w = [w_1, w_2, \ldots, w_n]^T$, where $w_j \in [0, 1], 1 \leq i \leq n$ and*

$$\sum_{i=1}^{n} w_{i=} w_1 + w_2 + \ldots + w_n = 1, \tag{1}$$

where

$$F(a_1, a_2, \ldots, a_n) = \sum_{k=1}^{n} w_j b_j, \tag{2}$$

where b_j is the jth element largest of the collection $a_1 a_2, \ldots, a_n$.

One of the key aspects of the OWA operator in decision making under uncertain conditions is that it unifies different formulations. Thus, the optimistic criteria, pessimistic (or Wald) criteria, Laplace criteria and Hurwicz criteria are specific cases of the OWA operator. With the OWA operator, the optimistic criteria are found if $w_1 = 1$ and $w_0 = 0$ for all $j \neq 1$; the pessimistic criteria are found if $w_n = 1$ and $w_j = 0$ for all $j \neq n$; the Laplace criteria are found if $w_j = 1/n$ for all j; and finally, the Hurwicz criteria are found if $w_1 = \alpha$, $w_n = 1 - \alpha$ and $w_j = 0$ for all $w_j = 0$ for all $j \neq 1, n$.

In group decision making, some of the decision makers are usually regarded as superior to others; therefore, to make a proper decision in this kind of group decision-making situation, we can first construct the prioritization relations among the decision makers and then calculate the overall scores of each alternative using the prioritized aggregation operator [53,54].

A prioritized OWA operator (POWA) is defined as follows.

Definition 2. *Assume that we have a collection of criteria portioned into q distinct groups, $H_1, H_2, \ldots, H_q$, for which $H_i = (C_{i1}, C_{i2}, \ldots, C_{in})$ denotes the criteria of the i^{th} category (i=1, ... ,q) and n_i is the number of criteria in the class. Furthermore, we have a prioritization between the groups as $H_1 > H_2 > \ldots > H_q$. That is, the criteria in category H_i have a higher priority than those in H_k for all $i < k$ and $i, k \in (1, \ldots, q)$. Denote the total set of criteria as $C = U_{i=1}^{q} H_i$ and the total number of criteria as $n = \sum_{i=1}^{q} n_i$. Additionally, suppose that $X = (x_1, \ldots, x_m)$ indicates the set of alternatives. For a given alternative x, let $C_{ij}(x)$ measure the satisfaction of the j^{th} criteria in the i^{th} group by the alternative $x \in X$ for each $i = 1, \ldots, q$, $j = 1, \ldots, i_i$. The formula is as follows:*

$$C_{(x)} = \sum_{i=1}^{q} \sum_{h=1}^{n_i} w_{ij} C_{ij}(x) \tag{3}$$

where w_{ij} *is the corresponding weight of the* j^{th} *criteria in the* i^{th} *category,* $i = 1, \ldots, q$, $j = 1, \ldots, i_i$.

Note that if $w_i = 1/n$ for all i, the POWA becomes the prioritized average (PrA).

3. The SDG Analysis with OWA Operators

The Sustainable Development Report focuses on the SDG Index and Dashboards, which provide an annual review of the performance of the 193 UN member countries in working toward the 17 SDGs [55].

Countries are ranked according to their overall score. This score measures a country's overall progress towards achieving the 17 SDGs. The score can be interpreted as the percentage achievement of the SDGs; a rating of 100 indicates that all SDGs have been achieved.

The index divides the goals according to the degree to which each country has achieved them and assigns each a label of SDG achievement (if the goal was met), challenges remain, significant challenges remain or major challenges remain.

The 17 SDGs are the following: 1. No poverty; 2. Zero hunger; 3. Good health and well-being; 4. Quality education; 5. Gender equality; 6. Clean water and sanitization; 7. Affordable and clean energy; 8. Decent work and economic growth; 9. Industry, innovation and infrastructure; 10. Reduced inequalities; 11. Sustainable cities and communities; 12. Responsible consumption and production; 13. Climate action; 14. Life below water; 15. Life on land; 16. Peace, justice and strong institutions; 17. Partnership for the goals [56].

Achieving the SDGs depends on an effective approach to the implementation and measurement of the actions taken to achieve them, ensuring a continuous dialogue between all entities directly and indirectly involved [56]. To assess some of the identified challenges in the current measurement of the SDGs, the next steps for the implementation analysis are proposed. Please note that even though the SDGs are universal, each entity has its own political, social and natural characteristics that require prioritizing of the goals according to its specific needs. The proposed OWA measuring mechanism allows the inclusion of expert opinions, thus generating an index with relative importance for the chosen items, including the possibility of handling scarce availability of the indicator's information [33], quantification of intangible or intersubjective issues [34] and interpretation pitfalls that can lead to inconsistencies in measuring the progress of actions.

Step 1. Obtain the weights of each SDG. The process proposed by [57], which is based on personal construction theory (PCT), was used. This process uses an expert (or experts) on the topic to compare the criteria between goals by selecting H if the importance of the criterion is higher than that of the one it is being compared with, S if the importance is the same or L if the importance is lower than that of the one being compared with. Next, the number of H votes that each criterion received was totaled, another column was created with this total plus one and, finally, the weights of each criterion were obtained by calculating the value of each criterion in the column that includes the plus one divided by the total sum of that column. In the case in this paper, five experts were consulted to obtain the weights. These experts are all from Mexico and are currently working (in private or public organizations) in politics, processes or research regarding the SDGs; for informant confidentiality, additional details about their profiles cannot be shared. To visualize the process more clearly, an example with Expert 1 is detailed with the understanding that all other experts followed the same process. Please note that the present analysis seeks to exemplify the proposed mechanism; the inclusion of experts should be extended for a representative analysis of a country's SDG efforts.

The first step was to obtain a matrix that compares the importance of the criteria see Table 1. Next, the H values were summed. Then, one was added to the column sum, and finally, the weight was obtained by dividing the SDG value in the column that includes the plus one by the total sum of the column see Table 2. The results for each expert are presented in Table 3.

Table 1. Matrix of importance for Expert 1.

SDG	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17
G1	0	S	S	L	H	H	S	L	S	H	S	S	S	S	S	S	S
G2	S	0	S	S	S	H	H	H	S	H	H	H	H	H	H	H	H
G3	S	S	0	S	S	S	H	S	H	H	H	H	H	H	H	H	H
G4	L	S	S	0	H	S	S	S	H	H	H	H	H	H	H	H	H
G5	H	S	S	H	0	H	H	H	L	L	L	L	L	H	L	H	L
G6	H	H	S	S	H	0	S	H	H	H	H	H	H	H	H	H	H
G7	S	H	H	S	H	S	0	L	S	H	S	H	H	L	H	H	H
G8	L	H	S	S	H	H	L	0	S	H	H	H	H	H	H	H	H
G9	S	S	H	H	L	H	S	S	0	L	S	S	S	S	S	S	S
G10	H	H	H	H	L	H	H	H	L	0	L	S	S	S	S	S	S
G11	S	H	H	H	L	H	S	H	S	L	0	S	L	L	L	L	L
G12	S	H	H	H	L	H	H	H	S	S	S	0	S	L	L	L	L
G13	S	H	H	H	L	H	H	H	S	S	L	S	0	S	L	L	L
G14	S	H	H	H	H	H	L	H	S	S	L	L	S	0	H	L	L
G15	S	H	H	H	L	H	H	H	S	S	L	L	L	H	0	H	L
G16	S	H	H	H	H	H	H	H	S	S	L	L	L	L	H	0	H
G17	S	H	H	H	L	H	H	H	S	S	L	L	L	L	L	H	0

Table 2. Weights for each SDG based on Expert 1.

SDG	Sum	Sum + 1	Weight
G1	3	4	2.68%
G2	11	12	8.05%
G3	10	11	7.38%
G4	10	11	7.38%
G5	7	8	5.37%
G6	13	14	9.40%
G7	9	10	6.71%
G8	11	12	8.05%
G9	3	4	2.68%
G10	7	8	5.37%
G11	5	6	4.03%
G12	6	7	4.70%
G13	6	7	4.70%
G14	7	8	5.37%
G15	8	9	6.04%
G16	9	10	6.71%
G17	7	8	5.37%

Table 3. Weights for each SDG based on different experts.

SDG	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
G1	2.68%	6.90%	4.84%	10.23%	18.57%
G2	8.05%	13.79%	8.06%	17.05%	15.71%
G3	7.38%	10.34%	6.45%	14.77%	15.71%
G4	7.38%	11.49%	9.68%	12.50%	11.43%
G5	5.37%	6.90%	3.23%	1.14%	8.57%
G6	9.40%	12.64%	11.29%	12.50%	2.86%
G7	6.71%	9.20%	8.06%	10.23%	1.43%
G8	8.05%	5.75%	4.84%	11.36%	10.00%
G9	2.68%	4.60%	6.45%	1.14%	1.43%
G10	5.37%	5.75%	3.23%	1.14%	4.29%
G11	4.03%	1.15%	11.29%	1.14%	1.43%
G12	4.70%	2.30%	9.68%	1.14%	1.43%
G13	4.70%	2.30%	3.23%	1.14%	1.43%
G14	5.37%	2.30%	3.23%	1.14%	1.43%
G15	6.04%	2.30%	1.61%	1.14%	1.43%
G16	6.71%	1.15%	3.23%	1.14%	1.43%
G17	5.37%	1.15%	1.61%	1.14%	1.43%

For example, G1 had an H when compared with G5, G6 and G1, making its sum 3; G2 had an H when compared with G6, G7, G8, G10, G11, G12, G13, G14, G15, G16 and G17, making its sum 11. Then, 1 was added to the sum, making, in this case, the results for G1 = 4 and G2 = 12. After the results for each SDG were obtained, the total sum was obtained; in this case, it was 149. To obtain the weight for G1, the operation was 4 (the sum of H plus 1) divided by 149 (the total sum of the column sum + 1), then multiplied by 100, making G1 = (4/149) × 100 = 2.68%. In the case of G2, the formula was (12/149) × 100 = 8.05%. This process was performed for all SDGs.

Table 3 shows the weights assigned by the experts for each SDG. It is important to note that, in general, the opinions are similar in terms of the objectives with the highest importance. The objective with the highest incidence of high importance was number 2, which corresponds to zero hunger; the objective with the second highest importance according to most experts was number 6, which corresponds to clean water and sanitization; and the objective with the third highest importance was 4, quality education. Another objective that was rated with high importance is 3, good health and well-being, followed by SDG number 1, no poverty.

Step 2. To unify the information provided by the different weights of the experts, the POWA operator was used. In this sense, the importance of each expert was determined as $e_1 = 0.15$, $e_2 = 0.20$, $e_3 = 0.20$, $e_4 = 0.30$ and $e_5 = 0.15$. This valuation was made considering the experts' seniority in SDG-related positions. It is important to note that the weights assigned to each expert can be defined in different ways; in this case, we based them on the experience of each expert and qualifications such as hierarchical position, research impact on the field, number of related projects or the monetary value of the projects that they have completed or supported. There is no limitation on the attributes that can be considered to determine the weights. For this specific case, each expert has the following number of years of work: $e_1 = 6$, $e_2 = 8$, $e_3 = 8$, $e_4 = 12$ and $e_5 = 6$; the sum of all of the years of experience is 40. To obtain the importance weight for Expert 1, the calculation was 6/40 = 0.15; the same process was performed for all the experts. The experts' experience was also considered if they worked on the Millennium Development Goals (2000–2015).

Step 3. With the information provided by each expert, it was possible to generate new SDG index scores that consider that all of the SDGs do not have the same importance. This is important because each country has different problems that need to be solved; therefore, it is possible that for public policies, companies and, in general, citizens, there is a priority concerning which of the SDGs need to be solved first. Rather than attempting to

approach all simultaneously, it is important to have a prioritization. Based on this concept, the ranking of countries will change drastically, because the efforts of a country can be aimed toward solving two SDGs rather than all of them Therefore, different rankings were created based on the weights provided by each expert based on the WA, OWA and POWA operators. It is important to note that the OWA and POWA operators used a maximum criterion. All the results are presented in Appendix A.

To better understand the process for obtaining the results, an explanation for Denmark based on the weights proposed by Expert 1 is presented. In Table 4, the results for the WA are obtained by multiplying the score of each SDG by the weights provided by Expert 1; then, the sum of all the results is the score for Denmark. In the case of the OWA operator, because a maximum criterion is considered, the Score and Weight columns are ordered from highest to lowest; then, each score is multiplied by its weight, and finally, the sum is the score for Denmark see Table 5. Finally, for the POWA operator, the result for Denmark for each expert with the OWA operator is multiplied by its importance and the sum is the score see Table 6.

In Table 7, the countries Sweden, Denmark and Finland remain in the top three according to the opinion of the five experts, only with changes in their positions between first and third place. Position four in the SDG index belongs to France and position five to Germany; however, in the opinion of Expert 1, these countries should be included in the fifth and eighth positions, respectively. For Experts 2, 3, 4 and 5, these two countries should not be included in the top ten. Position seven of the SDG index corresponds to Norway; this country is included in the top ten for Experts 1 and 2, in position six for Expert 1 and in position five for Expert 2. The opinions of Experts 3, 4 and 5 do not include Norway in the ranking. Austria is ranked seventh in the SDG index based on the WA operator. Experts 1, 2, 4 and 5 include this country in the top ten. The Czech Republic is in the eighth position in the ranking, and all five experts include this country in the top ten, although in different positions in the ranking. In the ninth place of the SDG index is the Netherlands, and only Expert 1 considers this country in the top ten rankings. Finally, the SDG index includes Estonia in the tenth position; based on the WA operator, no expert includes it in the ranking. Experts 1, 2 and 3 included Slovenia in the ranking. Experts 2, 3, 4 and 5 included Belgium in the top ten. Other countries considered to be included by Experts 3, 4 and 5 are Hungary and Ireland.

Table 4. Explanation for Denmark with Expert 1 weights with the WA operator.

SDG	Score	Weight	Score × Weight
G1	99.58	2.68%	2.67
G2	71.41	8.05%	5.75
G3	94.49	7.38%	6.97
G4	99.10	7.38%	7.31
G5	85.96	5.37%	4.62
G6	90.92	9.40%	8.55
G7	94.21	6.71%	6.32
G8	85.28	8.05%	6.86
G9	96.85	2.68%	2.60
G10	97.55	5.37%	5.24
G11	89.35	4.03%	3.60
G12	42.62	4.70%	2.00
G13	62.52	4.70%	2.94
G14	58.08	5.37%	3.12
G15	92.94	6.04%	5.61
G16	92.76	6.71%	6.22
G17	83.87	5.37%	4.50
		Total sum	**84.89**

Table 5. Explanation for Denmark with Expert 1 weights with the OWA operator.

Score	Weight	Score × Weight
99.58	9.40%	9.36
99.10	8.05%	7.98
97.55	8.05%	7.85
96.85	7.38%	7.15
94.49	7.38%	6.97
94.21	6.71%	6.32
92.94	6.71%	6.24
92.76	6.04%	5.60
90.92	5.37%	4.88
89.35	5.37%	4.80
85.96	5.37%	4.62
85.28	5.37%	4.58
83.87	4.70%	3.94
71.41	4.70%	3.36
62.52	4.03%	2.52
58.08	2.68%	1.56
42.62	2.68%	1.14
	Total Sum	**88.87**

Table 6. Explanation for Denmark with the POWA operator.

Expert	OWA Result	Weight	OWA Result × Weight
e1	88.87	15%	13.33
e2	88.78	20%	17.76
e3	91.35	20%	18.27
e4	94.49	30%	28.35
e5	94.20	15%	14.13
		Total sum	91.83

Table 7. Top ten ranking based on the WA operator.

Rank	SDG Index		Expert 1		Expert 2		Expert 3		Expert 4		Expert 5	
	Country	Score	Country	Score	Country	Score	Country	Score	Country	Score	Country	Score
1	Sweden	84.72	Denmark	84.89	Denmark	88.43	Finland	79.71	Denmark	89.23	Finland	81.32
2	Denmark	84.56	Sweden	84.83	Sweden	87.80	Denmark	79.55	Finland	88.75	Denmark	81.11
3	Finland	83.77	Finland	84.09	Finland	87.65	Sweden	79.27	Sweden	88.14	Sweden	78.67
4	France	81.13	Austria	81.21	Belgium	85.75	Belgium	77.66	Ireland	86.30	Belgium	77.56
5	Germany	80.77	France	81.06	Norway	85.62	Japan	77.17	Austria	86.26	Hungary	77.39
6	Norway	80.76	Norway	80.94	Austria	85.21	Slovenia	76.66	United Kingdom	85.37	Canada	77.16
7	Austria	80.70	Slovenia	80.94	Czech Republic	85.19	Canada	76.54	Czech Republic	85.11	Austria	77.14
8	Czech Republic	80.58	Germany	80.91	Slovenia	85.19	Hungary	76.51	Belgium	84.82	Czech Republic	76.69
9	Netherlands	80.37	Czech Republic	80.85	United Kingdom	84.71	Ireland	76.48	Hungary	84.21	Ireland	76.20
10	Estonia	80.06	Netherlands	80.76	Japan	84.59	Czech Republic	76.27	Italy	83.64	Romania	76.16

In the comparison in Table 8, Sweden, Demark and Finland are in the top 3 of both rankings. However, according to the WA operator, the countries that enter the ranking that are not included in the SDG index are Belgium, Slovenia, Ireland, Hungary and the United Kingdom. The scores of both rankings are very similar, and the variations are small. According to the WA operator, France, Germany, Norway, the Netherlands and Estonia are countries that are not included in the ranking.

Table 8. Top ten ranking: Comparison of SDG Index and the WA operator.

Rank	SDG Index		WA	
	Country	Score	Country	Score
1	Sweden	84.72	Denmark	84.64
2	Denmark	84.56	Finland	84.30
3	Finland	83.77	Sweden	83.74
4	France	81.13	Czech Republic	80.82
5	Germany	80.77	Austria	82.45
6	Norway	80.76	Belgium	81.44
7	Austria	80.70	Slovenia	80.93
8	Czech Republic	80.58	Ireland	79.66
9	Netherlands	80.37	Hungary	79.37
10	Estonia	80.06	United Kingdom	75.04

Table 9 shows a greater number of countries that are included in the SDG Index and in the OWA operator for the five experts. This is the case for Sweden, Denmark, Finland, Norway, Austria and the Netherlands, which have similarities in the ranking between the SDG Index and the OWA operator of the five experts. However, France is only included in the OWA operator of the opinions of Experts 1, 3 and 5. Germany is included in the ranking of Experts 1 and 3. The Czech Republic is only in the ranking of the OWA operator of Expert 1, while Estonia is not included in any OWA operator of the experts. According to the five experts, Switzerland is included in the top ten. Slovenia is in the OWA operator ranking of Experts 2, 3, 4 and 5.

Table 9. Top ten ranking based on the OWA operator.

Rank	SDG Index		Expert 1		Expert 2		Expert 3		Expert 4		Expert 5	
	Country	Score	Country	Score	Country	Score	Country	Score	Country	Score	Country	Score
1	Sweden	84.72	Denmark	88.87	Sweden	88.82	Sweden	91.37	Norway	94.90	Sweden	94.54
2	Denmark	84.56	Sweden	88.83	Denmark	88.78	Denmark	91.35	Sweden	94.87	Norway	94.36
3	Finland	83.77	Finland	87.91	Norway	88.18	Finland	90.59	Denmark	94.49	Denmark	94.20
4	France	81.13	Norway	86.70	Finland	88.18	Norway	90.22	Finland	94.29	Finland	93.85
5	Germany	80.77	Netherlands	85.17	Switzerland	86.29	Netherlands	88.29	Switzerland	93.75	Switzerland	93.22
6	Norway	80.76	Austria	85.13	Netherlands	86.14	Switzerland	88.26	Iceland	92.79	Netherlands	92.44
7	Austria	80.70	Germany	84.88	Austria	85.85	Austria	88.10	Netherlands	92.75	Iceland	92.33
8	Czech Republic	80.58	France	84.71	Slovenia	85.79	Slovenia	87.85	Slovenia	92.48	Slovenia	92.31
9	Netherlands	80.37	Czech Republic	84.63	Iceland	85.72	Germany	87.52	Austria	92.20	Austria	91.86
10	Estonia	80.06	Switzerland	84.59	New Zealand	85.16	France	87.46	United Kingdom	91.83	France	91.61

Table 10 shows that the OWA operator scores are higher than those in the SDG Index. In this comparative table, the results are the same for the top 3 of both rankings, with Sweden in first place, followed by Denmark and Finland, and both rankings also include France, Germany and Norway in different positions in the ranking, while Austria is in 7th place in both rankings. The OWA operator does not include the Czech Republic and Estonia, but does include Switzerland and Slovenia.

Table 10. Top ten ranking comparison of the SDG Index and the OWA operator.

Rank	SDG Index		OWA	
	Country	Score	Country	Score
1	Sweden	84.72	Sweden	91.68
2	Denmark	84.56	Denmark	91.53
3	Finland	83.77	Finland	90.96
4	France	81.13	Norway	90.87
5	Germany	80.77	Switzerland	89.22
6	Norway	80.76	Netherlands	88.95
7	Austria	80.70	Austria	88.62
8	Czech Republic	80.58	Slovenia	87.22
9	Netherlands	80.37	France	87.02
10	Estonia	80.06	Germany	86.20

Table 11 shows that Sweden and Denmark remain in the same rank as in the SDG index. The countries that remain in the top ten but in a different rank are Norway, Finland, France, Austria and the Netherlands. The countries that should enter the top ten according to the POWA are Switzerland, Slovenia and Iceland, displacing Germany, the Czech Republic and Estonia.

Table 11. Top ten ranking based on the POWA operator.

Rank	SDG Index		POWA	
	Country	Score	Country	Score
1	Sweden	84.72	Sweden	92.00
2	Denmark	84.56	Denmark	91.83
3	Finland	83.77	Norway	91.31
4	France	81.13	Finland	88.38
5	Germany	80.77	Switzerland	88.36
6	Norway	80.76	Netherlands	91.31
7	Austria	80.70	Slovenia	89.00
8	Czech Republic	80.58	Austria	88.33
9	Netherlands	80.37	Iceland	89.35
10	Estonia	80.06	France	88.16

4. Discussion and Results

The objective of sustainable development is to improve the quality of human life, which may involve the management and even the transformation of ecosystems, taking advantage of their goods and services, reducing the problems caused by their overexploitation and distributing the ecological costs and benefits among the populations involved. The concept of sustainable development does not assume the conservation of nature in its original state as its sole objective, but rather indicates the application of a development model that minimizes the degradation or destruction of the ecological base of production and habitability and allows the development of future generations [58].

Globally, the issue of sustainability is important to the extent of measuring the sustainability of each country based on the 17 sustainable development goals, which currently include new areas such as climate change, economic inequality, innovation, sustainable consumption and peace. These goals serve as a guide that will allow countries to identify whether their social, economic and environmental impact brings value to society, consequently strengthening their reputation and relationships with different stakeholders [59]. Therefore, in this work, an analysis is applied with the purpose of presenting a method of measuring the SDGs in a more flexible manner according to the vision of experts in sustainability, thus allowing a closer approach to the current sustainable reality of the country of origin of the experts. The present study was conducted with the OWA operator introduced by Yager [38], which is an aggregation operator that provides a parameterized family of aggregation operators between the minimum and the maximum. One of the

key aspects of the OWA operator in decision making under uncertainty is that it unifies different formulations. Thus, the optimistic, pessimistic (or Wald), Laplace and Hurwicz criteria are specific cases of the OWA operator. We obtained weights assigned to each SDG by using the process proposed by [57], i.e., PCT. This process uses an expert (or experts) on the topic to compare the criteria between goals by selecting H if the importance of a criterion is higher than that of the criteria it is being compared with, S if the importance is the same or L if the importance is lower than that of the criteria it is being compared with. This study also shows the results obtained from the weighted opinions of five Mexican experts in the area of sustainability in terms of measuring progress toward the 17 sustainability objectives.

This approach allows comparisons to be made between the results of the countries with the best qualifications according to the index of the Sustainable Development Report and the results obtained from the weights given to the sustainability objectives by the Mexican experts. The methodology used allows for evaluation of the prioritized importance among the experts. From these results, it is possible to evaluate sustainability, allowing comparisons between the results obtained from the experts and the Sustainable Development Report. Thus, with the use of the aggregation operators, a new order of priority can be given to the objectives of sustainability, with the purpose of replicating this study in any country, based on the weighted opinions of sustainability experts, to identify the order of priority of the 17 objectives of sustainable development according to the characteristics and needs of each country.

The main results that were observed are that the OWA operator shows different countries than those included in the ranking. For example, countries such as Sweden, Denmark, Finland, Norway, Austria and the Netherlands remain similar even when different aggregation operators are used. Conversely, there are many countries that can be included or not included in the ranking if the results of the aggregation operators are included. For example, France is included in the OWA operator ranking in the opinion of Experts 1, 3 and 5. Germany is included in the ranking of Experts 1 and 3. The Czech Republic is only in the ranking of the OWA operator of Expert 1, while Estonia is not included in any experts' OWA operator ranking. According to the five experts, Switzerland should be included in the top ten. Slovenia is in the OWA operator ranking of Experts 2, 3, 4 and 5. The main results with the POWA operator show that Sweden and Denmark remain at the same ranking as in the SDG index. The countries that remain in the top ten but in a different ranking are Norway, Finland, France, Austria and the Netherlands. The countries that should enter the top ten according to the POWA operator are Switzerland, Slovenia and Iceland, displacing Germany, the Czech Republic and Estonia.

The main idea is that by using the same data but with different relative importance of each SDG, alternative results can be obtained. These new results are important because, based on the country, not all SDGs have the same importance for a government. As resources are limited, a government will apply resources to the SDG that they are trying to improve, but not all of them, which is why the assumption that the importance of each SDG is equal for all countries is not always the best interpretation of a country's actions and results. For example, the experts that were considered in this paper were all from Mexico, and their most important SDGs are zero hunger and clean water and sanitization because these are important problems in Mexico. Therefore, the government policies should place their efforts in improving those SDGs, but this situation may or may not be the same for another country; therefore, their efforts will be focused on another SDG.

For this reason, the OWA operator and its extensions are important tools to consider when analyzing data with different relative importance levels. Based on a weighting vector and a reordering step, different results can be obtained, even with the same data. As a good decision-making process considers a number of alternatives, these methodologies are a good way to improve the understanding and broaden the vision of the problem to be analyzed.

This methodology has some limitations that are important to note. The first concerns the weighting vector that is used to obtain the results. The weighting vector is obtained through the information provided by the experts or decision maker; therefore, if different

experts are considered, then different weighting vectors will be used, and the results can change drastically. This limitation can also be a benefit because it is possible to generate different results based on the aptitude, experience and knowledge of the decision maker.

Another problem arises when a prioritized operator is used. When different experts analyze the same problem, it is common that not all decision makers place the same importance on the results because they are lower in the hierarchy or have less experience in the field; therefore, a weight of importance must be assigned to each expert. The main problem with this is that the people who have more experience in an area may not necessarily have greater knowledge of the problem, and those who are hierarchically superior should not always have greater importance or influence on the results; therefore, a change in the weights assigned to each decision maker may change the results.

5. Conclusions

The main objective of this study was to present an application of the OWA operator and its extension, the prioritized OWA (POWA) operator, in an analysis of the SDGs for 166 countries in the world. The purpose was to propose an analysis of the evaluation of each goal with a different assigned relative importance rather than an evaluation in which the goals are considered equally important. Additionally, with the information provided by five experts, a proposition of relative weights was made based on PCT.

An interesting finding is that all of the experts consider zero hunger and clean water sanitization to be most important goals, indicating that these are problems that must be solved first and require additional effort. To analyze the information, a specific analysis of the top ten ranked countries in terms of SDG achievement was performed, and some interesting findings were discussed. In summary, it is possible to visualize some important changes in the ranking when different weighting vectors are used. Another finding is that with the unification of the results presented by each expert based on the POWA operator, it was possible to obtain new results, thereby providing another vision and understanding of the topic.

For future research, the study can be extended to include other measurement models and the perceptions of experts of other nationalities. Additionally, the use of aggregation operators, such as the OWA operator and its extensions, in different management problems, such as in the cases of finance, law, engineering, entrepreneurship, stakeholders, economics and other fields, can be assessed. Furthermore, it is possible to formulate a new extension of the OWA operator using moving averages, logarithms and probabilities.

Author Contributions: Conceptualization, E.L.-C.; methodology, V.G.A.-G.; writing—original draft preparation, B.R.-M.; writing—review and editing, I.C.E.-M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by FONDECYT Iniciacion, grant number 11190056.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Ranking of the SDG Index Using the WA Operator.

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
1	Denmark	84.89	Denmark	88.43	Finland	79.71	Denmark	89.23	Finland	81.32
2	Sweden	84.83	Sweden	87.80	Denmark	79.55	Finland	88.75	Denmark	81.11
3	Finland	84.09	Finland	87.65	Sweden	79.27	Sweden	88.14	Sweden	78.67
4	Austria	81.21	Belgium	85.75	Belgium	77.66	Ireland	86.30	Belgium	77.56
5	France	81.06	Norway	85.62	Japan	77.17	Austria	86.26	Hungary	77.39
6	Norway	80.94	Austria	85.21	Slovenia	76.66	United Kingdom	85.37	Canada	77.16
7	Slovenia	80.94	Czech Republic	85.19	Canada	76.54	Czech Republic	85.11	Austria	77.14
8	Germany	80.91	Slovenia	85.19	Hungary	76.51	Belgium	84.82	Czech Republic	76.69
9	Czech Republic	80.85	United Kingdom	84.71	Ireland	76.48	Hungary	84.21	Ireland	76.20
10	Netherlands	80.76	Japan	84.59	Czech Republic	76.27	Italy	83.64	Romania	76.16
11	Estonia	80.71	France	84.31	Romania	75.92	Canada	83.42	New Zealand	75.84
12	Ireland	80.55	New Zealand	84.16	United Kingdom	75.88	Norway	83.10	Japan	75.83
13	United Kingdom	80.27	Hungary	84.14	Norway	75.70	New Zealand	82.84	United Kingdom	75.71
14	New Zealand	79.95	Estonia	84.00	Estonia	75.43	France	82.73	Slovenia	75.50
15	Belgium	79.76	Ireland	83.85	Malta	75.25	Switzerland	82.46	Switzerland	75.41
16	Japan	79.76	Canada	83.56	New Zealand	75.25	Romania	82.10	Norway	75.39
17	Switzerland	79.50	Germany	83.05	Chile	74.70	Nepal	82.02	Chile	75.25
18	Croatia	78.99	Netherlands	82.46	Germany	74.50	Slovenia	81.71	Malta	74.74
19	Belarus	78.94	Poland	82.46	Poland	74.46	Estonia	81.34	France	74.59
20	Latvia	78.91	Latvia	82.05	Bulgaria	74.40	Japan	80.91	Nepal	74.50
21	Canada	78.73	Switzerland	81.87	France	74.26	Latvia	79.40	Bulgaria	74.09
22	Poland	78.68	Romania	81.82	Slovak Republic	74.26	Chile	78.90	Lithuania	73.90
23	Slovak Republic	78.40	Portugal	81.71	Portugal	74.25	Lithuania	78.87	Estonia	73.67
24	Chile	78.23	Malta	81.06	Switzerland	74.15	Malta	78.53	Latvia	73.62
25	Portugal	78.19	Chile	80.92	Latvia	74.14	Germany	78.00	Netherlands	73.46
26	Hungary	78.12	Italy	80.51	Netherlands	73.78	Armenia	77.46	Portugal	73.45
27	Korea, Rep.	78.08	United States	80.25	Austria	73.47	Iceland	77.25	Germany	73.20
28	Spain	77.86	Bulgaria	79.81	United States	73.41	Spain	76.64	Moldova	73.14
29	Iceland	77.74	Slovak Republic	79.69	Lithuania	73.39	Korea, Rep.	76.59	Italy	72.87
30	Italy	77.52	Korea, Rep.	79.69	Korea, Rep.	73.21	Cyprus	76.56	Korea, Rep.	72.68
31	Malta	77.05	Lithuania	79.16	Italy	72.94	United States	76.48	Slovak Republic	72.39
32	United States	76.51	Iceland	79.11	Iceland	72.59	Albania	76.31	Cyprus	72.27
33	Australia	76.05	Croatia	78.51	Belarus	72.47	Slovak Republic	76.14	United States	72.26
34	Lithuania	75.80	Spain	78.25	Spain	72.21	Netherlands	76.04	Poland	71.89
35	Cyprus	75.60	Moldova	78.03	Cyprus	72.10	Portugal	75.71	North Macedonia	71.54

Table A1. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
36	Serbia	75.35	Belarus	77.93	Uruguay	71.87	Poland	73.82	Greece	71.08
37	Romania	75.30	Nepal	77.80	Moldova	71.71	Israel	73.61	Spain	70.81
38	Costa Rica	75.03	Serbia	76.70	Ukraine	71.48	Bulgaria	73.29	Uruguay	70.80
39	Greece	74.80	Cuba	76.40	Ecuador	71.42	Colombia	72.68	Cuba	70.23
40	Bulgaria	74.68	Cyprus	76.28	Serbia	71.13	Moldova	72.57	Bosnia and Herzegovina	69.95
41	Uruguay	74.64	Ukraine	76.08	Israel	71.09	Belarus	72.26	Australia	69.71
42	Thailand	74.52	Argentina	75.41	North Macedonia	70.80	Australia	72.21	Ukraine	69.66
43	Cuba	74.52	Israel	75.28	Kyrgyz Republic	70.55	Georgia	72.18	Belarus	69.62
44	Moldova	74.49	Armenia	74.63	Nicaragua	70.50	Bosnia and Herzegovina	71.99	Ecuador	69.47
45	Ukraine	74.47	Australia	74.59	Croatia	70.39	Malaysia	71.76	Brazil	69.35
46	Ecuador	74.38	Uruguay	74.50	Australia	70.01	Russian Federation	71.47	Bolivia	69.33
47	Luxembourg	74.37	Georgia	74.39	Cuba	69.90	Kyrgyz Republic	71.22	Iceland	69.22
48	Israel	74.12	Ecuador	74.39	Brazil	69.88	Oman	71.07	Kyrgyz Republic	69.18
49	Bosnia and Herzegovina	73.97	Kyrgyz Republic	74.08	Nepal	69.87	Ukraine	71.05	Russian Federation	69.12
50	Vietnam	73.72	Costa Rica	73.80	Armenia	69.68	Ecuador	70.87	Georgia	69.08
51	Argentina	73.54	Bosnia and Herzegovina	73.71	Argentina	69.62	Uruguay	70.71	Israel	68.83
52	China	73.52	Tunisia	73.55	Greece	69.57	Croatia	70.57	Serbia	68.81
53	Kyrgyz Republic	73.23	North Macedonia	73.53	Oman	69.50	China	70.52	China	68.71
54	Brazil	73.09	Algeria	73.50	Georgia	69.31	North Macedonia	69.87	Oman	68.65
55	Georgia	72.83	Greece	73.24	Maldives	69.30	Argentina	69.69	Nicaragua	68.44
56	Peru	72.63	Luxembourg	73.22	Bosnia and Herzegovina	69.01	Brazil	68.51	Turkey	68.04
57	North Macedonia	72.37	Russian Federation	73.02	Bolivia	68.97	Tunisia	68.46	Argentina	67.64
58	Azerbaijan	72.32	Maldives	73.01	Barbados	68.81	Cuba	68.21	Croatia	67.35
59	Uzbekistan	71.83	Thailand	72.88	Russian Federation	68.72	Serbia	68.08	Paraguay	67.27
60	Algeria	71.77	Oman	72.73	Turkey	68.50	Maldives	67.81	Namibia	67.13
61	Kazakhstan	71.53	Nicaragua	72.67	Tunisia	68.31	Nicaragua	66.68	Maldives	67.10
62	Colombia	71.41	Kazakhstan	72.57	Azerbaijan	67.81	Bolivia	66.67	Lebanon	66.40
63	Malaysia	71.35	Iran, Islamic Rep.	72.38	Thailand	67.69	Azerbaijan	66.54	Botswana	66.16
64	Albania	71.32	Morocco	71.85	China	67.56	Uzbekistan	66.45	Azerbaijan	66.08
65	Russian Federation	71.22	China	71.84	Paraguay	67.23	El Salvador	66.30	Dominican Republic	66.02
66	Iran, Islamic Rep.	71.20	Azerbaijan	71.40	Costa Rica	67.01	Algeria	66.19	Mexico	65.90

Table A1. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
67	Morocco	71.10	Bolivia	71.08	Vietnam	66.94	Paraguay	66.00	Colombia	65.72
68	Mexico	70.98	Bahrain	70.53	Algeria	66.85	Luxembourg	65.67	Tunisia	65.52
69	Tunisia	70.85	Brazil	70.35	Kazakhstan	66.83	Dominican Republic	65.38	Egypt, Arab Rep.	65.42
70	Bahrain	70.58	Montenegro	70.34	Egypt, Arab Rep.	66.45	Turkey	65.32	Tajikistan	65.27
71	Armenia	70.38	Colombia	70.20	Bahrain	66.36	Mexico	65.32	Suriname	65.14
72	Turkey	70.37	Uzbekistan	70.11	Suriname	66.27	Greece	65.19	Armenia	64.60
73	Montenegro	70.27	Turkey	70.00	Montenegro	66.23	Montenegro	65.09	Jamaica	64.45
74	Dominican Republic	70.26	Barbados	69.91	Luxembourg	66.12	Bahrain	65.06	Trinidad and Tobago	64.44
75	Fiji	70.25	Fiji	69.59	Morocco	66.06	Jamaica	64.36	Fiji	64.42
76	Suriname	70.25	United Arab Emirates	69.53	Iran, Islamic Rep.	65.86	Thailand	64.32	Vietnam	64.11
77	United Arab Emirates	70.05	Mexico	69.52	Cambodia	65.58	Barbados	64.29	Malaysia	64.01
78	Tajikistan	70.04	Peru	69.51	Mexico	65.57	Costa Rica	64.24	Montenegro	63.67
79	El Salvador	69.97	Vietnam	69.31	Brunei Darussalam	65.51	Kazakhstan	64.03	Algeria	63.66
80	Panama	69.67	Brunei Darussalam	69.28	Lebanon	65.47	Vietnam	63.65	Albania	63.40
81	Bolivia	69.58	Paraguay	69.14	Fiji	65.43	Botswana	63.61	Barbados	63.29
82	Oman	69.47	Jamaica	69.08	Peru	65.41	Egypt, Arab Rep.	63.54	Iran, Islamic Rep.	63.10
83	Bhutan	69.38	Saudi Arabia	69.06	Bangladesh	65.39	Iran, Islamic Rep.	63.47	Jordan	63.06
84	Barbados	69.10	Dominican Republic	68.77	Dominican Republic	65.24	Fiji	63.02	Luxembourg	63.03
85	Egypt, Arab Rep.	69.02	Suriname	68.69	Jordan	65.16	Trinidad and Tobago	63.01	Bahrain	62.94
86	Jamaica	68.89	Lebanon	68.66	Jamaica	64.94	Tajikistan	62.98	Kazakhstan	62.92
87	Nicaragua	68.87	El Salvador	68.38	Saudi Arabia	64.88	Lebanon	62.87	Turkmenistan	62.88
88	Maldives	68.67	Malaysia	68.27	Tajikistan	64.76	Suriname	62.72	Mauritius	62.83
89	Cabo Verde	68.65	Singapore	68.10	Panama	64.65	Peru	62.60	Saudi Arabia	62.79
90	Paraguay	68.62	Tajikistan	68.02	Qatar	64.55	Turkmenistan	62.02	El Salvador	62.74
91	Brunei Darussalam	68.53	Bangladesh	67.83	Uzbekistan	64.53	Brunei Darussalam	61.87	Panama	62.68
92	Singapore	67.76	Egypt, Arab Rep.	67.68	Mauritius	64.07	Morocco	61.69	Thailand	62.58
93	Nepal	67.21	Albania	67.57	Colombia	63.96	Philippines	61.21	Cabo Verde	61.84
94	Trinidad and Tobago	67.17	Cambodia	66.69	United Arab Emirates	63.86	Cabo Verde	61.20	Morocco	61.76
95	Jordan	67.01	Bhutan	66.62	Venezuela, RB	63.76	Bhutan	61.18	Uzbekistan	61.70
96	Sri Lanka	66.96	Qatar	66.59	Ghana	63.70	Singapore	61.14	Costa Rica	61.33
97	Belize	66.77	Belize	66.51	El Salvador	63.40	Sri Lanka	61.10	Qatar	61.29
98	Lebanon	66.23	Trinidad and Tobago	66.02	Singapore	63.39	United Arab Emirates	61.05	Bangladesh	61.10
99	Indonesia	65.95	Jordan	65.89	Kuwait	63.19	Bangladesh	61.01	Singapore	61.10
100	Philippines	65.71	Kuwait	65.87	Bhutan	62.77	Kenya	60.92	Brunei Darussalam	60.94
101	Turkmenistan	65.69	Panama	65.79	Albania	62.65	Panama	60.60	Bhutan	60.88
102	Qatar	65.69	Cabo Verde	65.69	Namibia	62.63	Jordan	60.53	Peru	60.13
103	Saudi Arabia	65.63	Turkmenistan	65.47	Botswana	62.49	Saudi Arabia	60.09	India	59.90
104	Ghana	65.53	Guatemala	65.26	Guatemala	62.36	Qatar	59.98	Philippines	59.69
105	Honduras	65.41	Mauritius	64.44	Malaysia	62.13	Namibia	59.74	Gabon	59.46

Table A1. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
106	Mongolia	64.86	Indonesia	64.22	Gabon	62.08	Belize	59.51	Myanmar	59.12
107	Venezuela, RB	64.66	Honduras	63.98	Cabo Verde	61.90	Indonesia	58.65	Venezuela, RB	59.10
108	Bangladesh	64.60	Sri Lanka	63.93	South Africa	61.89	Mauritius	58.21	Iraq	59.00
109	Myanmar	64.45	Venezuela, RB	62.76	India	61.55	Honduras	58.01	Kuwait	58.88
110	Mauritius	64.42	Botswana	61.63	Sao Tome and Principe	61.52	Sao Tome and Principe	57.95	United Arab Emirates	58.44
111	Sao Tome and Principe	63.99	Myanmar	61.61	Iraq	61.34	Gabon	57.63	Sao Tome and Principe	58.44
112	Cambodia	63.75	Kenya	61.36	Indonesia	61.08	Guatemala	57.57	Guatemala	58.43
113	South Africa	63.59	Mongolia	60.84	Guyana	61.00	Zimbabwe	57.43	Sri Lanka	58.41
114	Kuwait	63.57	Philippines	60.47	Sri Lanka	60.78	Cambodia	57.17	Mongolia	58.40
115	Iraq	63.13	Ghana	60.14	Vanuatu	60.71	Mongolia	57.06	Belize	58.11
116	Gabon	62.99	Gabon	60.14	Belize	60.54	Venezuela, RB	56.55	Cambodia	57.79
117	Lao PDR	62.84	South Africa	59.92	Honduras	60.50	Iraq	56.31	Vanuatu	57.48
118	Guatemala	62.13	Namibia	59.79	Trinidad and Tobago	60.46	Myanmar	56.02	Honduras	57.26
119	India	62.02	Iraq	59.45	Lao PDR	60.36	India	55.63	Indonesia	57.02
120	Botswana	61.92	India	58.91	Philippines	59.92	Kuwait	54.59	Guyana	56.59
121	Namibia	61.81	Sao Tome and Principe	58.68	Uganda	59.34	Vanuatu	53.99	South Africa	56.17
122	Vanuatu	60.87	Lao PDR	58.65	Burkina Faso	59.32	Ghana	53.81	Senegal	55.80
123	Guyana	60.37	Guyana	57.89	Myanmar	59.11	South Africa	52.72	Kenya	55.70
124	Kenya	60.27	Zimbabwe	56.76	Mongolia	58.77	Guyana	52.55	Burkina Faso	55.37
125	Zimbabwe	60.20	Vanuatu	55.68	Tanzania	58.03	Burkina Faso	50.49	Tanzania	54.74
126	Senegal	59.52	Senegal	54.74	Turkmenistan	57.73	Lao PDR	50.38	Angola	54.31
127	Syrian Arab Republic	59.29	Tanzania	54.32	Syrian Arab Republic	57.69	Senegal	48.94	Syrian Arab Republic	53.70
128	Rwanda	58.30	Syrian Arab Republic	53.71	Cameroon	57.63	Uganda	48.58	Pakistan	52.89
129	Cote d'Ivoire	58.10	Cameroon	53.23	Ethiopia	56.35	Afghanistan	47.82	Uganda	52.62
130	Gambia, The	57.63	Congo, Rep.	52.46	Angola	56.27	Tanzania	47.46	Ethiopia	52.53
131	Cameroon	57.36	Burkina Faso	52.00	Djibouti	56.25	Togo	47.40	Mozambique	52.51
132	Tanzania	57.11	Uganda	51.50	Mozambique	56.11	Angola	47.19	Togo	52.05
133	Congo, Rep.	57.11	Angola	51.12	Pakistan	55.49	Syrian Arab Republic	46.95	Ghana	51.82
134	Mauritania	56.04	Rwanda	51.12	Mauritania	55.42	Ethiopia	46.69	Malawi	50.81
135	Burkina Faso	55.44	Ethiopia	50.22	Lesotho	55.30	Benin	45.96	Zimbabwe	50.48
136	Ethiopia	55.30	Mauritania	49.01	Kenya	54.90	Congo, Rep.	45.84	Mauritania	50.45
137	Pakistan	55.05	Lesotho	48.67	Togo	54.80	Mauritania	45.80	Benin	50.11
138	Mozambique	54.90	Benin	48.64	Mali	54.76	Pakistan	45.76	Rwanda	50.00
139	Burundi	54.82	Cote d'Ivoire	48.56	Haiti	54.75	Mozambique	45.35	Afghanistan	49.13
140	Benin	54.71	Mozambique	48.36	Senegal	54.40	Haiti	45.20	Comoros	48.82
141	Lesotho	54.70	Togo	48.31	Congo, Rep.	54.25	Cameroon	44.99	Cameroon	48.75
142	Togo	54.23	Djibouti	48.05	Gambia, The	54.02	Papua New Guinea	44.40	Lao PDR	47.87

Table A1. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
143	Eswatini	54.20	Haiti	47.29	Eswatini	53.84	Malawi	43.79	Congo, Rep.	47.80
144	Uganda	54.07	Afghanistan	46.93	Sudan	53.84	Rwanda	43.68	Djibouti	47.36
145	Zambia	53.97	Eswatini	46.89	Rwanda	53.84	Djibouti	43.62	Mali	46.94
146	Djibouti	53.95	Papua New Guinea	46.51	Niger	53.83	Cote d'Ivoire	43.39	Niger	46.57
147	Malawi	53.53	Gambia, The	46.46	Benin	53.64	Madagascar	43.09	Cote d'Ivoire	46.31
148	Angola	52.94	Pakistan	46.30	Zimbabwe	53.28	Mali	42.61	Guinea	46.09
149	Afghanistan	52.88	Malawi	46.18	Afghanistan	53.13	Niger	42.24	Congo, Dem. Rep.	45.53
150	Comoros	52.82	Zambia	46.01	Yemen, Rep.	52.89	Lesotho	41.38	Yemen, Rep.	45.33
151	Sierra Leone	52.59	Burundi	45.95	Madagascar	52.75	Sierra Leone	41.34	Gambia, The	45.14
152	Haiti	52.48	Mali	45.83	Zambia	52.58	Sudan	41.18	Madagascar	45.09
153	Guinea	52.40	Sudan	45.83	Guinea	52.40	Congo, Dem. Rep.	40.69	Eswatini	45.01
154	Papua New Guinea	51.96	Madagascar	45.55	Malawi	51.50	Yemen, Rep.	39.71	Papua New Guinea	44.93
155	Mali	51.57	Yemen, Rep.	44.45	Sierra Leone	51.45	Guinea	39.61	Sudan	44.81
156	Congo, Dem. Rep.	51.05	Guinea	43.01	Comoros	51.33	Gambia, The	39.11	Zambia	44.73
157	Niger	50.58	Nigeria	42.57	Papua New Guinea	50.99	Comoros	38.92	Lesotho	44.72
158	Madagascar	50.25	Sierra Leone	42.20	Nigeria	50.40	Eswatini	38.58	Sierra Leone	44.55
159	Yemen, Rep.	50.16	Congo, Dem. Rep.	41.63	Congo, Dem. Rep.	49.97	Zambia	38.00	Haiti	44.07
160	Nigeria	50.05	Comoros	41.42	Liberia	49.66	Somalia	37.02	Liberia	43.75
161	Sudan	48.87	Niger	40.04	Somalia	49.65	Burundi	36.83	Nigeria	43.36
162	Liberia	47.72	Liberia	38.55	Cote d'Ivoire	49.61	Nigeria	36.34	South Sudan	41.91
163	Somalia	46.42	Somalia	38.08	Burundi	47.80	Liberia	34.09	Burundi	40.92
164	South Sudan	44.09	Chad	33.65	Chad	44.70	South Sudan	30.29	Somalia	39.08
165	Chad	42.89	South Sudan	30.99	South Sudan	44.02	Chad	28.75	Chad	36.42
166	Central African Republic	39.49	Central African Republic	29.00	Central African Republic	41.46	Central African Republic	25.16	Central African Republic	35.44

Table A2. Ranking of the SDG Index Using the OWA Operator.

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
1	Denmark	88.87	Sweden	88.82	Sweden	91.37	Norway	94.90	Sweden	94.54
2	Sweden	88.83	Denmark	88.78	Denmark	91.35	Sweden	94.87	Norway	94.36
3	Finland	87.91	Norway	88.18	Finland	90.59	Denmark	94.49	Denmark	94.20
4	Norway	86.70	Finland	88.18	Norway	90.22	Finland	94.29	Finland	93.85
5	Netherlands	85.17	Switzerland	86.29	Netherlands	88.29	Switzerland	93.75	Switzerland	93.22
6	Austria	85.13	Netherlands	86.14	Switzerland	88.26	Iceland	92.79	Netherlands	92.44
7	Germany	84.88	Austria	85.85	Austria	88.10	Netherlands	92.75	Iceland	92.33
8	France	84.71	Slovenia	85.79	Slovenia	87.85	Slovenia	92.48	Slovenia	92.31
9	Czech Republic	84.63	Iceland	85.72	Germany	87.52	Austria	92.20	Austria	91.86
10	Switzerland	84.59	New Zealand	85.16	France	87.46	United Kingdom	91.83	France	91.61
11	Slovenia	84.55	Ireland	85.13	Czech Republic	87.45	New Zealand	91.81	New Zealand	91.60
12	Estonia	84.46	United Kingdom	85.08	Ireland	87.36	Czech Republic	91.52	United Kingdom	91.41
13	Belgium	84.34	Estonia	85.03	Iceland	87.36	France	91.49	Belgium	91.40
14	Ireland	84.28	Czech Republic	85.03	New Zealand	87.33	Belgium	91.47	Germany	91.35
15	United Kingdom	84.22	Belgium	85.02	Belgium	87.32	Ireland	91.41	Ireland	91.22

Table A2. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
16	New Zealand	84.00	Germany	85.02	Estonia	87.30	Germany	91.39	Czech Republic	91.21
17	Iceland	83.41	France	84.99	United Kingdom	87.29	Japan	91.37	Japan	91.17
18	Japan	83.35	Japan	84.16	Japan	86.53	Estonia	91.19	Estonia	91.09
19	Korea, Rep.	82.71	Canada	84.01	Canada	86.05	Latvia	91.04	Latvia	90.93
20	Canada	82.71	Latvia	83.93	Latvia	85.95	Korea, Rep.	90.93	Korea, Rep.	90.83
21	Belarus	82.71	Korea, Rep.	83.82	Korea, Rep.	85.87	Australia	90.81	Canada	90.60
22	Latvia	82.55	Australia	83.61	Spain	85.40	Canada	90.65	Australia	90.44
23	Spain	82.29	Malta	83.38	Australia	85.27	Malta	90.58	Malta	90.34
24	Poland	82.18	Spain	83.21	Belarus	85.19	United States	90.36	United States	90.15
25	Chile	81.97	Portugal	82.84	Malta	85.16	Spain	89.90	Spain	89.82
26	Portugal	81.77	Poland	82.82	Poland	85.07	Portugal	89.55	Portugal	89.63
27	Hungary	81.61	United States	82.80	Portugal	84.92	Singapore	89.53	Luxembourg	89.42
28	Slovak Republic	81.38	Belarus	82.63	Chile	84.90	Luxembourg	89.39	Poland	89.37
29	Croatia	81.31	Chile	82.61	United States	84.82	Israel	89.35	Israel	89.25
30	Malta	81.24	Hungary	82.11	Hungary	84.44	Poland	89.34	Chile	89.08
31	United States	81.16	Luxembourg	81.95	Slovak Republic	84.10	Chile	89.13	Belarus	88.97
32	Australia	81.12	Slovak Republic	81.75	Italy	83.97	Belarus	88.95	Singapore	88.54
33	Italy	80.97	Italy	81.73	Luxembourg	83.86	Hungary	88.58	Hungary	88.49
34	Luxembourg	80.03	Israel	81.47	Croatia	83.38	Ukraine	88.38	Italy	88.46
35	Cyprus	80.02	Cyprus	81.26	Cyprus	83.29	Italy	88.24	Ukraine	88.44
36	Costa Rica	79.82	Cuba	80.96	Israel	83.23	Slovak Republic	88.00	Cyprus	88.13
37	Israel	79.49	Ukraine	80.81	Ukraine	82.78	Cyprus	87.99	Slovak Republic	88.07
38	Lithuania	79.39	Costa Rica	80.66	Costa Rica	82.74	Cuba	87.99	Cuba	87.66
39	Ukraine	79.23	Croatia	80.55	Cuba	82.58	Uruguay	87.66	Lithuania	87.62
40	Moldova	79.14	Singapore	80.52	Lithuania	82.49	Lithuania	87.27	Uruguay	87.41
41	Ecuador	79.07	Lithuania	80.35	Uruguay	82.35	Moldova	87.04	Moldova	87.11
42	Serbia	79.05	Uruguay	80.33	Moldova	82.27	Algeria	86.98	Vietnam	87.07
43	Uruguay	78.89	Ecuador	80.19	Ecuador	82.11	Greece	86.98	Greece	86.93
44	Romania	78.77	Moldova	80.07	Bosnia and Herzegovina	81.80	Fiji	86.89	Costa Rica	86.91
45	Cuba	78.59	Vietnam	79.76	Serbia	81.78	Costa Rica	86.87	Croatia	86.86
46	Bosnia and Herzegovina	78.55	Bosnia and Herzegovina	79.69	Vietnam	81.71	Croatia	86.77	Montenegro	86.84
47	Greece	78.51	Greece	79.66	Greece	81.69	Vietnam	86.69	Fiji	86.63
48	Vietnam	78.42	China	79.37	Romania	81.46	Ecuador	86.52	Bosnia and Herzegovina	86.59
49	China	78.31	Argentina	79.37	China	81.46	Montenegro	86.36	Algeria	86.54
50	Bulgaria	78.13	Serbia	79.33	Argentina	81.19	Bosnia and Herzegovina	86.34	China	86.46
51	Thailand	78.09	Romania	79.14	Singapore	81.05	China	86.25	Ecuador	86.37
52	Argentina	77.86	Algeria	79.11	Algeria	80.94	Argentina	86.14	Serbia	86.27

Table A2. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
53	Kyrgyz Republic	77.45	Fiji	78.96	Thailand	80.69	Serbia	86.07	Argentina	86.26
54	Brazil	77.33	Peru	78.65	Bulgaria	80.60	Azerbaijan	85.84	Azerbaijan	86.05
55	Algeria	77.29	Montenegro	78.54	Azerbaijan	80.56	Turkey	85.68	Turkey	85.80
56	Azerbaijan	77.25	Kyrgyz Republic	78.41	Kyrgyz Republic	80.50	Armenia	85.52	Tunisia	85.56
57	Peru	76.88	Azerbaijan	78.35	Peru	80.44	Maldives	85.49	Romania	85.47
58	Georgia	76.81	Brazil	78.32	Brazil	80.37	Tajikistan	85.45	Albania	85.40
59	Malaysia	76.32	Thailand	78.21	Fiji	80.28	Romania	85.45	Armenia	85.38
60	Russian Federation	76.30	Albania	78.20	Georgia	80.13	Peru	85.42	Tajikistan	85.37
61	Morocco	76.18	Georgia	78.14	Montenegro	80.00	Kyrgyz Republic	85.41	Maldives	85.34
62	Colombia	76.09	Bulgaria	78.13	Albania	79.76	Tunisia	85.40	Peru	85.31
63	Albania	76.08	Maldives	77.92	Malaysia	79.68	Albania	85.34	Morocco	85.16
64	Tunisia	76.07	Turkey	77.90	Morocco	79.61	Uzbekistan	85.03	Bulgaria	85.15
65	Iran, Islamic Rep.	76.04	Dominican Republic	77.87	Uzbekistan	79.59	Georgia	84.99	Uzbekistan	85.10
66	Uzbekistan	76.01	Uzbekistan	77.84	Turkey	79.52	Morocco	84.95	Thailand	85.07
67	Fiji	75.97	Tajikistan	77.82	Russian Federation	79.52	Thailand	84.92	Russian Federation	85.03
68	Mexico	75.93	Malaysia	77.74	Tunisia	79.49	Brazil	84.77	Kyrgyz Republic	85.00
69	Montenegro	75.83	Morocco	77.72	Mexico	79.48	Dominican Republic	84.76	Malaysia	84.86
70	Dominican Republic	75.76	Mexico	77.70	Dominican Republic	79.41	Malaysia	84.67	Barbados	84.76
71	Turkey	75.56	Tunisia	77.59	Colombia	79.40	Russian Federation	84.62	Brazil	84.69
72	North Macedonia	75.52	Colombia	77.54	Tajikistan	79.37	Bulgaria	84.59	Georgia	84.68
73	Singapore	75.45	Russian Federation	77.53	Iran, Islamic Rep.	79.26	Sri Lanka	84.59	Dominican Republic	84.65
74	Kazakhstan	75.43	Armenia	77.49	Maldives	79.03	Mexico	84.53	Iran, Islamic Rep.	84.47
75	Tajikistan	75.34	Iran, Islamic Rep.	77.21	Armenia	79.03	Barbados	84.36	Brunei Darus-salam	84.37
76	United Arab Emirates	75.19	El Salvador	76.98	El Salvador	78.60	Iran, Islamic Rep.	84.27	Sri Lanka	84.33
77	Armenia	75.13	Panama	76.94	United Arab Emirates	78.57	El Salvador	83.95	Mexico	84.32
78	El Salvador	74.98	Barbados	76.86	Kazakhstan	78.56	Brunei Darus-salam	83.93	El Salvador	83.95
79	Panama	74.68	United Arab Emirates	76.84	Panama	78.43	Colombia	83.81	Egypt, Arab Rep.	83.86
80	Maldives	74.39	Kazakhstan	76.46	North Macedo-nia	78.26	United Arab Emirates	83.77	Bahrain	83.68

Table A2. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
81	Oman	74.17	North Macedonia	76.20	Barbados	78.19	Panama	83.64	United Arab Emirates	83.67
82	Bolivia	74.02	Brunei Darussalam	76.17	Brunei Darussalam	77.80	Egypt, Arab Rep.	83.53	Panama	83.63
83	Barbados	73.99	Sri Lanka	76.03	Egypt, Arab Rep.	77.56	Kazakhstan	83.11	Colombia	83.41
84	Nicaragua	73.93	Egypt, Arab Rep.	75.96	Oman	77.43	Bahrain	83.05	Kazakhstan	83.22
85	Brunei Darussalam	73.89	Bahrain	75.71	Sri Lanka	77.31	Mauritius	82.71	Mauritius	82.51
86	Egypt, Arab Rep.	73.87	Oman	75.60	Bahrain	77.29	Oman	82.25	North Macedonia	82.40
87	Bhutan	73.78	Jamaica	75.49	Nicaragua	77.18	North Macedonia	82.24	Oman	82.39
88	Jamaica	73.69	Nicaragua	75.28	Bolivia	77.11	Nicaragua	82.10	Nicaragua	82.04
89	Bahrain	73.67	Bolivia	75.15	Jamaica	76.98	Bhutan	81.88	Jordan	81.99
90	Paraguay	73.00	Bhutan	75.05	Bhutan	76.96	Jordan	81.76	Bolivia	81.86
91	Sri Lanka	72.85	Paraguay	74.69	Paraguay	76.40	Bolivia	81.72	Bhutan	81.78
92	Suriname	72.66	Jordan	74.40	Jordan	76.05	Jamaica	81.58	Nepal	81.78
93	Jordan	72.52	Mauritius	74.08	Lebanon	75.30	Paraguay	81.19	Lebanon	81.53
94	Cabo Verde	72.27	Lebanon	73.58	Cabo Verde	75.11	Lebanon	81.13	Jamaica	81.47
95	Lebanon	71.68	Trinidad and Tobago	73.36	Mauritius	75.10	Nepal	81.05	Paraguay	81.25
96	Trinidad and Tobago	71.27	Qatar	73.30	Suriname	74.99	Qatar	80.71	Trinidad and Tobago	81.05
97	Nepal	71.19	Cabo Verde	73.27	Nepal	74.95	Trinidad and Tobago	80.53	Saudi Arabia	81.00
98	Saudi Arabia	70.80	Nepal	73.26	Trinidad and Tobago	74.88	Saudi Arabia	80.46	Qatar	80.88
99	Qatar	70.65	Saudi Arabia	73.04	Qatar	74.64	Cambodia	80.00	Cambodia	80.74
100	Philippines	70.35	Suriname	72.69	Saudi Arabia	74.55	Indonesia	79.50	Philippines	79.82
101	Belize	70.34	Belize	72.39	Belize	73.94	Cabo Verde	79.28	Indonesia	79.75
102	Mauritius	70.34	Honduras	72.32	Honduras	73.90	Philippines	79.23	Myanmar	79.75
103	Indonesia	70.30	Indonesia	72.32	Philippines	73.88	Honduras	79.22	Honduras	79.50
104	Honduras	70.23	Philippines	72.22	Indonesia	73.80	Iraq	79.19	Bangladesh	79.33
105	Ghana	69.80	Cambodia	72.14	Cambodia	73.66	Venezuela, RB	79.11	Iraq	79.32
106	Myanmar	69.77	Venezuela, RB	71.79	Myanmar	73.51	Myanmar	79.09	Kuwait	79.27
107	Cambodia	69.76	Myanmar	71.77	Ghana	73.23	Belize	79.02	Cabo Verde	79.18
108	Bangladesh	68.86	Iraq	71.68	Iraq	72.78	Ghana	78.73	Belize	79.11
109	Mongolia	68.78	Ghana	71.27	Bangladesh	72.71	Kuwait	78.69	Ghana	79.07

Table A2. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
110	Iraq	68.69	Bangladesh	71.05	Venezuela, RB	72.68	Bangladesh	78.66	Syrian Arab Republic	78.92
111	South Africa	68.53	Guatemala	71.01	Kuwait	72.27	Lao PDR	78.64	India	78.91
112	Turkmenistan	68.37	Namibia	70.95	Guatemala	72.22	Guatemala	78.40	Lao PDR	78.91
113	Kuwait	68.33	Kuwait	70.78	Sao Tome and Principe	72.19	India	78.38	Sao Tome and Principe	78.62
114	Sao Tome and Principe	68.25	Sao Tome and Principe	70.78	Mongolia	71.99	Sao Tome and Principe	78.30	Venezuela, RB	78.61
115	Venezuela, RB	68.16	Lao PDR	70.33	Namibia	71.94	Syrian Arab Republic	78.25	Guatemala	78.58
116	Gabon	68.01	South Africa	70.29	South Africa	71.85	Suriname	77.94	Mauritania	78.04
117	Namibia	67.91	Gabon	70.26	Lao PDR	71.84	Mauritania	77.86	Gabon	78.02
118	Guatemala	67.89	Mongolia	70.12	Turkmenistan	71.76	Zimbabwe	77.71	Zimbabwe	77.90
119	Lao PDR	67.65	India	70.09	Gabon	71.62	Namibia	77.52	Suriname	77.78
120	India	67.29	Turkmenistan	70.03	India	71.48	Gabon	77.49	Mongolia	77.40
121	Botswana	67.10	Syrian Arab Republic	69.90	Syrian Arab Republic	70.68	Gambia, The	77.31	Gambia, The	77.36
122	Vanuatu	66.21	Zimbabwe	69.14	Botswana	70.35	South Africa	76.87	Namibia	77.28
123	Guyana	65.95	Guyana	68.92	Zimbabwe	70.32	Mongolia	76.78	Lesotho	76.82
124	Syrian Arab Republic	65.80	Botswana	68.92	Guyana	69.99	Lesotho	76.53	Turkmenistan	76.70
125	Zimbabwe	65.69	Gambia, The	68.71	Vanuatu	69.76	Turkmenistan	76.52	Yemen, Rep.	76.64
126	Kenya	65.16	Mauritania	68.28	Gambia, The	69.64	Guyana	76.19	Guyana	76.61
127	Gambia, The	64.65	Vanuatu	68.24	Mauritania	69.22	Burkina Faso	75.98	Burkina Faso	76.56
128	Mauritania	64.16	Lesotho	67.96	Kenya	68.84	Yemen, Rep.	75.81	South Africa	76.26
129	Senegal	63.94	Kenya	67.23	Senegal	67.99	Vanuatu	75.18	Congo, Rep.	76.01
130	Cote d'Ivoire	63.29	Burkina Faso	67.23	Lesotho	67.95	Kenya	75.14	Kenya	75.59
131	Rwanda	63.15	Congo, Rep.	66.81	Burkina Faso	67.76	Mozambique	75.14	Vanuatu	75.44
132	Tanzania	62.82	Senegal	66.63	Congo, Rep.	67.54	Botswana	75.03	Afghanistan	75.26
133	Congo, Rep.	62.71	Mozambique	66.17	Cote d'Ivoire	67.34	Congo, Rep.	74.78	Benin	75.07
134	Burkina Faso	62.52	Rwanda	66.13	Tanzania	67.25	Tanzania	74.70	Tanzania	75.03
135	Lesotho	62.19	Tanzania	66.04	Rwanda	67.12	Niger	74.57	Mozambique	74.99
136	Cameroon	62.03	Cote d'Ivoire	66.00	Mozambique	66.86	Guinea	74.46	Botswana	74.95
137	Pakistan	61.98	Yemen, Rep.	65.96	Ethiopia	66.35	Senegal	74.28	Senegal	74.92
138	Mozambique	61.57	Burundi	65.89	Burundi	66.30	Benin	74.10	Ethiopia	74.90
139	Ethiopia	61.56	Benin	65.50	Pakistan	66.24	Ethiopia	74.01	Cote d'Ivoire	74.81
140	Burundi	61.53	Ethiopia	65.40	Yemen, Rep.	66.23	Cote d'Ivoire	73.96	Niger	74.64

Table A2. *Cont.*

Rank	Country	e_1	Country	e_2	Country	e_3	Country	e_4	Country	e_5
141	Afghanistan	60.87	Guinea	65.14	Cameroon	66.16	Afghanistan	73.92	Guinea	74.60
142	Benin	60.68	Pakistan	65.03	Benin	65.84	Burundi	73.74	Pakistan	74.14
143	Djibouti	60.47	Afghanistan	64.95	Afghanistan	65.77	Rwanda	73.41	Burundi	74.10
144	Yemen, Rep.	60.31	Niger	64.87	Guinea	65.65	Pakistan	73.30	Rwanda	73.90
145	Eswatini	60.14	Cameroon	64.69	Djibouti	65.10	Togo	72.92	Togo	73.54
146	Guinea	60.07	Togo	64.24	Togo	64.84	Mali	72.88	Cameroon	73.35
147	Uganda	59.99	Sierra Leone	64.07	Niger	64.73	Sierra Leone	72.78	Sierra Leone	73.25
148	Zambia	59.92	Djibouti	64.07	Sierra Leone	64.72	Cameroon	72.77	Mali	73.13
149	Togo	59.74	Eswatini	64.04	Zambia	64.71	Djibouti	72.39	Djibouti	73.00
150	Malawi	59.73	Zambia	63.90	Eswatini	64.53	Zambia	72.02	Zambia	72.21
151	Sierra Leone	59.46	Mali	63.89	Malawi	64.44	Uganda	71.64	Uganda	72.11
152	Mali	58.87	Malawi	63.75	Uganda	64.42	Malawi	71.55	Malawi	71.71
153	Niger	58.66	Uganda	63.36	Mali	64.34	Papua New Guinea	71.42	Papua New Guinea	71.64
154	Papua New Guinea	58.36	Papua New Guinea	62.61	Papua New Guinea	63.38	Madagascar	71.00	South Sudan	71.44
155	Comoros	58.35	Madagascar	61.89	Haiti	62.45	South Sudan	70.86	Liberia	71.17
156	Angola	57.85	Haiti	61.32	Madagascar	62.28	Eswatini	70.83	Madagascar	71.09
157	Haiti	57.83	Congo, Dem. Rep.	61.00	Comoros	62.09	Liberia	70.15	Haiti	71.05
158	Madagascar	56.99	Liberia	60.72	Congo, Dem. Rep.	61.89	Haiti	70.08	Nigeria	70.91
159	Congo, Dem. Rep.	56.93	Nigeria	60.69	Angola	61.59	Nigeria	69.90	Eswatini	70.66
160	Nigeria	55.98	Comoros	60.61	Nigeria	61.29	Congo, Dem. Rep.	69.42	Congo, Dem. Rep.	70.10
161	Sudan	55.69	South Sudan	60.45	Liberia	60.80	Chad	68.96	Comoros	69.56
162	Liberia	55.05	Angola	60.08	Sudan	60.30	Comoros	68.51	Chad	69.33
163	Somalia	53.63	Sudan	59.19	South Sudan	59.75	Sudan	67.74	Sudan	68.58
164	South Sudan	52.70	Somalia	58.60	Somalia	58.99	Angola	67.52	Angola	68.52
165	Chad	51.95	Chad	58.29	Chad	58.14	Somalia	67.38	Somalia	68.15
166	Central African Republic	46.86	Central African Republic	53.85	Central African Republic	53.45	Central African Republic	64.11	Central African Republic	65.31

Table A3. Ranking of the SDG Index Using the POWA Operator.

Rank	Country	POWA
1	Sweden	92.00
2	Denmark	91.83
3	Finland	91.31
4	France	88.38
5	Germany	88.36
6	Norway	91.31
7	Austria	89.00
8	Czech Republic	88.33
9	Netherlands	89.35
10	Estonia	88.16
11	Belgium	88.27
12	Slovenia	89.00
13	United Kingdom	88.37
14	Ireland	88.25

Table A3. *Cont.*

Rank	Country	POWA
15	Switzerland	89.71
16	New Zealand	88.38
17	Japan	87.73
18	Belarus	86.00
19	Croatia	84.04
20	Korea, Rep.	87.25
21	Canada	87.20
22	Spain	86.51
23	Poland	86.11
24	Latvia	87.31
25	Portugal	86.13
26	Iceland	88.81
27	Slovak Republic	84.99
28	Chile	85.90
29	Hungary	85.40
30	Italy	85.03
31	United States	86.33
32	Malta	86.62
33	Serbia	82.84
34	Cyprus	84.53
35	Costa Rica	83.75
36	Lithuania	83.80
37	Australia	86.75
38	Romania	82.39
39	Bulgaria	81.61
40	Israel	85.06
41	Thailand	81.73
42	Moldova	83.52
43	Greece	83.18
44	Luxembourg	85.40
45	Uruguay	83.78
46	Ecuador	83.23
47	Ukraine	84.38
48	China	82.76
49	Vietnam	83.13
50	Bosnia and Herzegovina	82.97
51	Argentina	82.57
52	Kyrgyz Republic	81.77
53	Brazil	81.47
54	Azerbaijan	82.03
55	Cuba	84.04
56	Algeria	82.68
57	Russian Federation	80.99
58	Georgia	81.38
59	Iran, Islamic Rep.	80.65
60	Malaysia	81.06
61	Peru	81.77
62	North Macedonia	79.25
63	Tunisia	81.28
64	Morocco	81.15
65	Kazakhstan	79.74
66	Uzbekistan	81.16
67	Colombia	80.46
68	Albania	81.42
69	Mexico	80.83
70	Turkey	81.39
71	United Arab Emirates	80.04
72	Montenegro	82.02
73	Dominican Republic	80.95

Table A3. *Cont.*

Rank	Country	POWA
74	Fiji	82.30
75	Armenia	81.04
76	Oman	78.76
77	El Salvador	80.14
78	Tajikistan	81.18
79	Bolivia	78.35
80	Bhutan	78.30
81	Panama	79.91
82	Bahrain	79.12
83	Egypt, Arab Rep.	79.42
84	Jamaica	78.24
85	Nicaragua	78.52
86	Suriname	75.48
87	Barbados	80.13
88	Brunei Darussalam	79.71
89	Jordan	77.80
90	Paraguay	77.71
91	Maldives	80.99
92	Cabo Verde	76.18
93	Singapore	83.77
94	Sri Lanka	79.62
95	Lebanon	77.10
96	Nepal	76.90
97	Saudi Arabia	76.43
98	Trinidad and Tobago	76.65
99	Philippines	75.51
100	Ghana	74.85
101	Indonesia	75.58
102	Belize	75.39
103	Qatar	76.53
104	Myanmar	75.21
105	Honduras	75.47
106	Cambodia	75.74
107	Mongolia	73.38
108	Mauritius	77.57
109	Bangladesh	74.58
110	South Africa	73.21
111	Gabon	73.53
112	Kuwait	74.36
113	Iraq	74.85
114	Turkmenistan	73.07
115	Sao Tome and Principe	74.12
116	Lao PDR	74.01
117	India	73.76
118	Venezuela, RB	74.64
119	Namibia	73.61
120	Guatemala	74.14
121	Botswana	71.67
122	Vanuatu	71.40
123	Kenya	70.87
124	Guyana	72.02
125	Zimbabwe	72.74
126	Syrian Arab Republic	73.30
127	Senegal	70.04
128	Cote d'Ivoire	69.57
129	Gambia, The	72.16
130	Mauritania	72.19
131	Tanzania	69.75
132	Rwanda	69.23

Table A3. *Cont.*

Rank	Country	POWA
133	Cameroon	68.31
134	Pakistan	68.66
135	Congo, Rep.	70.11
136	Ethiopia	69.02
137	Burkina Faso	70.65
138	Djibouti	67.57
139	Afghanistan	68.74
140	Mozambique	69.63
141	Lesotho	70.99
142	Uganda	66.86
143	Burundi	68.90
144	Eswatini	66.58
145	Benin	68.86
146	Comoros	64.28
147	Togo	67.68
148	Zambia	67.15
149	Angola	63.55
150	Guinea	68.70
151	Yemen, Rep.	69.72
152	Malawi	66.82
153	Sierra Leone	67.50
154	Haiti	65.11
155	Papua New Guinea	66.13
156	Mali	67.31
157	Niger	68.29
158	Congo, Dem. Rep.	64.46
159	Sudan	62.86
160	Nigeria	64.40
161	Madagascar	65.35
162	Liberia	64.28
163	Somalia	62.00
164	Chad	62.17
165	South Sudan	63.92
166	Central African Republic	57.52

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