

Measuring Sustainable Development: A Weighting Approach to Sustainable Development Indicators



Leonidas Mindrinos¹, Panagiotis Panagiotopoulos²

^{1,2} Agricultural University of Athens

SUMMARY: The concept of sustainable development, in recent years if not decades, has been introduced into all individual forms of development regardless of sector or economy. It has been realized internationally that when development does not become sustainable it will soon cease to exist.

In previous years, there have been attempts to measure development and sustainability mainly by the United Nations but also by many scholars. This process resulted in the construction of 50 main and 46 secondary indicators for sustainable development in 2007, which differ from the indicators that determine the percentage of achievement of the 17 Sustainable Development Goals as set in 2015.

In previous works (Panagiotopoulos et al. 2022) an attempt was made to categorize the 96 Sustainable Development indicators of the U.N. according to Maslow's pyramid of needs and Bossel's indicator categories. With this combination, the pyramid of sustainable development was formed, in which the individual indicators are distributed. The purpose of this categorization was to investigate the contribution of certain economic aspects of human life to sustainable development based on the individual indicators as well as its extent within the categories of the pyramid. Schematically, the pyramid assists in visualizing the contribution to sustainable development of the subject being examined.

From the above correlation and the corresponding categorization, an attempt is made to give weight to each indicator with the ultimate goal of creating a matrix of performance of specific scores for the objects under consideration, always in relation to sustainable development. It is reported that the specific way of scoring differs from the way of measuring states' sustainable development according to the United Nations (U.N. 2022).

KEYWORDS: Sustainable development, indicators, Sustainable development pyramid, weight.

INTRODUCTION

For several decades now, the need for a shift to sustainable development has been seen in terms of the operation and formation of cities (Vardopoulos, I., et al., 2023), the operation of society (Mitoula, Astará and Kaldis, 2008) and of course of the economy (Panagiotopoulos, P., et al. 2022 (2)), both locally and globally, (Wise, & Perić, 2017, Mingaleva, et al., 2017). For these reasons, a coordinated systematic effort is being made mainly by the United Nations but also by independent researchers, in order to define sustainable development, to set limits, to include it in a framework of indicators so that it can finally be measured as well as for each researcher to be able for example to compare the degree of sustainable development and the status of each country.

According to the above, sustainable development indicators were created by the United Nations (U.N. 2007) in order to make the term sustainability tangible, while a framework of goals for sustainable development in 2030 was finally formed (UN, 2015, 2017). Based on these goals, the United Nations publishes an annual report that outlines the score or percentage out of 100 that each country receives regarding the achievement of these goals. The performance of the score, however, does not seem to be based on any weighting criterion based on the individual indicators, but the calculation is done as a whole.

It is considered necessary, as the next step in the effort to measure sustainable development, to assign weight to each sustainable development indicator. At this point, in order to see the theoretical effect of the individual indicators of sustainable

¹ Assistant Professor, Department of Natural Resources Development and Agricultural Engineering, Agricultural University of Athens, Greece

² Academic Scholar, Department of Regional and Economic Development, Agricultural University of Athens, Greece

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development, it is deemed necessary to examine primarily the indicators of sustainable development of 2007 and not the indicators that evaluate the goals set for 2030, following their prioritization by the research of Panagiotopoulos, P., et al. 2022.

HIERARCHY OF SUSTAINABLE DEVELOPMENT INDICATORS

The purpose of prioritization is the satisfaction of the needs of man and his society with priority given to the basic needs proceeding towards the secondary importance needs. In order to achieve sustainability in development, development strategies and actions should be set in three main areas and in six individual operating systems of human social life. This is also the reason why the prioritization was done according to: a) Maslow's pyramid of needs (Maslow, 1943), b) Bossel's categories of sustainable development indicators (Bossel, 1999) and c) the indicators for the sustainable development of the United of Nations (U.N. 2007), alongside the triptych that distinguishes the concept of sustainability, economy, society and environment (Panagiotopoulos et al. 2022).

This is how the three pillars of sustainable development³ to which the six subsystems of Bossel correspond (grouped into three) are presented, and by extension the inclusion of the groups of indicators of the United Nations in these subsystems.

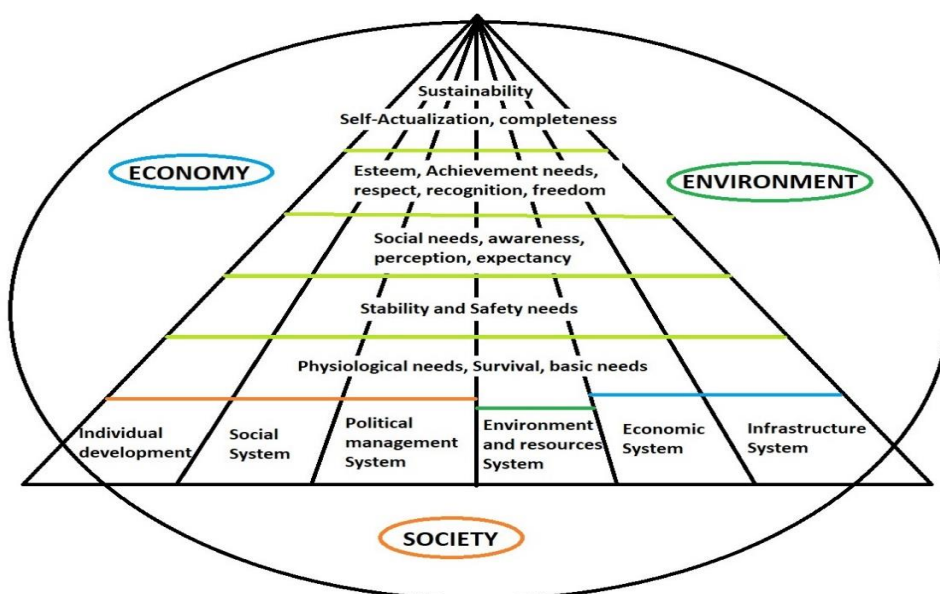


Figure 1 Three different colors orange, green and blue for the three pillars related to six subsystems

Subsequently, an attempt to link the five levels of needs, with social criteria, in relation to the 96 (50 basic and 46 secondary) indicators of sustainable development (United Nations, 2007) was presented in the said study, in order to achieve a hierarchical connection between them. The indicators and criteria are surrounded and supported by the three pillars of sustainable development as well as they act and operate within this framework (Figure 1).

After coding the United Nations indicators⁴ for sustainable development, they were categorized according to Bossel's six-level categorization (1999) and the corresponding categories of Maslow's pyramid (1943). This mapping is illustrated in Figure 2.

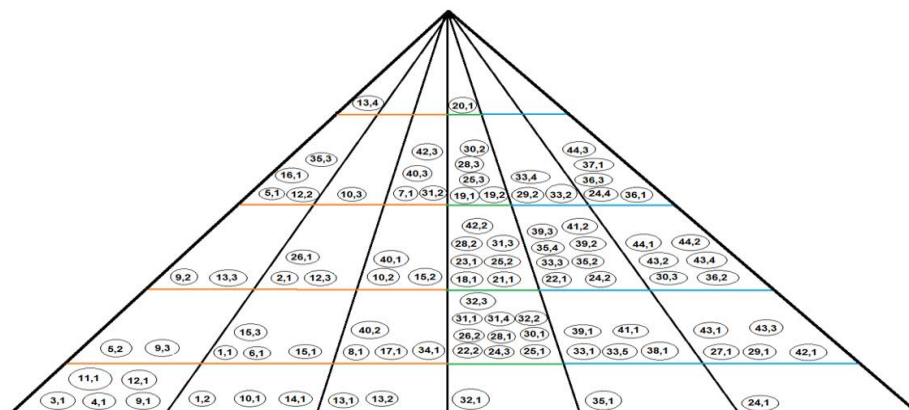


Figure 2 The indicators within the Bossel's six-level categorization

³ Environment, Economy, Society

⁴ The categorization is presented in the appendix where the 96 indicators are recorded in detail.

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The numbers in each category represent the corresponding sustainable development indicator as listed in the appendix. Accordingly, the five levels of needs represent: 1) survival, psychological and basic needs, 2) stability needs, 3) social needs, awareness, perception and expectation, 4) needs for achievement of goals, recognition, respect and 5) Self-actualization, sustainability, integration for the individual and by extension for society respectively. In this way, the final shape of the pyramid of sustainable development is formed as below (Figure 3).

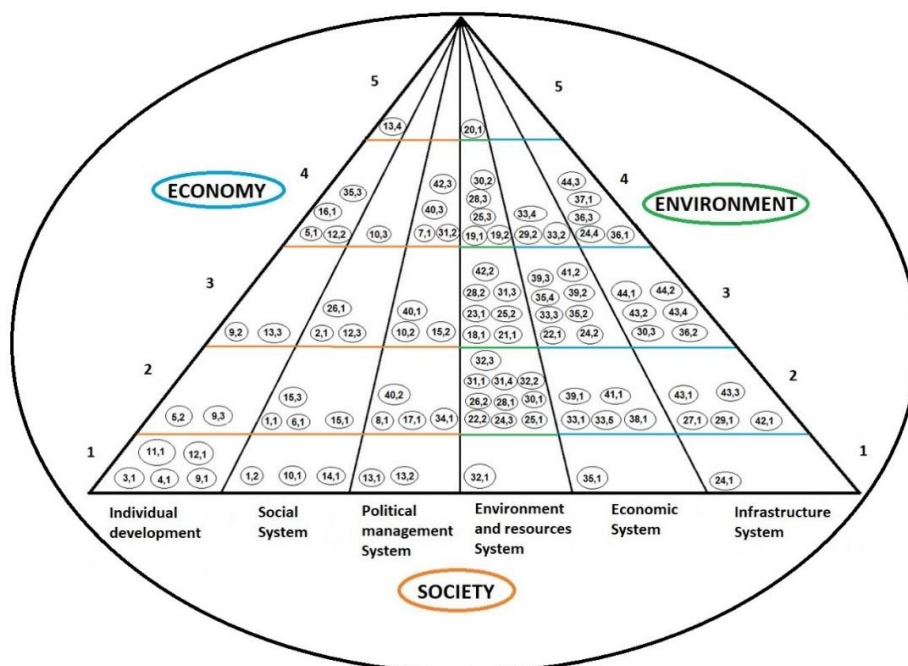


Figure 3 Sustainable development Pyramid
Pyramidal schematic representation of the categorization of indicators

The above pyramid diagram of indicator categorization aims at the gradual evolution of the development of individual indicator subjects in order to finally be optimized until bottom-up sustainable development occurs in each category or group which is under improvement.

OPERATING FRAMEWORK OF SUSTAINABLE DEVELOPMENT INDICATORS

Sustainable development is a pursuit that, in order to be achieved, certain conditions must be met. These conditions are calculated and illustrated in the form of indicators. Therefore, the fulfillment of each indicator contributes to the achievement of sustainable development. However, the question that arise is to what percentage is the requirement of each indicator fulfilled and with what weight does each indicator contribute to the whole? These are exactly the questions that this paper is called upon to answer. However, the achievement of sustainable development at the global level requires that the states and primarily the regions have managed to be in a state of sustainable local development (Nijkamp, Laschuit and Soeteman, 1991), with the reverse being extreme and even utopian.

Many human activities of a different nature contribute to the goal of sustainable local development. Examples are major infrastructure projects (Mitoula, R., Papavasileiou, A., 2023), alternative tourism (Panagiotopoulos, P., et al. 2022 (2)), urban reshaping (Vardopoulos, I., et al., 2023) and others. Since 2016, there has been an intense and collective effort to achieve sustainable development under the umbrella of the United Nations and specifically through Agenda 2030 (U.N. 2015) which sets goals, measurable reference values as well as proposes a methodology for measurement and information feedback regarding the extent to which it is being achieved through the 17 goals it established. In this direction, all U.N. member states are called to act in specific ways and in specific directions in order to achieve sustainability in development (Mitoula, 2006). As pointed out above, such effort should indeed be collective and not individual. Something like this seems to be happening in recent years (2016 and after) as shown by the review of National Reports of the department of economic and social affairs (DESA, 2016-2019) of the U.N. and Greece also participated in this by sending a report in 2018.

It is important to ascertain the degree of sustainability and fulfillment of the sustainable development indicators of each place, region or country in relation to others and to what extent, these individually and ultimately collectively at the level of continents or federations, cover the requirements concerning the goal for sustainable development. After all, sustainable development in one place is not necessarily sustainable in another (Nijkamp and Ouwersloot, 1997), but depends on the place

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itself and its state concerning its carrying capacity. This is another point that shows the need to give weight to the individual indicators. What is certain is that local regional sustainable development must ensure good living conditions for the local population of the region in the present and maintain them in the future, as well as this development must not contradict sustainable development at supra-regional level (Nijkamp, Laschuit and Soeteman, 1991). The regions, but also two places between them, differ on many levels and mainly on the level of natural resources, environment and productivity structure. These factors alone are enough for two different regions to need completely different sustainable development practices. Nevertheless, based on the contribution of each place to different indicators of sustainable development more or less, it is possible to derive an overall score which makes two completely different regions comparable as can be seen in the U.N. report 2022.

SUSTAINABLE DEVELOPMENT PYRAMID AND INDICATORS WEIGHT

Considering the pyramid of sustainable development which correlates and combines Maslow's pyramid of needs, Bossel's categories of sustainable development indicators and the United Nations indicators (Figure 3), an attempt is made to give weight to the individual indicators in order to contribute the respective percentage in the total score. The weighting performance follows the logic of increased weighting at the lower levels of the pyramid, decreasing as the indicators move a level up. Corresponding importance to the weight of each indicator is whether it is primary or secondary, while the three pillars of sustainability are given the same weight.

Specifically, we aim to derive a quantitative interpretation for the 96 indicators effecting sustainable development. The goal is to assign to every indicator, described by x_k , a normalized weight function w_k for $k = 1, \dots, 96$ such that

$$S = \sum_{k=1}^{96} w_k x_k \times 100$$

describes the total "score" (from 0 to 100) of a factor, like sport tourism, concerning its contribution on sustainability. We set

$$x_k = \begin{cases} 1, & \text{if the } k\text{th indicator is fulfilled} \\ 0, & \text{if the } k\text{th indicator is not fulfilled} \end{cases}$$

We compute the weights considering the following aspects:

- All three pillars (economy, environment and society) contribute equally.
- The type of the indicator (main or secondary) is important.
- The influence of an indicator on sustainable development depends on the level of needs (1 to 5). The effect of the level of needs depends also on the number of included indicators.

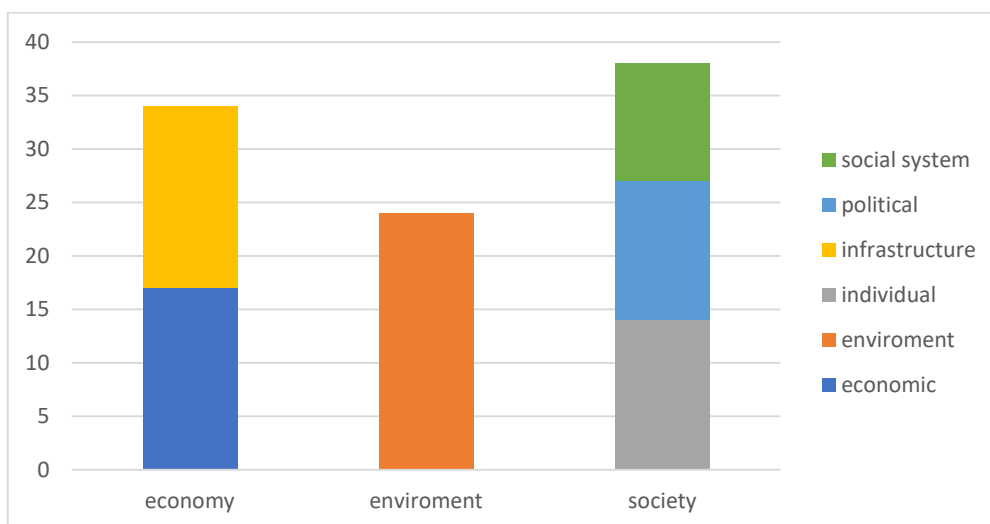


Figure 4 Indicators allocation within the three pillars of Sustainable development within six different systems

The above factors a, b and c will contribute to the weight function as follows. We set $a = 1/3$ and we assume

$$b_k = \begin{cases} 1, & \text{if the } k\text{th indicator is main} \\ 1/2, & \text{if the } k\text{th indicator is secondary} \end{cases}$$

The lower the level of needs the bigger its effect. Thus, we set $x\%$ the effect of the 5th level and we assume 5% more for each next level. Thus, we get

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$$5x + 50\% = 100\%$$

resulted in

| | | | | | |
|------------------|-----|-----|-----|-----|-----|
| Level of needs | 1 | 2 | 3 | 4 | 5 |
| Effect (e_k) | 30% | 25% | 20% | 15% | 10% |

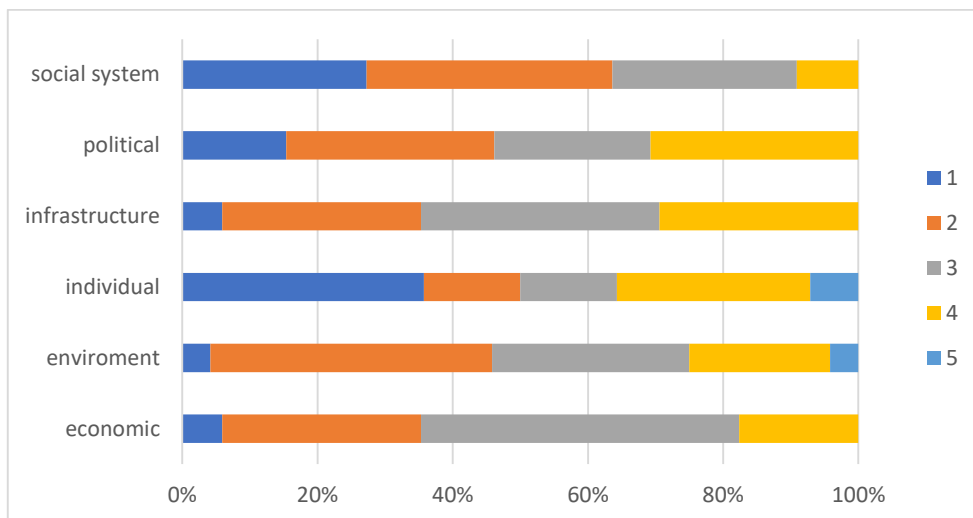


Figure 5 Indicators allocation within the six different systems of Sustainable development Within the five different levels

However, as we observe in Figure 3 there are only two indicators in the 5th level. We cannot assign 10% importance to only two indicators. Thus, we consider also the number of indicators appearing in every level. We get

| | | | | | |
|--------------------------|-------|-------|-------|-------|------|
| Level of needs | 1 | 2 | 3 | 4 | 5 |
| Indicator rate (r_k) | 13/96 | 30/96 | 29/96 | 22/96 | 2/96 |

We propose to set

$$c_k = \frac{e_k + r_k}{2}, \text{ for } k = 1, \dots, 5$$

With this analysis we cannot assign a unique weight function to every indicator but we can assign one weight function to all indicators belonging to a specific cell of the following table. We rewrite the pyramid of [paper] in the following form (main shown in bold)

| | | Pillar | | |
|----------------|---|---|---|---|
| | | Economy | Environment | Society |
| Level of needs | 1 | 24.1, 35.1 | 32.1 | 1.2, 3, 4, 9.1, 10.1, 11, 12.1, 13.1, 13.2, 14 |
| | 2 | 27, 29.1, 33.1, 33.5, 38, 39.1, 41.1, 42.1, 43.1, 43.3 | 22.2, 24.3, 25.1, 26.2, 28.1, 30.1, 31.1, 31.4, 32.2, 32.3 | 1.1, 5.2, 6, 8, 9.3, 15.1, 15.3, 17, 34, 40.2 |
| | 3 | 22.1, 24.2, 30.3, 33.3, 35.2, 35.4, 36.2, 39.2, 39.3, 41.2, 43.2, 43.4, 44.1, 44.2 | 18, 21, 23, 25.2, 28.2, 31.3, 42.2 | 2, 9.2, 10.2, 12.3, 13.3, 15.2, 26.1, 40.1 |
| | 4 | 24.4, 29.2, 33.2, 33.4, 36.1, 36.3, 37, 44.3 | 19.1, 19.2, 25.3, 28.3, 30.2 | 5.1, 7, 10.3, 12.2, 16, 31.2, 35.3, 40.3, 42.3 |
| | 5 | - | 20 | 13.4 |

Let A_{ij} , for $i = 1, \dots, 5$ and $j = 1, 2, 3$ be the cell of the above table corresponding to the i^{th} level and the j^{th} pillar, and let M_{ij} and N_{ij} denote the number of main and secondary indicators appearing in this cell, respectively.

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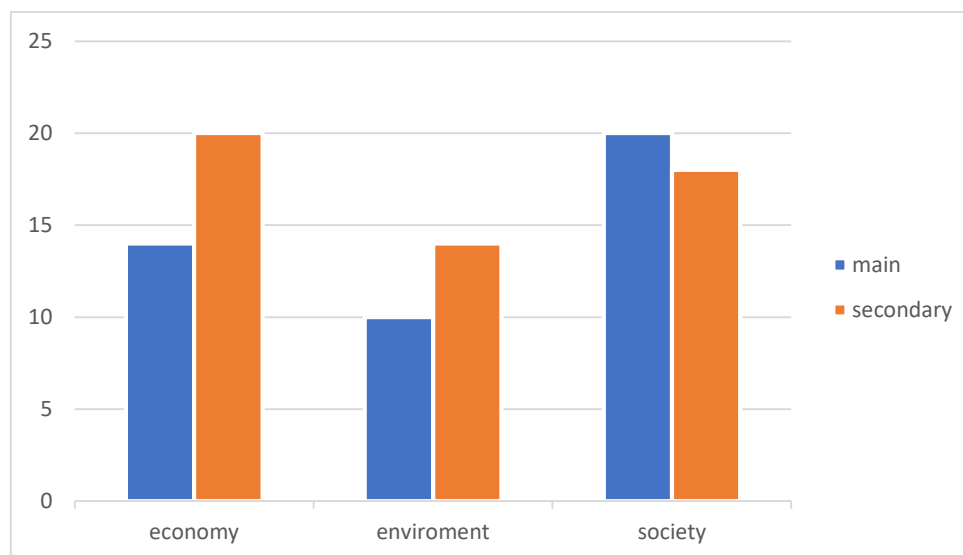


Figure 6 Partition of Sustainable development indicators as main or secondary Within the three different pillars

Then, the weight function is given by

$$W_{ij} = \frac{a c_i}{M_{ij} + \frac{1}{2} N_{ij}}$$

if the indicator in the A_{ij} cell is main and its half if the indicator is secondary. The above formula holds for all cases, except for A_{51} , where no economic indicators appear in level 5. Then, $w_{51} = 0$, and we set $c_1 = c_1 + c_5$, so that the contribution of economic indicators remains the 1/3 of the total. Following the above analysis, we obtain

$$W = \begin{bmatrix} 0.046 & 0.073 & 0.008 \\ 0.010 & 0.013 & 0.012 \\ 0.010 & 0.019 & 0.011 \\ 0.011 & 0.021 & 0.011 \\ 0 & 0.020 & 0.040 \end{bmatrix}$$

This means, for example, that the economic indicators 24.1 and 35.1 with level 1 will have 0.046 as weight since both are main. The following table presents a full list of all indicators with their type, pillar, sub-pillar, level and weight.

| ID | TYPE | PILLAR | Sub-PILLAR | LEVEL OF NEEDS | Weight |
|------|-----------|---------|---------------|----------------|----------|
| 1.1 | main | society | social system | 2 | 0,011719 |
| 1.2 | secondary | society | social system | 1 | 0,003819 |
| 2 | main | society | social system | 3 | 0,011157 |
| 3 | main | society | individual | 1 | 0,007639 |
| 4 | main | society | individual | 1 | 0,007639 |
| 5.1 | main | society | individual | 4 | 0,010532 |
| 5.2 | secondary | society | individual | 2 | 0,005859 |
| 6 | main | society | social system | 2 | 0,011719 |
| 7 | main | society | political | 4 | 0,010532 |
| 8 | main | society | political | 2 | 0,011719 |
| 9.1 | main | society | individual | 1 | 0,007639 |
| 9.2 | main | society | individual | 3 | 0,011157 |
| 9.3 | secondary | society | individual | 2 | 0,005859 |
| 10.1 | main | society | social system | 1 | 0,007639 |
| 10.2 | main | society | political | 3 | 0,011157 |
| 10.3 | secondary | society | social system | 4 | 0,005266 |
| 11 | main | society | individual | 1 | 0,007639 |
| 12.1 | main | society | individual | 1 | 0,007639 |

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| | | | | | |
|------|-----------|------------|----------------|---|----------|
| 12.2 | secondary | society | individual | 4 | 0,005266 |
| 12.3 | secondary | society | social system | 3 | 0,005579 |
| 13.1 | main | society | political | 1 | 0,007639 |
| 13.2 | main | society | political | 1 | 0,007639 |
| 13.3 | main | society | individual | 3 | 0,011157 |
| 13.4 | secondary | society | individual | 5 | 0,020139 |
| 14 | main | society | social system | 1 | 0,007639 |
| 15.1 | main | society | social system | 2 | 0,011719 |
| 15.2 | main | society | political | 3 | 0,011157 |
| 15.3 | secondary | society | social system | 2 | 0,005859 |
| 16 | secondary | society | individual | 4 | 0,005266 |
| 17 | main | society | political | 2 | 0,011719 |
| 18 | secondary | enviroment | enviroment | 3 | 0,009298 |
| 19.1 | main | enviroment | enviroment | 4 | 0,021065 |
| 19.2 | secondary | enviroment | enviroment | 4 | 0,010532 |
| 20 | main | enviroment | enviroment | 5 | 0,020139 |
| 21 | main | enviroment | enviroment | 3 | 0,018596 |
| 22.1 | secondary | economy | economic | 3 | 0,004922 |
| 22.2 | secondary | enviroment | enviroment | 2 | 0,006696 |
| 23 | secondary | enviroment | enviroment | 3 | 0,009298 |
| 24.1 | main | economy | infrastructure | 1 | 0,046354 |
| 24.2 | secondary | economy | economic | 3 | 0,004922 |
| 24.3 | secondary | enviroment | enviroment | 2 | 0,006696 |
| 24.4 | secondary | economy | infrastructure | 4 | 0,005745 |
| 25.1 | main | enviroment | enviroment | 2 | 0,013393 |
| 25.2 | secondary | enviroment | enviroment | 3 | 0,009298 |
| 25.3 | secondary | enviroment | enviroment | 4 | 0,010532 |
| 26.1 | main | society | social system | 3 | 0,011157 |
| 26.2 | secondary | enviroment | enviroment | 2 | 0,006696 |
| 27 | main | economy | infrastructure | 2 | 0,010417 |
| 28.1 | main | enviroment | enviroment | 2 | 0,013393 |
| 28.2 | secondary | enviroment | enviroment | 3 | 0,009298 |
| 28.3 | secondary | enviroment | enviroment | 4 | 0,010532 |
| 29.1 | main | economy | infrastructure | 2 | 0,010417 |
| 29.2 | main | economy | economic | 4 | 0,01149 |
| 30.1 | main | enviroment | enviroment | 2 | 0,013393 |
| 30.2 | secondary | enviroment | enviroment | 4 | 0,010532 |
| 30.3 | secondary | economy | infrastructure | 3 | 0,004922 |
| 31.1 | main | enviroment | enviroment | 2 | 0,013393 |
| 31.2 | secondary | society | political | 4 | 0,005266 |
| 31.3 | secondary | enviroment | enviroment | 3 | 0,009298 |
| 31.4 | secondary | enviroment | enviroment | 2 | 0,006696 |
| 32.1 | main | enviroment | enviroment | 1 | 0,072569 |
| 32.2 | secondary | enviroment | enviroment | 2 | 0,006696 |
| 32.3 | secondary | enviroment | enviroment | 2 | 0,006696 |
| 33.1 | main | economy | economic | 2 | 0,010417 |
| 33.2 | main | economy | economic | 4 | 0,01149 |
| 33.3 | secondary | economy | economic | 3 | 0,004922 |
| 33.4 | secondary | economy | economic | 4 | 0,005745 |

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| | | | | | |
|------|-----------|------------|----------------|---|----------|
| 33.5 | secondary | economy | economic | 2 | 0,005208 |
| 34 | main | society | political | 2 | 0,011719 |
| 35.1 | main | economy | economic | 1 | 0,046354 |
| 35.2 | main | economy | economic | 3 | 0,009845 |
| 35.3 | main | society | individual | 4 | 0,010532 |
| 35.4 | secondary | economy | economic | 3 | 0,004922 |
| 36.1 | main | economy | infrastructure | 4 | 0,01149 |
| 36.2 | secondary | economy | infrastructure | 3 | 0,004922 |
| 36.3 | secondary | economy | infrastructure | 4 | 0,005745 |
| 37 | secondary | economy | infrastructure | 4 | 0,005745 |
| 38 | main | economy | economic | 2 | 0,010417 |
| 39.1 | main | economy | economic | 2 | 0,010417 |
| 39.2 | secondary | economy | economic | 3 | 0,004922 |
| 39.3 | secondary | economy | economic | 3 | 0,004922 |
| 40.1 | main | society | political | 3 | 0,011157 |
| 40.2 | secondary | society | political | 2 | 0,005859 |
| 40.3 | secondary | society | political | 4 | 0,005266 |
| 41.1 | main | economy | economic | 2 | 0,010417 |
| 41.2 | secondary | economy | economic | 3 | 0,004922 |
| 42.1 | main | economy | infrastructure | 2 | 0,010417 |
| 42.2 | main | enviroment | enviroment | 3 | 0,018596 |
| 42.3 | secondary | society | political | 4 | 0,005266 |
| 43.1 | main | economy | infrastructure | 2 | 0,010417 |
| 43.2 | main | economy | infrastructure | 3 | 0,009845 |
| 43.3 | secondary | economy | infrastructure | 2 | 0,005208 |
| 43.4 | secondary | economy | infrastructure | 3 | 0,004922 |
| 44.1 | main | economy | infrastructure | 3 | 0,009845 |
| 44.2 | secondary | economy | infrastructure | 3 | 0,004922 |
| 44.3 | secondary | economy | infrastructure | 4 | 0,005745 |

It is observed that the sum of all weights is one, as expected since we created a normalized weight function.

For example, the sport tourism influences (Panagiotopoulos et al. 2022) the following indicators (main indicators are marked with bold)

| Sport Tourism | | Pillar | | |
|----------------|---|-----------------|-------------------|------------------|
| | | Economy | Environment | Society |
| Level of needs | 1 | 35.1 | - | - |
| | 2 | 33.1, 38 | 22.2, 28.1 | 8 |
| | 3 | - | - | 9.2, 12.3 |
| | 4 | 33.2 | 25.3 | 16, 35.3 |
| | 5 | - | - | - |

resulting in

$$P_{ST} = (W_{11} + 2W_{21} + W_{41} + \frac{3}{2}W_{22} + \frac{1}{2}W_{42} + W_{23} + \frac{3}{2}W_{33} + \frac{3}{2}W_{43}) \times 100 = 15.36$$

which is higher compared to the ratio $12/96 \times 100 = 12.5$ of the affected indicators. Of course, we will get the same score if we add the weights of the affected indicators in Figure 6.

CONCLUSIONS

The search for the means by which there can be sustainable development and sustainability in a place, has led to the need to develop and record indicators of sustainable development in order to clarify how close or far a place is from achieving sustainable development. From the indicators given by the U.N., the relative scores of the countries arise in U.N.'s sustainable development

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report. With the above analysis, it is clear that the way of rendering the scores through the indicators of sustainable development, and by extension the indicators of the goals for sustainable development in 2030, probably need to be prioritized and given weight according to their importance concerning the society, the environment as well as the economy. In this paper, a sustainable, systematic separation of the indicators was presented in order to give them weight so that the scores of each place are more representative based on needs on the road to achieve sustainable development.

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Appendix

1. Income poverty (2 indicators) - Proportion of population living below national poverty line (1.1) and Proportion of population below \$1 a day (1.2).
2. Ratio of share in national income of highest to lowest quintile (2.1).
3. Sanitation - Proportion of population using an improved sanitation facility (3.1).
4. Drinking water - Proportion of population using an improved water source (4.1).
5. Access to energy (2 indicators) - Share of households without electricity or other modern energy services (5.1) and Percentage of population using solid fuels for cooking (5.2).
6. Living conditions - Proportion of urban population living in slums (6.1).
7. Corruption - Percentage of population having paid bribes (7.1)
8. Crime - Number of intentional homicides per 100,000 population (8.1).
9. Mortality (3 indicators) - Under-five mortality rate (9.1), Life expectancy at birth (9.2) and Healthy life expectancy at birth (9.3).
10. Health care delivery (3 indicators) - Percent of population with access to primary health care facilities (10.1), Immunization against infectious childhood diseases (10.2) and Contraceptive prevalence rate (10.3).
11. Nutritional status - Nutritional status of children (11.1).
12. Health status and risks (3 indicators) - Morbidity of major diseases such as HIV/AIDS, malaria, tuberculosis (12.1), Prevalence of tobacco use (12.2) and Suicide rate (12.3).
13. Education level (4 indicators) - Gross intake ratio to last grade of primary education (13.1), Net enrolment rate in primary education (13.2), Adult secondary (tertiary) schooling attainment level (13.3), and Life long learning (13.4).
14. Literacy – Adult literacy rate (14.1).
15. Population (3 indicators) - Population growth rate (15.1), Dependency ratio (15.2) and Total fertility rate (15.3).
16. Tourism - Ratio of local residents to tourists in major tourist regions and destinations (16.1).
17. Vulnerability to natural hazards - Percentage of population living in hazard prone areas (17.1).
18. Disaster preparedness and response - Human and economic loss due to natural disasters (18.1).
19. Climate change (2 indicators) - Carbon dioxide emissions (19.1) and Emissions of greenhouse gases (19.2).
20. Ozone layer depletion - Consumption of ozone depleting substances (20.1).
21. Air quality - Ambient concentration of air pollutants in urban areas (21.1).
22. Land use and status (2 indicators) - Land use change (22.1) and Land degradation (22.2).
23. Desertification - Land affected by desertification (23.1).
24. Agriculture (4 indicators) - Arable and permanent cropland area (24.1), Fertilizer use efficiency (24.2), Use of agricultural pesticides (24.3) και Area under organic farming (24.4).
25. Forests (3 indicators) - Proportion of land area covered by forests (25.1), Percent of forest trees damaged by defoliation (25.2) and Area of forest under sustainable forest management (25.3).
26. Coastal zone (δύο δείκτες) - Percentage of total population living in coastal areas (26.1) and Bathing water quality (26.2).
27. Fisheries - Proportion of fish stocks within safe biological limits (27.1).
28. Marine environment (3 indicators) - Proportion of marine area protected (28.1), Marine trophic index (28.2) and Area of coral reef ecosystems and percentage live cover (28.3).
29. Water quantity (2 indicators) - Proportion of total water resources used (29.1) and Water use intensity by economic activity (29.2).

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30. Water quality (3 indicators) - Presence of faecal coliforms in freshwater (30.1), Biochemical oxygen demand in water bodies (30.2) and Wastewater treatment (30.3).
31. Ecosystem (4 indicators) - Proportion of terrestrial area protected, total and by ecological region (31.1), Management effectiveness of protected areas (31.2), Area of selected key ecosystems (31.3) and Fragmentation of habitats (31.4).
32. Species (3 indicators) - Change in threat status of species (32.1), Abundance of selected key species (32.2) and Abundance of invasive alien species (32.3).
33. Macroeconomic performance (5 indicators) - Gross domestic product (GDP) per capita (33.1), Investment share in GDP (33.2), Gross saving (33.3), Adjusted net savings as percentage of gross national income (GNI) (33.4) and Inflation rate (33.5).
34. Sustainable public finance - Debt to GNI ratio (34.1).
35. Employment (4 indicators) – Employment-population ratio (35.1), Labor productivity and unit labor costs (35.2), Share of women in wage employment in the non-agricultural sector (35.3) and Vulnerable employment (35.4).
36. Information and communication technologies (3 indicators) - Internet users per 100 population (36.1), Fixed telephone lines per 100 population (36.2) and Mobile cellular telephone subscribers per 100 population (36.3).
37. Research and development - Gross domestic expenditure on R&D as a percent of GDP (37.1).
38. Tourism - Tourism contribution to GDP (38.1).
39. Trade (3 indicators) - Current account deficit as percentage of GDP (39.1), Share of imports from developing countries and from LDCs (39.2), Average tariff barriers imposed on exports from developing countries and LDCs (39.3).
40. External financing (3 indicators) - Net Official Development Assistance (ODA) given or received as a percentage of GNI (40.1), Foreign direct investment (FDI) net inflows and net outflows as percentage of GDP (40.2) and Remittances as percentage of GNI (40.3).
41. Material consumption (2 indicators) - Material intensity of the economy (41.1), Domestic material consumption (41.2).
42. Energy use (3 indicators) - Annual energy consumption, total and by main user category (42.1), Intensity of energy use, total and by economic activity (42.2) and Share of renewable energy sources in total energy use (42.3).
43. Waste generation and management (4 indicators) - Generation of hazardous waste (43.1), Waste treatment and disposal (43.2), Generation of waste (43.3) and Management of radioactive waste (43.4).
44. Transportation (3 indicators) - Modal split of passenger transportation (44.1), Modal split of freight transport (44.2) and Energy intensity of transport (44.3).



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