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Achievement Of Indonesian Sustainable Development Using Multimoora Analysis

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Abstract: Sustainable development is a global concept that has become a priority for every country, including Indonesia. As a vast archipelagic nation with diverse regions, Indonesia presents a unique case study in the implementation of sustainable development. One of the key challenges faced by Indonesia is the uneven distribution of development, which tends to be concentrated around major urban centers such as the capital city, while peripheral regions often lag behind. The essence of sustainable development lies in the internalization of environmental, social, and economic impacts in every policy and action taken. It emphasizes the need to ensure that current development efforts do not compromise the ability of future generations to meet their needs. This study employs the MULTIMOORA (Multi-Objective Optimization by Ratio Analysis plus Full Multiplicative Form) analytical technique to evaluate Indonesia's sustainable development performance. The results demonstrate significant progress in 2022, where Indonesia ranked first across all three MULTIMOORA methods, marking an improvement from third place in 2021. This upward trend indicates the country's growing commitment to sustainable development principles. The Sustainable Development Goals (SDGs) serve as comprehensive frameworks that provide specific targets and indicators, which are essential in measuring the effectiveness of development initiatives. By aligning national policies with the SDGs, Indonesia can ensure more inclusive, equitable, and environmentally conscious growth. Sustainable development requires that every social and economic activity accounts for its environmental impact to ensure that natural ecosystems can continue to support life—both now and in the future—thus preserving the planet for generations to come.

Keywords: Sustainable Development, Human Development, Environment, Multimoora

Introduction

Sustainable development has become a global trend today (United Nations Conference on Trade and Development, 2018). The Sustainable Development Goals (SDGs) were born at the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012. Its aim is to produce a set of universal goals that meet the urgent environmental, political and economic challenges facing the world.

Sustainable development is a concept that is a priority for countries in the world. In Indonesia, as a reference for the national development agenda contained in the NAWACITA during the reign of President Joko Widodo, it was included in the 2015-2019 medium-term development plan (RPJMN) and 2020-2024 RPJMN. This program aims to improve people's welfare and is aligned with the Sustainable Development Goals (SDGs) (Bappenas & BPS, 2020; Rassanjani, 2018).

The SDGs replace the Millennium Development Goals (MDGs), which started a global effort in 2000 to tackle the abomination of poverty. The MDGs set measurable and universally agreed goals to end extreme poverty and hunger, prevent terminal illness, and expand primary education for all children, among other development priorities.

The Sustainable Development Goals clearly aim to eradicate poverty and hunger, reduce inequalities within and between countries, improve water and energy management, and take urgent action to address climate change. Contrary to the Millennium Development Goals, the Sustainable Development Goals emphasize poverty alleviation and strategic efforts to increase economic growth, as well as implementing social policy measures to meet various social needs (such as education, health care, social protection, employment opportunities) and measures policy measures to tackle climate change and protect the environment.

Since 2015 Indonesia has adopted the Sustainable Development Goals (SDGs) agenda. The SDGs are a joint agenda of UN member countries for the welfare of society through development in the social, economic, environmental and governance fields. In general, the SDGs have 169 targets which are summarized in 17 big goals, all of which are expected to be achieved by 2030.

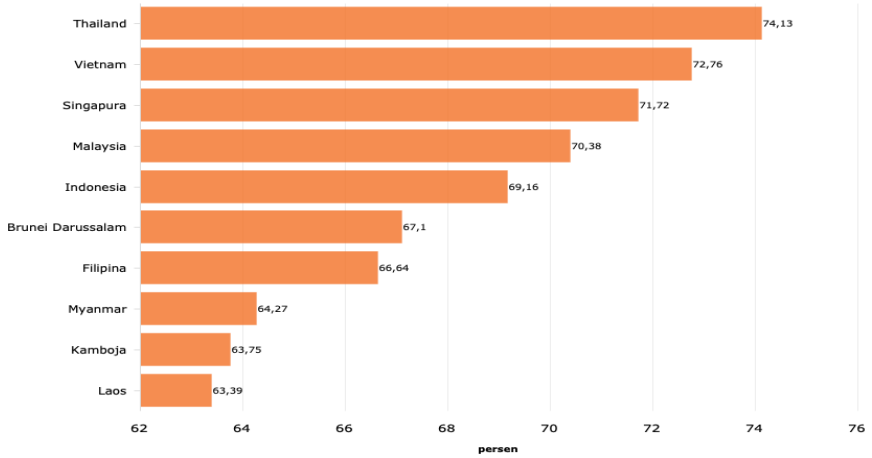

Figure 1. SDGs Achievement Scores for Southeast Asian Countries in 2022
Source: Indonesian Statistics Center (data processed)

According to the 2022 Sustainable Development Report, currently Indonesia has succeeded in achieving 69.16% of all SDGs goals. This achievement increased compared to 2015 where the score was still 65.03%. However, until 2022 Indonesia will still be labeled 'red' or considered to have major challenges in handling hunger, health, urban sustainability, preservation of marine and land ecosystems, peace, justice and institutions, as well as global partnerships. In 2022 the achievement of SDGs Indonesia is ranked 82nd out of 163 countries. Meanwhile in the Southeast Asia region, Indonesia is ranked 5th as shown in the graph. Regarding this condition, in September 2022 President Joko Widodo has issued a new Presidential Regulation (Perpres) to encourage performance in achieving the SDGs. With the stipulation of Presidential Decree No.

Indonesia is an interesting country to study in terms of sustainable development, where Indonesia's vast territory tends to experience uneven development but tends to be concentrated in the area around the capital city. As for the provinces that have action plans for sustainable development, only 19 provinces in the form of Regional Action Plans (RAD), namely South Kalimantan, Gorontalo, South Sulawesi, Bali, West Nusa Tenggara, East Nusa Tenggara, South Sumatra, Central Sulawesi, North Sulawesi, Sumatra West, Riau, Bengkulu, Lampung, West Java, Central Java, East Java, the Special Region of Yogyakarta, North Kalimantan, and the Riau Archipelago. As for the rest, they have not finished preparing the RAD (Salsabila, 2019).

The essence of sustainable development is the internalization of the impact of every social and economic action on the environment. This means that every social and economic activity needs to avoid/prevent or take into account its impact on environmental conditions, so that the environment can continue to carry out its function to support life now and in the future.

Indonesia's environmental preservation is classified as poor on a global scale, even on an Asia Pacific regional scale. This is recorded in the 2022 Environmental Performance Index (EPI) report. The EPI measures the level of environmental sustainability in countries through dozens of indicators which are summarized in three big pillars, namely: Environmental Health: Air quality, water pollution, waste treatment quality, and so on. Climate: Climate change mitigation policies, greenhouse gas emissions, and so on. Ecosystem Viability: Quality of biodiversity, sustainability of fisheries, agriculture, water resources, and so on. The data used by EPI comes from international organizations, research institutions, academics and government agencies. Most of the data has been audited by third parties. EPI then processes the data related to the indicators above into a score on a scale of 0-100. The higher the number, the better environmental sustainability is considered, and vice versa.

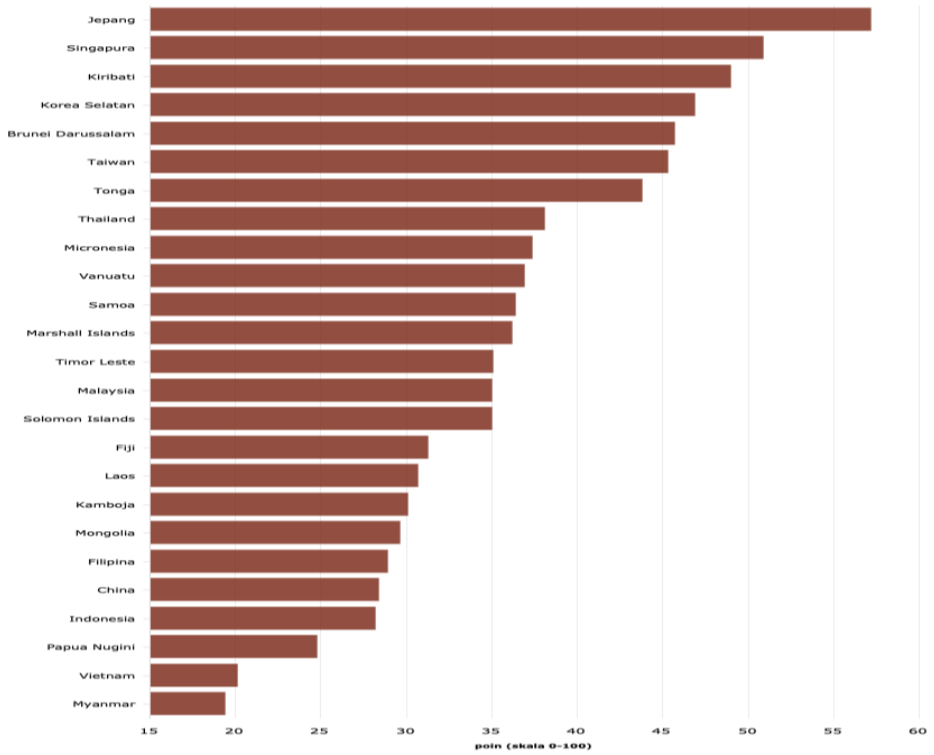

Figure 2. Environmental Sustainability Scores in Asia Pacific Countries in 2022
Source: Indonesian Central Bureau of Statistics (data processed)

As a result, Indonesia received a score of 28.2 out of 100. This score places Indonesia in 164th place out of 180 countries researched. When viewed on a regional scale, Indonesia's position is also in the lower ranks. Indonesia is ranked 22nd out of 25 Asia Pacific countries, or 8th out of 10 ASEAN countries. In this report, Indonesia scores low for all indicators, with details of an ecosystem vitality score of 34.1, an environmental health score of 25.3, and a climate change mitigation policy score of 23.2 out of 100. The EPI states that low scores are received by countries that prioritize economic growth rather than environmental sustainability. While high scores are achieved by countries that have performance commitments and long-term investments in conserving biodiversity, preserving natural resources, and reducing greenhouse gas emissions.

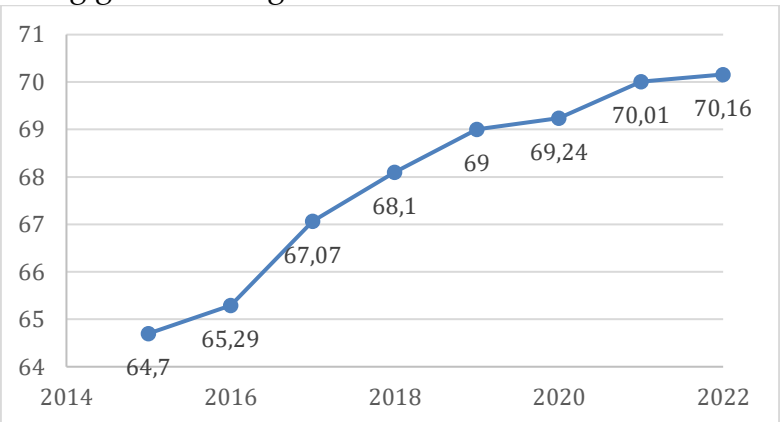

Figure 3. Development of Indonesia's SDGs for 2015 – 2022
Source: Indonesian Central Bureau of Statistics (data processed)

Based on Figure 3, data on the development of SDGs in Indonesia shows significant progress from 2021 to 2022 with a score of 70.16, but in 2020 Indonesia's SDGs score has decreased, this is because that year the Covid-19 pandemic occurred so that 17 goals of the SDGs in Indonesia has decreased.

Methodology

Variable Operational Definitions

1. Sustainable development isseek equitable development between generations in the present and in the future to meet human needs and aspirationsmeasured using the 2015-2022 SDGs with a score unit.
2. Poverty is a condition in which a person or group of people are unable to fulfill their basic rights to maintain and develop a dignified life, measured using the percentage of poor population in 2015-2022 in percent units.
3. Economic growth is a condition in which the people of a country or region experience an increase in income which can be caused by an increase in the production of goods and services, measured by the 2015-2022 economic growth rate in units of percent.
4. The Human Development Index measures human development achievements based on a number of basic quality of life components, measured by the 2015-2022 human development index in points.
5. The Environmental Quality Index is a national environmental management performance indicator that can be used as information material to support policy-making processes related to environmental protection and management as measured by the 2015-2022 IKLHK in units of percent.

Data Analysis Technique

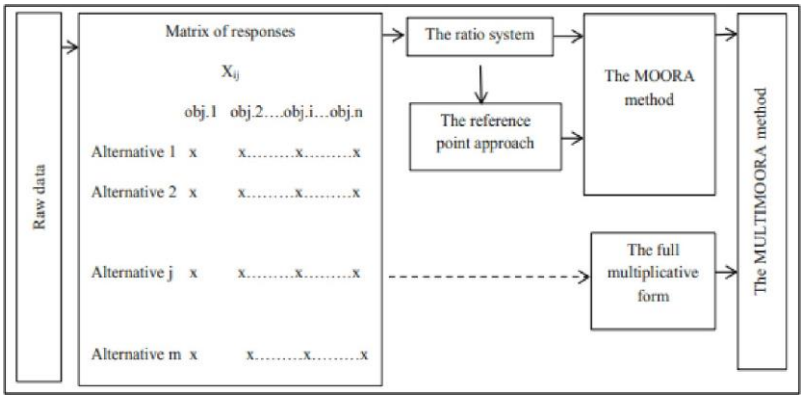

Figure 4. Multimoora method

The MULTIMOORA method (Multi-Objective Optimization on the basis of a Ratio Analysis plus the full MULTIplicative form) is a decision-making method or technique that is useful in terms of multi-criteria (Hafezalkotob, Hafezalkotob, Liao, & Herrera, 2019). In Figure 4, Raw Data is the raw data that has been collected, then the Matrix of Responses is the placement of each data that has been assessed with a weighted value per criteria that has been determined in the form of a matrix. After that, after the data is formed in a matrix,

the ratio system calculation will be carried out which will be continued in the reference point approach calculation, after that the results of the rational system and the reference point approach will be processed in the MOORA method. In addition, the data in the matrix of responses is carried out in the calculation of the full multiplicative form and the results of the full multiplicative form and the results of the MOORA method will be further processed in the MULTIMOORA method to produce the final result. Multimoora was first introduced by Brauers and Zafadskas in early 2012. This method makes a reliable multiple optimization system in multiple optimization under nominal group conditions that have been fixed and Delphi (Brauers & Zafadskas, 2012). The Multimoora method has several parts, namely:

1. Define Matrix Values
   Determine a goal of a problem that will be faced to identify evaluation attributes that will be used.
2. Define the Decision Matrix
   Displays all Displays all available information for the attribute in the form of a decision matrix. X is the criterion value of each criterion which will be represented as a matrix as follows:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad \text{…………….. (1)}$$

3. Vector Normalization
   Regardless of the approach used, the initial decision criteria can be transformed by applying vector normalization, namely:

$$\underline{x}_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad \text{………………………………………….(2)}$$

   Where xij is the initial criterion value, which is the response from the alternative*i*for the purpose of*j*;*i*= 1, 2, . . . ,*m;m*is the number of alternatives ;*j*= 1, 2, . . . ,*n;n*is the number of decision criteria (objectives) i.e. xij is the dimensionless value of a decision criterion.
4. Calculating the Optimization Value
   The first part of this approach is based on the ratios present in the system. To calculate the relative significance, each alternative,*yi* from each alternative*i* in connection with all the purposes of criterion j, the weighting of the normalized criterion values must be added if the case is in the form of maximization, while for normalization the normalized criterion value weights must be reduced as follows:

$$y_i = \sum_{j=1}^{j=g} W_J^5 X_{ij}^* - \sum_{j=g+1}^{n} W_J^5 X_{ij}^{5*} \quad \text{…………. (3)}$$

Where$j$= 1, 2, . . . ,$g$is the decision criterion that is maximized and ;j=g+1,g+2, . . . ,$n$is a decision criterion that is minimized;$wj$is the weight (relative significance) of a criterion.

5. Calculation of References Point Approach
   In the reference point approach calculation is a calculation to find the maximum value and minimum value of each existing data. This calculation is performed to find the optimization value of the ratio system calculation stages. Furthermore, the criteria in this study only have a benefit value, so that the calculation of the sum of the ratio calculation values for alternatives is carried out. The results obtained are in the form of a matrix of alternatives, namely:

$$r_j = \begin{cases} max_i X_{ij}^* \\ max_i X_{ij}^* \end{cases} \quad \text{..... (4)}$$

6. Multimoora ranking
   The second part of this approach is based on the overall form of multiplication as presented by Brauers and Zavadskas. The full multiplication form for calculating the utility of the alternatives can be implemented as follows:

$$U^i = \frac{A_i}{B_i} \quad \text{..... (5)}$$

   WhereAi And Bi calculated separately to maximize the decision criterion$j$= 1, 2, . . . ,$g$and minimize decision criteria$j$=g+1,g+2, . . . ,n, respectively.Ai And Bi calculated as follows:

$$A_i = \Pi_{j=1}^{g} w_j \underline{x}_{ij}$$

$$B_i = \Pi_{j=g+1}^{g} w_j \underline{x}_{ij} \quad \text{.....(6)}$$

Result and Discussion

The first process to be carried out is to form a matrix, namely by determining the assessment criteria. The criteria considered in decision making are grouped into benefit (+) or cost (-) criteria. In addition, to simplify the calculation process, a code is created that represents the name of the criteria.

Table 1. Determination of Criteria

Code	Criteria Name	Type	Indicator
C1	Economic Growth Rate	+	Good Indicator
C2	Human Development Index	+	Good Indicator
C3	Sustainable Development Index	+	Good Indicator
C4	Environmental Quality Index	-	Bad Indicators
C5	Poverty	-	Bad Indicators

Source: processed data

Then the data is entered in the decision matrix table as in the following table:

Table 2. Decision Matrix

Alternative	C1	C2	C3	C4	C5
	+	+	+	-	-
2015 (A1)	4.88	69.55	64,70	68,23	11,13
2016 (A2)	5.03	70,18	65,29	65,73	10.70
2017 (A3)	5.07	70,81	67.07	66,46	10,12
2018 (A4)	5,17	71.39	68,10	65,10	9,66
2019 (A5)	5.02	71,92	69.00	66.50	9,22
2020 (A6)	-2.07	71.94	69,24	70.30	10,19
2021 (A7)	3.70	72,29	70.01	71.50	9,71
2022 (A8)	5,31	72,91	70,16	72,40	9.57

Source: processed data

Calculations from the matrix have been made into the normalized matrix. To calculate the normalized matrix value, use equation 2 from the decision matrix table, as shown in table 3 below:

Table 3. Normalization Matrix

Alternative	C1	C2	C3	C4	C5
	+	+	+	-	-
A1	0.152	0.122	0.119	0.125	0.139
A2	0.157	0.123	0.120	0.120	0.133
A3	0.158	0.124	0.123	0.122	0.126
A4	0.161	0.125	0.125	0.119	0.120
A5	0.156	0.126	0.127	0.122	0.115
A6	-0.064	0.126	0.127	0.129	0.127
A7	0.115	0.127	0.129	0.131	0.121
A8	0.165	0.128	0.129	0.133	0.119
Ln(8)	2,079	2,079	2,079	2,079	2,079

Source: processed data

The calculation of the normalization matrix is made in the form of a weight matrix using equation 3, as shown in table 4 below:

Table 4. Weight Matrix

Alternative	C1	C2	C3	C4	C5
	+	+	+	-	-
A1	-0.286	-0.256	-0.253	-0.260	-0.274
A2	-0.290	-0.258	-0.255	-0.255	-0.269
A3	-0.291	-0.259	-0.258	-0.256	-0.261
A4	-0.294	-0.260	-0.260	-0.254	-0.255
A5	-0.290	-0.261	-0.262	-0.256	-0.249
A6	-0.177	-0.261	-0.262	-0.264	-0.262
A7	-0.249	-0.262	-0.264	-0.266	-0.255
A8	-0.298	-0.263	-0.264	-0.268	-0.254
SUMMARY	-2.176	-2,079	-2,079	-2,079	-2,078
ENTROPY	1,046	1,000	1,000	1,000	0.999
DJ	-0.046	0.000	0.000	0.000	0.001
Wj	1.032	-0.001	-0.004	-0.008	-0.018

Source: processed data

Next, the References Point Approach calculation matrix is carried out based on equation 4, as shown in table 5 below:

Table 5. References Point Approach Matrix

Alternative	C1	C2	C3	C4	C5	Sum	Sum
	+	+	+	-	-	**Benefits**	**Cost**
A1	0.383	0.000	-0.001	-0.003	-0.007	0.381	-0.010
A2	0.395	0.000	-0.001	-0.003	-0.007	0.393	-0.010
A3	0.398	0.000	-0.002	-0.003	-0.007	0.396	-0.009
A4	0.406	0.000	-0.002	-0.003	-0.006	0.404	-0.009
A5	0.394	0.000	-0.002	-0.003	-0.006	0.392	-0.009
A6	-0.162	0.000	-0.002	-0.003	-0.007	-0.164	-0.009
A7	0.290	0.000	-0.002	-0.003	-0.006	0.288	-0.009
A8	0.417	0.000	-0.002	-0.003	-0.006	0.415	-0.009
Rj	0.417	0.000	-0.001	-0.003	-0.006		

Source: processed data

Based on the calculation of the decision matrix, normalization, weights and References Point Approach, a summary of the calculations is obtained as follows:

Table 6. Recapitulation of Matrix Calculations

Year	y*	Ry	z*	Rz	U*	ru	Aggregation	Final Rank
2015	0.391	6	0.034	4	0.008	8	1,846	8
2016	0.402	4	0.383	6	0.064	4	1,500	7
2017	0.405	3	0.383	6	0.064	3	1,200	6
2018	0.413	2	0.011	1	0.011	5	0.588	2
2019	0.400	5	0.349	3	0.116	2	0.968	5
2020	-0.155	8	0.014	1	0.014	2	0.615	4
2021	0.297	7	0.014	1	0.014	2	0.609	3
2022	0.424	1	0.372	1	0.372	1	0.333	1

Source: processed data

Discussion

This research results that based on data on the achievement of sustainable development in Indonesia which is measured using three good indicators and 2 bad indicators. The good indicators used are the rate of economic growth, the human development index and the sustainable development index, while the bad indicators used are the environmental quality index and poverty. The results obtained are based on table 6. In the recapitulation of matrix calculations using multimoora analysis, namely, it shows consistent results in 2022, namely ranking 1 using three techniques or methods. This reflects that in 2022, Indonesia's achievement of sustainable development will increase from rank 3 in 2021 to rank 1 in 2022.

The completeness of sustainable development targets and indicators reflected in the SDGs is an opportunity and opportunity to complete our understanding of the development measures for each pillar and how these indicators are related to measuring the implementation of sustainable development. With the nature of the SDGs indicators like that, the enthusiasm for using indicators in the SDGs is a way to find out the progress and development of a country in implementing sustainable development, especially in Indonesia.

Conclusion

However, the recapitulation of matrix calculations for rank 2 and rank 3 is not consistent, the main thing is because the main response to implementing sustainable development is that being environmentally friendly is feared to make goods prices more expensive. Sustainable development, especially the implementation of environmentally friendly production processes, will indeed bring consequences for changes from the usual production process, to a production process that pays attention to material efficiency and clean waste, so the production method will become longer/longer. The use of new technologies that are more environmentally friendly will require new capital so that it is more expensive than using current technology. The use of raw materials that are safe for the environment also has a higher price. Therefore, every producer feels "bothersome" changing

technology and will definitely pass on the value of expensiveness into the price of goods. Human Development in sustainable development plays a fundamental role not only because human resources have health, their basic needs are fulfilled and their capabilities are built; however, within the capability of human resources there needs to be a fundamental transformation regarding their responsibility to nature. their basic needs are fulfilled and their capabilities are built; however, within the capability of human resources there needs to be a fundamental transformation regarding their responsibility to nature. their basic needs are fulfilled and their capabilities are built; however, within the capability of human resources there needs to be a fundamental transformation regarding their responsibility to nature.

Zero Poverty is actually the ultimate goal of all the Goals in the SDGs, but it is also a prerequisite for sustainable development to be carried out properly. In achieving this goal, poverty measurement is not only based on poverty based on income dimensions, but also poverty measurement based on access to basic services and access to other productive resources.

Inconsistencies in the matrix calculations for rank 2 and 3 stem from concerns that sustainable development, especially environmentally friendly production, raises product costs. Such processes demand longer methods, new technologies, and eco-safe materials—all requiring higher capital. Producers often find these changes burdensome and pass the costs to consumers. Human development is key, not just in meeting basic needs and building capabilities, but also in fostering environmental responsibility. Zero Poverty, the ultimate SDG goal, is both a target and a prerequisite, measured not only by income but also by access to basic services and productive resources.

Main Findings:

The study revealed that Indonesia experienced a significant improvement in achieving sustainable development goals in 2022, rising from rank 3 in 2021 to rank 1 across all MULTIMOORA methods. This indicates stronger national commitment and performance in sustainable development efforts. However, inconsistencies in the ranking results for positions 2 and 3 suggest challenges in uniformly implementing sustainable policies across all areas. A key obstacle identified is the economic concern that environmentally friendly production processes may lead to higher costs, as they require longer production times, new technologies, and more expensive, eco-friendly raw materials. Additionally, the study emphasizes that sustainable development is not solely a technological or economic challenge—it requires a transformation in human development. Human capabilities must be complemented by a deepened sense of environmental responsibility. Furthermore, the study underlines that eradicating poverty (Zero Poverty) is not only a final goal of the SDGs but also a prerequisite for the success of all other sustainable development efforts. This requires multidimensional poverty measurements, considering not just income, but also access to essential services and productive resources.

Significant Implications:

These findings imply that while progress is evident, sustainable development in Indonesia still faces systemic barriers, especially in cost and mindset. Transitioning to environmentally friendly practices demands not only policy support and technological innovation but also a cultural shift in how production and consumption are viewed. Moreover, sustainable development must prioritize inclusive human development and poverty reduction, ensuring that environmental goals do not exacerbate social inequality.

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