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A COMPOSITE INDEX FOR SUSTAINABLE DEVELOPMENT: MEASUREMENT AND DEVELOPMENT STATUS OF SELECTED COUNTRIES

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ABSTRACT

Measuring and comparing development status among countries has long been a difficult task in economic analyses. Development analyses incorporating several aspects of sustainability are one of the most discussed concepts. The present study attempts to assess and measure the development status of various countries by developing a composite index for sustainable development. The measure comprises three sub-indices for economic, social, and environmental dimensions. For this purpose, separate sub-indices for economic, social, and environmental sustainability are designed and constructed to formulate a composite index for sustainable development. The study employs panel data to estimate the state of 140 countries for 1995-2020, taken from the World Bank. The sample includes 46 developed and 94 developing countries. The study utilized standard IMF index-construction methodology. The data is normalized by using the min-max method, and then the principal component analysis is applied for weighting selected variables. Finally, all weighted variables are aggregated to form up concerned indices. Selected countries were ranked based on their score obtained in all three dimensions and for the composite index. The study's findings highlighted high-income countries better in economic sustainability performance with greater environmental degradation. While low-income countries are also the lowest in economic sustainability, having lesser environmental damage. There are mixed results for social sustainability. The study recommends improvements in the economic and social dimensions of sustainability while maintaining environmental standards.

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INTRODUCTION

Sustainable development is an integrated concept that establishes a complex interconnection between the human and biophysical arena, simultaneously considering present and future generations at local and global levels (Paul, 2008; Hosseini and Kaneko, 2011). Although three decades of debate on the notion and its aspects helped in a better understanding of the concept, the path towards sustainable development is still considered vague (Moran et al., 2008; Paul, 2008; Hosseini and Kaneko, 2011). Measuring and comparing development status across the globe has long been difficult in economic analysis. Development analysis considering several aspects of sustainability has become the most discussed concept in the recent era (Tarabusi and Palazzi, 2004).

The notion of sustainable development has generally been illustrated with the Triple bottom-line approach encompassing economic, social, and environmental sustainability. Initially, it was presented in the Brundtland report in 1987 and later recognized by United Nations Conference on Environment and Development (UNCED), also called the “Earth Summit” in 1992. The approach emphasizes developing balance and making a trade-off among three pillars (Gibson, 2006; Moldan et al., 2012; Boyer et al., 2016; Purvis et al., 2019; Tomislav, 2018) or three dimensions (Lehtonen, 2004; Mori and Christodoulou, 2012; Purvis et al., 2019) of sustainable development (Figure 1). Attainment of sustainable development is only possible through a balance among all three pillars; however, the indispensable condition is not easy to earn (Tomislav, 2018).

The typical representation of the three dimensions of sustainable development is depicted as three intersecting circles (Figure 2) with sustainable development positioned at the intersection. The particular representation indicates the overlapping nature of economic, social, and environmental dimensions (Purvis et al., 2019).

Economic sustainability as a sub-system of sustainable development suggests an economic structure capable of the satisfying present as well as future consumption (Mensah and Casadevall, 2019). It needs economically sound decisions based on equitable and fiscally viable grounds while taking into account relevant aspects of sustainability (Zhai and Chang, 2019). Social sustainability encompasses concepts of “equity, empowerment, accessibility, participation, cultural identity, and institutional stability” (Daly, 1992). The notion signifies people's prosperity by recognising people's values since all development and prosperity belong to people (Benaim et al., 2008). According to Kolk (2016), social sustainability not only ensures the fulfillment of people's needs but strives for the provision of favorable circumstances for everyone to realize their needs and wants (Brodhag and Taliere, 2006; Pierobon, 2019). Environmental sustainability concerns how the environment can support human existence while continuing to be resilient and productive. The stability and health of ecosystems and the carrying capacity of the natural environment are the main factors that describe environmental sustainability (Brodhag and Taliere, 2006). It necessitates the sustainable use of natural resources utilized as economic input (Goodland and Daly, 1996).

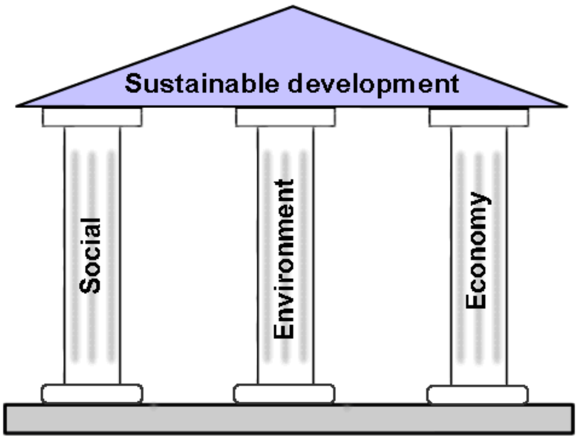

Figure 1. Three pillars of sustainable development (Purvis et al., 2019).

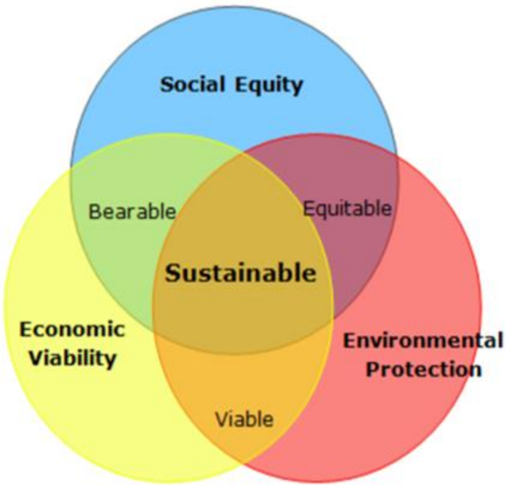

Figure 2. Three dimensions of sustainable development (Pattberg, 2012).

Implementing sustainable development goals under public policy requires a quantitative framework or composite operational indicators for measuring sustainable development (Stevens, 2005; Khalid et al., 2018). A composite indicator incorporates many individual indicators, which can be used to compare and rank countries based on their performance. It gives a solid footing and a way forward for sustainable development policies (Stevens, 2005; OECD, 2008). But sustainable development's broad and complex agenda poses significant challenges from a measurement perspective (Stevens, 2005). Although several measures and measurement methodologies exist to quantify sustainable development, there still exists a research gap. These indicators are not properly serving the sphere of sustainable development. Each indicator entertains a separate dimension. Thus, relevant policy implications at the country level have no consensus over their use. The measurement methodologies are mostly based on perfect substitutability and equal weighting or arbitrary weighting of the variables selected for indices (Agliardi et al., 2015).

The motivation for the study comes from the goals of sustainable development, which calls for a better future while simultaneously ensuring sustainable growth, a sustainable society, and a sustainable environment. The notion of having 17 goals and 169 targets provided a strong impetus toward this overarching research focus. Hence, the measurement and quantification of sustainable development status and progress toward sustainability would contribute significantly to the existing literature in the following ways. First, this study provides the country-wise status of sustainable development based on a novel composite index of sustainable development, considering three dimensions of sustainable development. Second, it uses a total of 23 indicators of sustainability from three dimensions such as six economic indicators, eleven social indicators, and six environmental indicators. Third, this study utilizes a standard index construction methodology that covers the methodological research gap in this context. Fourth, this study uses a large panel of countries (i.e., 140 countries), which helps compare countries from all income groups.

Previous studies showed the construction and use of several indicators of sustainability and sustainable development for different countries. For example, Hanley et al. (1999) empirically analyzed the movement pattern of seven alternative indicators of sustainability for Scotland during the period 1980-1993. These indicators include net national product, genuine savings, ecological footprint, environmental space, net primary productivity, the index of sustainable economic welfare, and the genuine progress indicator. Further, a time series empirical investigation of eight alternative measures is carried out by Nourry (2008) to capture the path of sustainable development in France during 1990-2000. The measures used in this analysis were the green national net product, genuine savings, an indicator of sustainable economic welfare, genuine progress indicator, pollution-sensitive human development indicator, sustainable human development indicator, French dashboard on sustainable development, and ecological footprint. The results favored a positive welfare path based on these measures, while regarding sustainability, different measures provided contradictory outcomes.

The UNDP (UNDP, 1990) introduced the concept of the Human development index, considered one of the popular indicators for measuring human and social aspects of development (Hickel, 2020). Considering this, De la Vega and Urrutia (2001) constructed Pollution Sensitive Human Development Index (HPDI) for 165 countries from 1993 to 1998. It incorporates pollution elements such as CO_2 emission from industrial processes. Considering its limitations, they suggested adding more environmental aspects, including air, water, and soil, for future constructs. Costantini and Monni (2008) constructed another composite index, the Sustainable Human Development Index (SHDI), which served extensive aspects of human development along with specific environmental concerns. It directly focuses on the significance of human well-being with minimal resource depletion. They concluded that the path to sustainability demands massive economic resources, knowledge, and technological skill. Therefore, achieving global sustainability requires industrialized countries to make it easier for developing countries. Another study (Hickel, 2020) highlighted the ecological limitations of HDI. The SDI is corrected for ecological dimension by incorporating ecological impact calculated from CO_2 emission and material footprint. The index is corrected for income level by placing a sufficiency threshold and dividing human development by ecological impact. The SDI is presented as an indicator of strong sustainability that is vigorous in terms of both ecological concerns and human development.

Several studies incorporate three major dimensions of sustainable development. For example, Tarabusi and Palazzi (2004) ranked 126 countries by devising indices for economic, social, and environmental sustainability. They constructed a composite index combining all variables. Results showed that high-income countries are considered best in economic sustainability with greater environmental degradation. Contrary to this, low-income countries had the lowest economic sustainability, with lesser environmental damage. There are mixed results for social sustainability. Federici (2007) constructed a sustainable socioeconomic development index based on the concave average. Due to perfect substitutability among various variables, a ranking of countries is carried out and found very different results on a scale of 0-1 for socioeconomic development. After that, the Sustainable Society Index (SSI) was developed for 150 countries by Van de Kerk and Manuel (2008) by integrating significant aspects of sustainability and quality of life. They incorporate social, environmental, ecological, and institutional aspects, thus, using 22 indicators from five categories. Great differences were found between developed and developing countries in terms of human development, well-balanced society, environmental protection, and sustainable resource use. Realizing the need for an authentic and functional index of sustainable development, Eboli (2012) developed an aggregate sustainability index based on various types of developments. The aggregation methodology to build the sustainability index was carried out through a recursive dynamic computable general equilibrium (CGE) model, allowing sustainability projections for the future. The findings revealed heterogeneous levels of sustainable developments across the globe, which is sufficient sustainability in developed countries than developing countries.

Extending the literature, Salvati and Carlucci (2014) provided a measure of the sustainable development by catering to a methodological integration of geographical information systems (GIS) and multivariate statistics in Italy. The sustainable development index was constructed by utilizing Factor Weighting Model, which incorporates 99 variables (i.e., economic system, population dynamics, labor markets, agriculture, social aspects, and environmental dimension). Pinar et al. (2014) developed another composite index using three major pillars of sustainable development and 19 indicators. The index is formulated utilizing Choquest integral aggregation method. Recently, Singh et al. (2021) formulated the Global sustainable development index for 39 countries from 2000 to 2016. It is a joint index that considers economic, social, and environmental sustainability indices by applying the composite Z-score method. Bonnet et al., (2021) proposed a multi-dimensional approach for assessing French regional sustainable performance. This approach is based on six composite indices: environment, economy, society, energy, mobility, and governance. Some studies show indices based on the Sustainable Development Goals to rank the European countries. In this regard, Ligus and Peternek (2021) constructed a sustainable energy development index for EU-28 states. It is composed of several indicators grouped into economic, social, and environmental dimensions. They developed dimensional and aggregated indices by employing the technique of standardized sums. Later, Elavarasan et al. (2022) conducted a study to assess and compare the state of energy sustainability in European countries. They devised a composite index considering energy conservation, energy intensity, energy security, energy accessibility, and carbon emissions.

This discussion explored several measures and indicators for the assessment and comparison of the sustainable development performance of the countries. Only a few studies extend an integrated approach toward sustainable development incorporating all dimensions. Most indicators represent one or more dimensions of sustainability, or the measures are formulated at the country level. This, in turn, highlights the need for a composite measure that can adequately serve the comprehensive notion of sustainable development. Therefore, this study filled this literature gap by (a) considering all three dimensions of sustainability, (b) using multiple indicators for each dimension, and (c) using a large data set of 140 countries.

Theoretical Framework

Mankind must identify and execute alternative socioeconomic subsystems inspired by Limits to growth to avoid the growth imperative ‘Grow-or-Die’ extended by capitalism, which resulted in more resource consumption and waste production beyond planetary limits (Schweickart, 2009). In the 18th Century, the issue of development was pointed out by economic theoreticians such as Adam Smith. In the 19th Century, certain elements of sustainable development were narrated by Karl Marx and other classical economists such as Malthus, Ricardo, and Mill. Later, developments show that Neoclassical economic theory argued the significance of environmental quality and renewable resources (i.e., fossil fuels and ores) along with a need for government intervention in the case of externalities and public goods (Paul, 2008; Willis, 2011). The pioneering works were provided in 1974 by Dasgupta and Heal, Solow, Maler, and Stiglitz by applying the Ramsey-Cass-Koopmans (RCK) growth model (Ramsey, 1928; Cass, 1965; Koopmans, 1965). These sustainable growth models are labeled as neoclassical sustainable growth models, and fewer or more have very similar specifications, allowing them to conclude that an economy can have infinitely sustained optimal growth with exhaustible resources (Romer, 1990). The concept of constant consumption has been taken as equivalent to intergenerational equity by many economic analysts, who considered the theory of justice a major foundation and philosophical basis for constant consumption. Greek philosophers provided a strong basis for social sciences, leading to the influential works of Karl Marx, Jahn Stuart Mill, and Jeremy Benthem. John Rawls’s seminal work provided a strong footing for establishing a just structure of society, including the economic, political, social, and legal spheres. However, the work belongs to political philosophy and ethics and addresses the issue of the distribution of goods that is socially just in a society (Sabag and Schmitt, 2016). Sen’s capability approach provides an elucidative framework for social arrangement in terms of ‘equality of capabilities for the sake of individual welfare (Li and Wang, 2020).

Environmental worsening along with economic progress dates back to the controversial idea of ‘Limits to growth’ by Meadows et al. (1972). The relationship exists as economic growth is associated with industrialization, overproduction, and resource depletion due to the over-consumption of resources that exerts pressure on the environment (Aydin et al., 2019). The pioneering work by Grossman and Krueger (1991) suggested that the environmental quality could be increased after reaching a certain level of income following the pattern of the Kuznets Curve (1955). The Kuznets curve was used to describe the relationship between environmental quality and income growth and termed as Environmental Kuznets curve (EKC). To endorse the validity of the EKC hypothesis, various empirical analysis have been carried out by Grossman and Krueger (1991), Panayotou (1993), Shafik and Bandyopadhyay (1992), and Stern et al. (1996) on different data sets, and ultimately found strong evidence to EKC hypothesis suggesting an inverted U shaped curve (Aydin et al., 2019; Alam and Adil, 2019).

METHODOLOGY

This study aims to assess the state of development based on sustainable development indicators. Thus, a composite measure of sustainable development has been constructed by combining all three dimensions of sustainable development. Sustainable development is not a goal to be achieved; rather, it is an ongoing process to be maintained (Hjorth and Bagheri, 2006).

Data Sources and Variable Selection

The study employs panel data to explore the sustainability status of 140 countries. The data were obtained from World Development Indicators for the period of 26 years (i.e., from 1995 to 2020). The work considers several characteristics of development considering sustainable development goals. Sustainable development is designed to encompass economic, social, and environmental dimensions. First, separate sub-indices were constructed for economic sustainability, social sustainability, and environmental sustainability. Second, a combined measure of sustainable development was estimated by combining all variables included in three sub-indices. Thus, the following indices are constructed to evaluate the development status of the selected countries:

- Economic Sustainability Index
- Social Sustainability Index
- Environmental Sustainability Index
- Sustainable development Index

Variables used in Economic Sustainability (ES) Index

The measure of economic sustainability comprises different capital types to maintain the growth rate for present and future generations. A simplified computation of sustainability measures is based on real capital, human capital, and intergenerational cash flow (Ederer et al., 2006). Table 1 shows relevant variables which were used for the economic sustainability index. Table 1 shows a particular variable's sign/impact on economic sustainability.

Table 1. Selected variables for economic sustainability.

Dimension	Economic sustainability (ES) Indicators	Sign
Economic Growth	GDP per capita (constant 2015 US$)	+
Economic Strength	Gross fixed capital formation (% of GDP)	+
Economic Structure	Gross domestic savings (% of GDP)	+
Population	Labor force participation rate, total (% of total population ages 15-64)	+
Financial Strength	Domestic credit to the private sector by banks (% of GDP)	+
Economic Openness	Foreign direct investment, net inflows (% of GDP)	+

Variables used in Social Sustainability Index

Social sustainability is linked to social development and social progress; therefore, the measure of social sustainability is mostly defined in terms of overall quality of life (Pieper et al., 2019; Woodcraft, 2015). The measurement of social sustainability includes a wide range of relevant factors (Table 2) that influence the quality of life. Table 2 shows the expected sign/impact of a particular variable on social sustainability.

Table 2. Selected variables for social sustainability.

Dimension	Social sustainability (SS) Indicators	Sign
Health	Life expectancy at birth, total (years)	+
	Mortality rate, under 5 (per 1,000 live births)	-
Education	School enrollment, primary (% gross)	+
	School enrollment, secondary (% gross)	+
	School enrollment, tertiary (% gross)	+
Access to Electricity	Access to electricity (% of the population)	+
Gender Parity	Labor force, female (% of the total labor force)	+
	The ratio of female to male labor force participation rate (%)	+
Communication	Mobile cellular subscriptions (per 100 people)	+
	Fixed Telephone subscriptions (per 100 people)	+
Social Cohesion	Intentional homicides (per 100,000 people)	-

Variables used in the Environmental sustainability (ES) Index

One of the underlying themes in the post-2015 development agenda is environmental sustainability (Akpan et al., 2015; Asongu et al., 2016). The consequences of climate change, global warming, and resource depletion are projected to be the most significant. The sub-index for environmental sustainability is constructed using the following variables (Table 3). Table 3 shows the expected sign/impact of a particular variable on environmental sustainability.

Table 3. Selected variables for environmental sustainability.

Dimension	Environmental sustainability Indicators	Sign
Air Quality	Total greenhouse gas emissions per capita (kt of CO_2 equivalent)	-
Forests	Forest area (% of land area)	+
	Forest Area (sq. Km)	+
Land Use	Arable land (% of land area)	-
Soil Quality	Fertilizer consumption (kilograms per hectare of arable land)	-
Natural Resources	Total Natural Resource Rents (% of GDP)	-

Data Analysis

The analysis of the development status of countries has been tricky and controversial for a long. The challenge of complexity involved in the algorithm of measuring a meaningful and valid composite index requires a sound methodology to be carried out (Lemke and Bastini, 2020). Composite indicators are considered mathematical aggregations of sub-indices integrating multi-dimensional aspects. Composite indicators provide a better understanding of the complexity of these indicators (OECD, 2008). These indicators aim to assess countries' performance to compare and rank them based on indicator scores providing a pathway toward public policy (Stevens, 2005; OECD, 2008). The index-making procedure applied here is one of the sophisticated and systematic methodologies for formulation. However, a drawback in existing index-making methodologies lies in the weighting of selected variables. The measurement methodologies are mostly based on equal weighting (e.g., HDI and ESI) or arbitrary weighting (based on experts' opinion (e.g., FEEM Sustainability Index) of the variables selected for indices (Agliardi et al., 2015).

The present research adopts a standard three-step methodology of IMF (Svirydzenka, 2019) following guidelines provided in the OECD handbook for constructing composite indices (OECD, 2008). These steps include:

(i) Winsorizing and rescaling
(ii) Weighting and aggregation of rescaled variables into sub-indices
(iii) Aggregation of sub-indices into a composite index.

Winsorizing and Rescaling

Winsorizing each series is carried out to moderate the effect of outliers and to prevent the extreme values from distorting the process of rescaling into a 0-1 scale (Svirydzenka, 2019). This procedure identifies the lowest and highest cases and reassigns the values of adjacent lower and higher cases, thus, avoiding casting data aside and creating related issues (Blaine, 2018). For this purpose, each variable is winsorized, with the 5th and 95th percentiles set at the cutoff levels. Winsorized series are then rescaled by applying normalization.

Normalisation

Winsorized variables were normalized to rescale between 0 and 1 by using the Min-Max procedure. This procedure aims at facilitating the aggregation process over several variables with different measurement units (Svirydzenka, 2019).

$$N_{xit} = \frac{X_{it} - Xi_{t,min}}{X_{it,max} - X_{it,min}} \tag{1}$$

$$N_{xit} = 1 - \frac{X_{it} - X_{it,min}}{X_{it,max} - X_{it,min}} \tag{2}$$

Where X denotes raw value, and NXit is normalized 0-1 indicator. Eq. (1) is applied to variables having a positive relationship to a particular sustainability sub-index while Eq. (2) is applied to variables showing a negative relationship with the concerned sustainability sub-index (Salvati and Carlucci, 2014; Svirydzenka, 2019).

After normalization, all values of all variables lie between zero and one. However, the means and variances of different variables are still different from each other, although they are much closer to each other than before normalization. The normalized value indicates the country's performance about the global minimum and maximum across all countries and years. Therefore, the highest values of a particular variable across cross-sections and time series are equal to one, and the lowest values are equal to zero, while all other values are observed in terms of the highest and lowest values (Svirydzenka, 2019).

Weighting and Aggregation

After normalizing, aggregation is the next step to generate an index. Generally, there are two methods of aggregation. First, the index can be generated by taking a simple average of the variables that assume equal weights to all variables entering the index. Secondly, the index can be generated by taking the weighted average of selected variables. These weights can be assigned subjectively by the researcher or can be chosen in such a way as to maximize the information in the index, which is called statistically optimal weights. The present study assigned statistically optimal weights, commonly known as principal components weighting, using Principal Component Analysis (PCA). It is one of the most popular methods among multivariate techniques to construct SDIs. The central idea of PCA is to reduce the dimensionality of a data set consisting of a large number of interrelated variables while retaining possible variation in the data set. This is achieved by transforming it into a new set of variables. The first few retain most of the variation present in all of the original variables. In summary, it can be said that PCA is a variable reduction technique that can be used when variables are highly correlated. Therefore, it reduces the number of observed variables to a smaller number of PCs that account for most of the variation of the observed variables and is a large sample procedure (Hosseini and Kaneko, 2011).

Variables are weighted by their net contribution obtained through PCA and then aggregated to form three sub-indices. The aggregation is a weighted summation of the underlying series. Thus, three sustainability sub-indices are constructed, encompassing three dimensions of sustainable development such as economic, social, and environmental.

$$ESI = \sum_{i=1}^{n} W_i N_{xit} \tag{3}$$

$$SSI = \sum_{i=1}^{n} W_i N_{xit} \tag{4}$$

$$NSI = \sum_{i=1}^{n} W_i N_{xit} \tag{5}$$

Where ESI denotes economic sustainability index, SSI indicates social sustainability index, and NSI stands for environmental sustainability index. Wi indicate weights obtained through PCA while N_{Xit} shows a variable in normalized form. Finally, all three sub-indices are aggregated to obtain a composite index for sustainable development.

RESULTS AND DISCUSSION

Descriptive Analysis

The main concern of this analysis is to assess the development status of the selected countries and rank them based on the development score obtained in all three dimensions and on the whole as well. Descriptive analysis is performed to reveal the pattern of constructed indices. The ranking is determined considering the index score of the year 2020. The findings are helpful in making a comparison among three dimensions/pillars of sustainable development. The sustainable development index shows the overall level of development. The results are compiled for a whole sample of countries and also for four income groups classified by World Bank. The classification of countries is based on income level in current USD:

(i) High-Income Countries
(ii) Upper Middle Income Countries
(iii) Lower Middle Income Countries
(iv) Low-Income Countries

Descriptive statistics for all four indices across all income groups from 1995-2020 are shown in Table 4. The sustainable development index is higher for HICs, with a mean score of 0.65 and low for LICs, with a mean score of 0.46. However, SDI reports a minimum 0.31 score and a maximum of 0.83 score overall. Similar results are observed for ESI where relatively high sustainable economic performance is attached with HICs (0.55) along with a minimum index score of 0.31 and a maximum index score lies at 0.92, but such a remarkably high score is observed for only one country (Singapore). While LICs are not economically sustainable, having an index mean score of 0.25 along with the lowest and highest index scores at 0.07 and 0.37, respectively. Social sustainability is also found better in HICs but surprisingly, other income groups are also found to perform well as SSI mean score lies between 0.47 and 0.67, which shows a hopeful condition in sustainability analyses. Descriptive statistics of the environmental sustainability index provide entirely different results from the above discussion. NSI mean score is higher across all income groups except HICs, where it is relatively lower. The index score of 0.67 for LICs indicates lesser environmental damage in this income group, with 0.42 lowest value and 0.79 highest value. Likewise, lesser environmental degradation is reported for both UMICs and LMICs, with mean index scores 0.62 and 0.63, respectively. HICs showed a relatively more damaged environments with slightly low mean index scores. However, the overall panel provided an index mean score of 0.62 while the highest and lowest values lie at 0.34 and 0.79, respectively.

Table 4. Descriptive statistics.

Indicator	Panel	Mean	Std. Dev.	Min	Max
SDI	Overall	0.56029	0.09984	0.31789	0.83131
	HICs	0.65148	0.0714	0.44803	0.83131
	UMICs	0.54605	0.07776	0.31789	0.68406
	LMIC	0.50743	0.08021	0.35751	0.69481
	LICs	0.46792	0.04794	0.35413	0.55289
ESI	Overall	0.39501	0.17295	0.07534	0.91569
	HICs	0.55377	0.14705	0.31879	0.91569
	UMICs	0.34647	0.11771	0.12278	0.62281
	LMIC	0.31703	0.13698	0.09903	0.61535
	LICs	0.25815	0.08916	0.07534	0.37625
SSI	Overall	0.66285	0.15299	0.29851	0.89467
	HICs	0.79915	0.07423	0.61879	0.89467
	UMICs	0.67136	0.11166	0.30227	0.84148
	LMIC	0.57491	0.12363	0.34656	0.86757
	LICs	0.47683	0.11247	0.29851	0.72852
NSI	Overall	0.62302	0.09546	0.3457	0.81222
	HICs	0.60152	0.09823	0.3457	0.79408
	UMICs	0.6203	0.10082	0.38172	0.81215
	LMIC	0.63035	0.08318	0.4577	0.81222
	LICs	0.66878	0.08942	0.42537	0.79509

Global Sustainable Development Index

Global sustainable development index along with all three sub-indices is presented in Table 5. Among 140 countries, the development status of the following countries is ranked top 10 countries based on the Sustainable development index (SDI): Singapore, Sweden, Netherlands, Iceland, Ireland, Qatar, Austria, Estonia, Brunei Darussalam, and Finland. While inquiring about economic sustainability, Singapore, Qatar, Switzerland, Norway, Sweden, Netherlands, Denmark, Finland, Ireland and Malta are ranked highest based on the economic sustainability index (ESI). These countries are HICs, hence, maintaining sustainability practices. The social sustainability index (SSI) marked the following countries at the top ranking: Singapore, United States, Netherlands, Malta, Lithuania, Sweden, Portugal, Germany, Nepal, and Iceland. Finally, the environmental sustainability index (NSI) indicated that environmental damage is relatively lesser in Angola, Russian Federation, Guinea-Bissau, Austria, Congo, Rep., Congo, Dem. Rep., Iceland, Brunei Darussalam, Fiji, and Peru, as per the top 10 rankings. Tarabusi and Palazzi (2004), utilizing PCA methodology for sustainable development index, ranked Japan, Germany, and Switzerland as top achievers of economic sustainability, while Chad, Uganda, and Burundi were marked with lesser degradation of environment and Niger, Chad, and Burkina Faso were found best for social sustainability. The combined index ranked Japan, Netherlands, and Belgium in the top 3 positions.

Evaluating the development status of selected 140 countries based upon SDI, it is found that Jordan, Cote d'Ivoire, Mali, Moldova, Morocco, Central African Republic, Nigeria, Syrian Arab Republic, Pakistan, and Iraq are listed among the countries which are at lowest ranking. Economic sustainability is marked lowest in the following 10 countries: Tunisia, Namibia, Central African Republic, Tonga, Sierra Leone, Iraq, Papua New Guinea, Tajikistan, Pakistan, and the Syrian Arab Republic. The analysis of social sustainability unfolded the following countries at the lowest 10 positions: Eritrea, Syrian Arab Republic, Togo, Gambia The, Benin, Nigeria, India, Central African Republic, Iraq, and Mali. Environmental degradation has been reported via the environmental sustainability index in these countries: Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Venezuela RB, Vietnam, Zambia, and Zimbabwe. Tarabusi and Palazzi (2004) indicated lowest performing countries are Malawi, Niger, and Burundi in economic sustainability; Trinidad and Tobacco, Finland, Sweden, and Canada in social aspect; Ukraine and Estonia in environmental protection and Chad, Burundi, and Niger in overall sustainability performance. Tarabusi and Palazzi (2004) also presented ranking for the same set of countries by employing the method of concave average for indices development. The results indicated Japan, Switzerland, and Germany as best performing countries in economic sustainability; Iceland, Canada, and Sweden in social sustainability; Rwanda, Uganda, and Burundi in environmental conservation and Switzerland, Japan, and Iceland in overall sustainability score. The lowest performance is found for Malawi, Niger, and Madagascar in economic dimension; Chad, Guinea-Bissau, and Rwanda in social aspect; Belgium, Denmark, and Australia in environmental sustainability and the Syrian Arab Republic, Pakistan, and Malawi in overall sustainability execution.

In this connection, it is worth mentioning that the findings of the study under consideration are somewhat similar to Tarabusi and Palazzi (2004) in a way as both studies ranked developed countries best in economic sustainability performance with greater environmental degradation. While developing countries are also lower in economic sustainability, having lesser damage to the environment. There are mixed results for social sustainability in both studies. Like results are provided by Federici (2007) based on an aggregated index, namely the sustainable socioeconomic development index, reporting developed countries with a high sustainability ranking and low-income countries with a lower ranking. The above findings can be justified based on the argument that developing countries are always eager to develop their economies while ignoring sustainability practices following "grow first, clean up later" (Rock and Angel, 2007; Wang et al., 2019). While developed countries with grown-up economies are more concerned with sustainability practices (Wang et al., 2019).

Table 5. Ranking of selected countries (140 Countries).

Country	Sustainable Development Index		Economic Sustainability Index		Social Sustainability Index		Environmental Sustainability Index	
	SDI	Rank	ESI	Rank	SSI	Rank	NSI	Rank
Albania	0.54	83	0.34	85	0.72	61	0.55	109
Algeria	0.59	60	0.41	53	0.71	64	0.64	64
Angola	0.54	82	0.29	100	0.52	110	0.81	1
Argentina	0.54	85	0.23	117	0.75	49	0.63	68
Armenia	0.48	103	0.19	127	0.69	71	0.56	107
Australia	0.69	16	0.65	13	0.78	39	0.63	67
Austria	0.73	7	0.54	29	0.85	16	0.79	4
Azerbaijan	0.55	81	0.35	80	0.76	47	0.54	115
Bahrain	0.61	44	0.60	21	0.63	86	0.61	78
Bangladesh	0.50	95	0.30	96	0.60	93	0.60	87
Barbados	0.62	38	0.40	58	0.80	30	0.67	45
Belarus	0.59	54	0.42	52	0.84	21	0.51	125
Belgium	0.59	59	0.45	45	0.79	36	0.53	123
Belize	0.56	75	0.37	71	0.55	107	0.76	11
Benin	0.45	119	0.30	98	0.38	135	0.68	42
Bhutan	0.56	70	0.38	64	0.60	98	0.71	26
Botswana	0.56	77	0.37	69	0.55	104	0.75	14
Brazil	0.56	69	0.33	88	0.76	46	0.60	88
Brunei Darussalam	0.72	9	0.65	14	0.74	52	0.77	8
Bulgaria	0.56	72	0.35	81	0.77	42	0.57	102
Burkina Faso	0.50	97	0.36	75	0.46	122	0.68	40
Burundi	0.46	113	0.18	128	0.49	120	0.71	27
Cambodia	0.60	48	0.61	20	0.62	88	0.58	98
Cameroon	0.51	92	0.28	102	0.61	91	0.65	60
Canada	0.63	35	0.55	28	0.86	15	0.49	129
Central African Republic	0.40	136	0.14	133	0.30	138	0.75	13
Chile	0.63	34	0.48	41	0.81	25	0.61	84
China	0.68	17	0.62	16	0.81	27	0.62	71
Colombia	0.59	52	0.40	56	0.70	65	0.67	46
Congo, Dem. Rep.	0.48	100	0.25	113	0.41	130	0.79	6
Congo, Rep.	0.57	66	0.42	50	0.49	119	0.79	5
Costa Rica	0.61	45	0.30	94	0.80	31	0.74	16
Cote d'Ivoire	0.43	132	0.16	130	0.45	124	0.67	48
Croatia	0.58	62	0.34	83	0.81	26	0.60	90
Cyprus	0.65	27	0.56	27	0.86	14	0.53	119
Czech Republic	0.62	39	0.47	42	0.79	34	0.60	86
Denmark	0.67	19	0.74	7	0.82	23	0.46	132
Dominican Republic	0.56	71	0.38	66	0.74	54	0.57	101
Ecuador	0.62	42	0.45	46	0.69	72	0.72	23
Egypt, Arab Rep.	0.44	129	0.17	129	0.49	118	0.65	59
El Salvador	0.44	125	0.22	119	0.49	117	0.61	81
Eritrea	0.44	124	0.35	78	0.41	131	0.57	104
Estonia	0.73	8	0.68	11	0.86	12	0.65	58
Fiji	0.58	64	0.29	101	0.68	75	0.76	9
Finland	0.72	10	0.73	8	0.77	41	0.64	61
France	0.66	22	0.50	38	0.86	13	0.62	72
Gabon	0.59	56	0.41	55	0.63	84	0.72	19
Gambia, The	0.46	112	0.34	86	0.39	134	0.66	51
Georgia	0.62	40	0.41	54	0.72	62	0.73	18
Germany	0.59	55	0.42	51	0.87	8	0.48	130
Ghana	0.46	111	0.26	111	0.56	101	0.57	99
Greece	0.59	51	0.32	90	0.84	19	0.62	74
Guatemala	0.48	108	0.21	121	0.60	94	0.62	70
Guinea	0.47	109	0.21	122	0.50	114	0.70	34
Guinea-Bissau	0.55	80	0.27	108	0.58	100	0.80	3

Guyana	0.61	46	0.52	33	0.60	92	0.70	30
Honduras	0.45	117	0.29	99	0.46	123	0.61	76
Hungary	0.66	24	0.62	18	0.74	53	0.62	73
Iceland	0.74	4	0.58	23	0.86	10	0.77	7
India	0.43	130	0.30	97	0.35	137	0.66	54
Indonesia	0.59	53	0.37	68	0.65	82	0.74	15
Iran, Islamic Rep.	0.51	90	0.26	112	0.74	55	0.55	113
Iraq	0.32	140	0.12	136	0.30	139	0.53	122
Ireland	0.74	5	0.71	9	0.84	18	0.67	49
Israel	0.62	41	0.50	36	0.79	35	0.57	103
Italy	0.57	68	0.38	65	0.80	29	0.52	124
Jamaica	0.52	89	0.39	61	0.62	90	0.54	117
Japan	0.64	33	0.56	26	0.76	48	0.59	93
Jordan	0.43	131	0.30	93	0.50	113	0.49	128
Kazakhstan	0.52	87	0.40	59	0.78	37	0.39	137
Kenya	0.56	73	0.37	70	0.73	57	0.58	94
Korea, Rep.	0.66	25	0.57	25	0.85	17	0.55	110
Kyrgyz Republic	0.58	61	0.34	82	0.75	50	0.66	52
Latvia	0.63	37	0.44	47	0.77	40	0.66	50
Lithuania	0.60	49	0.39	63	0.88	5	0.53	121
Luxembourg	0.62	43	0.64	15	0.67	77	0.54	118
Madagascar	0.48	102	0.20	125	0.51	112	0.73	17
Malawi	0.46	115	0.22	120	0.51	111	0.64	62
Malaysia	0.65	26	0.53	31	0.73	56	0.70	36
Mali	0.43	133	0.28	107	0.30	140	0.70	31
Malta	0.70	13	0.68	10	0.89	4	0.54	114
Mauritius	0.56	76	0.31	92	0.80	32	0.56	105
Mexico	0.48	99	0.31	91	0.53	109	0.61	77
Moldova	0.41	134	0.24	115	0.62	87	0.38	138
Mongolia	0.64	32	0.57	24	0.74	51	0.59	92
Morocco	0.41	135	0.26	110	0.45	125	0.53	120
Mozambique	0.55	79	0.35	79	0.73	60	0.58	95
Namibia	0.48	107	0.16	132	0.55	103	0.72	20
Nepal	0.69	14	0.62	19	0.87	9	0.60	89
Netherlands	0.75	3	0.75	6	0.89	3	0.63	66
New Zealand	0.61	47	0.66	12	0.82	24	0.35	140
Nicaragua	0.44	127	0.20	126	0.50	115	0.62	69
Niger	0.51	91	0.38	67	0.50	116	0.67	47
Nigeria	0.36	137	0.24	114	0.38	136	0.46	134
North Macedonia	0.57	65	0.34	87	0.73	59	0.65	56
Norway	0.71	11	0.78	4	0.80	28	0.56	108
Oman	0.64	30	0.52	34	0.69	69	0.72	22
Pakistan	0.35	139	0.08	139	0.42	129	0.54	116
Panama	0.66	23	0.62	17	0.64	83	0.72	21
Papua New Guinea	0.45	120	0.10	137	0.55	106	0.71	28
Paraguay	0.52	88	0.28	104	0.70	67	0.60	91
Peru	0.65	28	0.43	49	0.76	44	0.76	10
Philippines	0.51	93	0.28	103	0.60	97	0.65	57
Poland	0.58	63	0.34	84	0.68	74	0.71	25
Portugal	0.69	15	0.51	35	0.88	7	0.68	43
Qatar	0.74	6	0.80	2	0.70	66	0.70	35
Romania	0.50	94	0.35	76	0.55	102	0.61	80
Russian Federation	0.67	20	0.44	48	0.76	43	0.81	2
Rwanda	0.48	106	0.35	77	0.65	80	0.43	136
Saudi Arabia	0.45	122	0.36	74	0.62	89	0.37	139
Senegal	0.45	118	0.27	109	0.43	127	0.66	53
Serbia	0.59	50	0.39	60	0.76	45	0.63	65
Sierra Leone	0.48	105	0.13	135	0.60	96	0.71	29
Singapore	0.83	1	0.92	1	0.89	1	0.68	39
Slovak Republic	0.59	57	0.36	72	0.78	38	0.62	75
slovenia	0.64	31	0.40	57	0.84	20	0.68	41
South Africa	0.46	114	0.23	118	0.44	126	0.70	33
Spain	0.64	29	0.49	39	0.83	22	0.61	82
Sri Lanka	0.53	86	0.33	89	0.69	70	0.57	100
Sweden	0.79	2	0.75	5	0.88	6	0.76	12
Switzerland	0.71	12	0.78	3	0.79	33	0.55	111
Syrian Arab Republic	0.35	138	0.08	140	0.41	132	0.58	97
Tajikistan	0.44	123	0.10	138	0.55	105	0.69	38
Tanzania	0.59	58	0.50	37	0.65	81	0.61	83
Thailand	0.56	74	0.47	43	0.66	79	0.55	112
Togo	0.44	128	0.28	106	0.40	133	0.64	63

Tonga	0.44	126	0.13	134	0.63	85	0.56	106
Tunisia	0.49	98	0.16	131	0.69	68	0.61	79
Turkey	0.50	96	0.28	105	0.73	58	0.49	127
Uganda	0.48	101	0.30	95	0.43	128	0.72	24
Ukraine	0.45	121	0.20	123	0.69	73	0.46	135
United Arab Emirates	0.55	78	0.52	32	0.68	76	0.46	133
United Kingdom	0.63	36	0.53	30	0.86	11	0.50	126
United States	0.68	18	0.48	40	0.89	2	0.68	44
Uruguay	0.54	84	0.36	73	0.67	78	0.58	96
Uzbekistan	0.57	67	0.45	44	0.60	95	0.66	55
Venezuela, RB	0.48	104	0.23	116	0.59	99	0.61	85
Vietnam	0.67	21	0.59	22	0.71	63	0.70	32
Zambia	0.47	110	0.39	62	0.54	108	0.47	131
Zimbabwe	0.46	116	0.20	124	0.47	121	0.69	37

Country-wise Ranking across Income Groups

Selected 140 countries are classified into their respective income groups by World Bank. In this respect, the high-income group contains 46 countries, while the upper-middle, lower-middle, and low-income groups contain 39, 37, and 18 countries, respectively. Across high-income countries (Table 6), Singapore has been marked as the highest performer in terms of economic and social sustainability assessment, while Austria achieves environmental sustainability. However, Saudi Arabia also stands at the lowest rank in SDI and SSI, while Greece and New Zealand are found to be lowest in ESI and NSI, respectively.

Within UMICs (Table 7), China is found to be the top performer in SDI and also for ESI. However, Belarus is reported as suitable for social sustainability, and the Russian Federation for environmental sustainability. However, Iraq is the lowest performer in SDI, ESI, and SSI, while Moldova is an environmentally more deteriorated country within UMICs (Table 7).

Table 6. Ranking of high-income countries.

Country	Sustainable Development Index		Economic Sustainability Index		Social Sustainability Index		Environmental Sustainability Index	
	SDI	Rank	ESI	Rank	SSI	Rank	NSI	Rank
Australia	0.69	15	0.65	13	0.78	33	0.63	18
Austria	0.73	7	0.54	23	0.85	15	0.79	1
Bahrain	0.61	34	0.60	17	0.63	45	0.61	23
Barbados	0.62	30	0.40	38	0.80	27	0.67	12
Belgium	0.59	40	0.45	34	0.79	31	0.53	38
Brunei Darussalam	0.72	9	0.65	14	0.74	37	0.77	3
Canada	0.63	27	0.55	22	0.86	14	0.49	41
Chile	0.63	26	0.48	32	0.81	23	0.61	25
Croatia	0.58	41	0.34	44	0.81	24	0.60	27
Cyprus	0.65	21	0.56	21	0.86	13	0.53	36
Czech Republic	0.62	31	0.47	33	0.79	29	0.60	26
Denmark	0.67	17	0.74	7	0.82	21	0.46	43
Estonia	0.73	8	0.68	11	0.86	11	0.65	15
Finland	0.72	10	0.73	8	0.77	35	0.64	16
France	0.66	18	0.50	29	0.86	12	0.62	19
Germany	0.59	38	0.42	36	0.87	8	0.48	42
Greece	0.59	37	0.32	46	0.84	18	0.62	21
Hungary	0.66	19	0.62	16	0.74	38	0.62	20
Iceland	0.74	4	0.58	18	0.86	9	0.77	2
Ireland	0.74	5	0.71	9	0.84	17	0.67	13
Israel	0.62	32	0.50	28	0.79	30	0.57	30
Italy	0.57	43	0.38	40	0.80	26	0.52	39
Japan	0.64	25	0.56	20	0.76	36	0.59	28
Korea, Rep.	0.66	20	0.57	19	0.85	16	0.55	32
Latvia	0.63	29	0.44	35	0.77	34	0.66	14
Lithuania	0.60	36	0.39	39	0.88	5	0.53	37
Luxembourg	0.62	33	0.64	15	0.67	43	0.54	35
Malta	0.70	13	0.68	10	0.89	4	0.54	34
Netherlands	0.75	3	0.75	6	0.89	3	0.63	17
New Zealand	0.61	35	0.66	12	0.82	22	0.35	46
Norway	0.71	11	0.78	4	0.80	25	0.56	31
Oman	0.64	23	0.52	26	0.69	40	0.72	5
Poland	0.58	42	0.34	45	0.68	41	0.71	6
Portugal	0.69	14	0.51	27	0.88	7	0.68	10
Qatar	0.74	6	0.80	2	0.70	39	0.70	7
Saudi Arabia	0.45	46	0.36	43	0.62	46	0.37	45
Singapore	0.83	1	0.92	1	0.89	1	0.68	8
Slovak Republic	0.59	39	0.36	41	0.78	32	0.62	22
Slovenia	0.64	24	0.40	37	0.84	19	0.68	9

Spain	0.64	22	0.49	30	0.83	20	0.61	24
Sweden	0.79	2	0.75	5	0.88	6	0.76	4
Switzerland	0.71	12	0.78	3	0.79	28	0.55	33
United Arab Emirates	0.55	44	0.52	25	0.68	42	0.46	44
United Kingdom	0.63	28	0.53	24	0.86	10	0.50	40
United States	0.68	16	0.48	31	0.89	2	0.68	11
Uruguay	0.54	45	0.36	42	0.67	44	0.58	29

Source: Author's computation.

Table 7. Ranking of upper middle income countries.

Country	Sustainable Development Index		Economic Sustainability Index		Social Sustainability Index		Environmental Sustainability Index	
	SDI	Rank	ESI	Rank	SSI	Rank	NSI	Rank
Albania	0.54	23	0.34	21	0.72	17	0.55	30
Argentina	0.54	24	0.23	33	0.75	12	0.63	17
Armenia	0.48	31	0.19	36	0.69	21	0.56	29
Azerbaijan	0.55	22	0.35	19	0.76	11	0.54	32
Belarus	0.59	12	0.42	9	0.84	1	0.51	35
Botswana	0.56	21	0.37	17	0.55	35	0.75	4
Brazil	0.56	16	0.33	23	0.76	10	0.60	23
Bulgaria	0.56	18	0.35	20	0.77	6	0.57	26
China	0.68	1	0.62	1	0.81	2	0.62	19
Colombia	0.59	11	0.40	12	0.70	19	0.67	14
Costa Rica	0.61	8	0.30	27	0.80	3	0.74	5
Dominican Republic	0.56	17	0.38	16	0.74	13	0.57	25
Ecuador	0.62	7	0.45	6	0.69	22	0.72	10
Fiji	0.58	14	0.29	28	0.68	23	0.76	2
Gabon	0.59	13	0.41	11	0.63	26	0.72	7
Georgia	0.62	6	0.41	10	0.72	18	0.73	6
Guatemala	0.48	34	0.21	35	0.60	31	0.62	18
Guyana	0.61	9	0.52	4	0.60	30	0.70	11
Iraq	0.32	39	0.12	39	0.30	39	0.53	34
Jamaica	0.52	27	0.39	15	0.62	29	0.54	33
Jordan	0.43	37	0.30	26	0.50	37	0.49	37
Kazakhstan	0.52	25	0.40	13	0.78	5	0.39	38
Malaysia	0.65	4	0.53	3	0.73	14	0.70	13
Mauritius	0.56	20	0.31	25	0.80	4	0.56	27
Mexico	0.48	30	0.31	24	0.53	36	0.61	20
Moldova	0.41	38	0.24	31	0.62	28	0.38	39
Namibia	0.48	33	0.16	37	0.55	34	0.72	8
North Macedonia	0.57	15	0.34	22	0.73	16	0.65	15
Panama	0.66	3	0.62	2	0.64	25	0.72	9
Paraguay	0.52	26	0.28	29	0.70	20	0.60	24
Peru	0.65	5	0.43	8	0.76	8	0.76	3
Romania	0.50	28	0.35	18	0.55	33	0.61	21
Russian Federation	0.67	2	0.44	7	0.76	7	0.81	1
Serbia	0.59	10	0.39	14	0.76	9	0.63	16
South Africa	0.46	35	0.23	34	0.44	38	0.70	12
Thailand	0.56	19	0.47	5	0.66	24	0.55	31
Tonga	0.44	36	0.13	38	0.63	27	0.56	28
Turkey	0.50	29	0.28	30	0.73	15	0.49	36
Venezuela, RB	0.48	32	0.23	32	0.59	32	0.61	22

Source: Author's computation.

Across LMICs (Table 8), the results marked Nepal as a top performer in SDI, ESI, and SSI. However, Angola is found to be environmentally sustained, with a score of 0.81 in NSI. On the other hand, the lowest rank is reported for Nigeria in SDI, Tajikistan in ESI, India in SSI, and Ukraine in NSI (Table 8).

Within low-income countries as shown in Table 9, Mozambique is performing relatively better, with an SDI score of 0.55 compared to other LICs. Niger is observed to have relatively good economic sustainability within the low-income group. However, social sustainability is observed again in Mozambique. Environmental damage is observed lesser in Guinea-Bissau across LICs. Syrian Arab Republic is indicated lowest performer in SDI (score 0.35) and ESI (score 0.08). Such a low score in ESI is obvious due to the Syrian's civil war that started in 2011, which destroyed the political system and institutions of the country (Akhmedov, 2022).

Table 8. Ranking of lower middle income countries.

Country	Sustainable Development Index		Economic Sustainability Index		Social Sustainability Index		Environmental Sustainability Index	
	SDI	Rank	ESI	Rank	SSI	Rank	NSI	Rank
Algeria	0.59	7	0.41	8	0.71	7	0.64	19
Angola	0.54	14	0.29	20	0.52	24	0.81	1
Bangladesh	0.50	19	0.30	16	0.60	15	0.60	25
Belize	0.56	13	0.37	13	0.55	22	0.76	3
Benin	0.45	26	0.30	18	0.38	35	0.68	10
Bhutan	0.56	11	0.38	10	0.60	18	0.71	5
Cambodia	0.60	4	0.61	2	0.62	13	0.58	29
Cameroon	0.51	17	0.28	21	0.61	14	0.65	18
Congo, Rep.	0.57	9	0.42	7	0.49	28	0.79	2
Cote d'Ivoire	0.43	34	0.16	33	0.45	31	0.67	11
Egypt, Arab Rep.	0.44	32	0.17	32	0.49	27	0.65	17
El Salvador	0.44	30	0.22	28	0.49	26	0.61	23
Ghana	0.46	22	0.26	25	0.56	19	0.57	30
Honduras	0.45	24	0.29	19	0.46	30	0.61	21
India	0.43	33	0.30	17	0.35	37	0.66	14
Indonesia	0.59	5	0.37	11	0.65	12	0.74	4
Iran, Islamic Rep.	0.51	16	0.26	26	0.74	4	0.55	32
Kenya	0.56	12	0.37	12	0.73	5	0.58	28
Kyrgyz Republic	0.58	8	0.34	14	0.75	2	0.66	12
Mongolia	0.64	3	0.57	4	0.74	3	0.59	27
Morocco	0.41	35	0.26	24	0.45	32	0.53	34
Nepal	0.69	1	0.62	1	0.87	1	0.60	26
Nicaragua	0.44	31	0.20	31	0.50	25	0.62	20
Nigeria	0.36	37	0.24	27	0.38	36	0.46	36
Pakistan	0.37	36	0.14	35	0.42	34	0.54	33
Papua New Guinea	0.45	27	0.10	36	0.55	21	0.71	6
Philippines	0.51	18	0.28	22	0.60	17	0.65	16
Senegal	0.45	25	0.27	23	0.43	33	0.66	13
Sri Lanka	0.53	15	0.33	15	0.69	9	0.57	31
Tajikistan	0.44	29	0.10	37	0.55	20	0.69	9
Tanzania	0.59	6	0.50	5	0.65	11	0.61	24
Tunisia	0.49	20	0.16	34	0.69	8	0.61	22
Ukraine	0.45	28	0.20	29	0.69	10	0.46	37
Uzbekistan	0.57	10	0.45	6	0.60	16	0.66	15
Vietnam	0.67	2	0.59	3	0.71	6	0.70	7
Zambia	0.47	21	0.39	9	0.54	23	0.47	35
Zimbabwe	0.46	23	0.20	30	0.47	29	0.69	8

Source: Author’s computation.

Table 9. Ranking of low income countries

Country	Sustainable Development Index		Economic Sustainability Index		Social Sustainability Index		Environmental Sustainability Index	
	SDI	Rank	ESI	Rank	SSI	Rank	NSI	Rank
Burkina Faso	0.50	4	0.36	2	0.46	10	0.68	10
Burundi	0.46	12	0.18	15	0.49	9	0.71	6
Central African Republic	0.40	17	0.14	16	0.30	17	0.75	3
Congo, Dem. Rep.	0.48	5	0.25	11	0.41	12	0.79	2
Eritrea	0.44	14	0.35	4	0.41	13	0.57	17
Gambia, The	0.46	11	0.34	6	0.39	16	0.66	12
Guinea	0.47	10	0.21	13	0.50	7	0.70	9
Guinea-Bissau	0.55	2	0.27	10	0.58	4	0.80	1
Madagascar	0.48	7	0.20	14	0.51	6	0.73	4
Malawi	0.46	13	0.22	12	0.51	5	0.64	13
Mali	0.43	16	0.28	9	0.30	18	0.70	8
Mozambique	0.55	1	0.35	5	0.73	1	0.58	15
Niger	0.51	3	0.38	1	0.50	8	0.67	11
Rwanda	0.48	9	0.35	3	0.65	2	0.43	18

Sierra Leone	0.48	8	0.13	17	0.60	3	0.71	7
Syrian Arab Republic	0.35	18	0.08	18	0.41	14	0.58	16
Togo	0.44	15	0.28	8	0.40	15	0.64	14
Uganda	0.48	6	0.30	7	0.43	11	0.72	5

Source: Author's computation.

CONCLUSIONS AND RECOMMENDATIONS

The overarching concepts of sustainability and sustainable development have been elusive and ambiguous, indicating the need to address a wide set of issues concerning the matter. Practically, sustainable development recognizes all stakeholders, including public, individual, corporate, civil, and institutions, as constituent factors with complex interrelations. Therefore, the measurement and quantification of sustainable development status and progress towards sustainability are currently one of the distinct research focuses having strong policy implications. The present study extends a substantive contribution to the debate about the measurement of sustainability by filling a gap in sustainability analysis and measurement. The study employs panel data to estimate the state of 140 countries obtained from the World Bank for 26 years (1995-2020). The work considered several development characteristics simultaneously to encompass economic, social, and environmental dimensions representing sustainable development. For this purpose, three sub-indices for economic, social, and environmental sustainability are constructed. Then, a combined measure of sustainable development is estimated by combining all variables included in the three sub-indices. The present research employs a standard three-step methodology in the literature following guidelines provided in the OECD handbook for constructing composite indices (OECD, 2008). The methodology at the first step treated outliers and then rescaled the variables. Secondly, rescaled variables are weighted using the PCA method, and finally, all weighted variables are aggregated to develop the indices. These indices are utilized to assess the development status of the selected countries by ranking them based on development scores obtained in all three dimensions and on the whole. The ranking is determined considering the index score of the year 2020. The findings ranked Singapore, Sweden, and the Netherlands as top achievers for sustainable development; Singapore, Qatar, and Switzerland for economic sustainability; Singapore, United States, and Netherlands for social sustainability and Angola, Russian Federation, and Guinea-Bissau for lesser environmental damage. However, the Syrian Arab Republic, Pakistan, and Iraq are listed among the countries which are the lowest ranking in sustainable development; Tajikistan, Pakistan, and the Syrian Arab Republic are found to be low for economic sustainability; the Central African Republic, Iraq, and Mali have been marked at lowest positions for social sustainability and Vietnam, Zambia and Zimbabwe are found for environmental degradation. SDI mean score for the overall panel is 0.56; even the HICs mean score for SDI lies at 0.65, showing a slow pace towards development. The economic sustainability average score in the overall panel is also very low, lying at 0.39, while in HICs mean score is 0.55, which indicates a few countries as economically sustainable. Social sustainability provision is found to be relatively better in the overall panel, and its mean score lies at 0.66 and above 0.4 for all panels. However, the environmental sustainability mean score is higher in developing countries as compared to the developing world. In light of these results, it is recommended to implement more effective strategies for promoting sustainable development as it is not an overnight play. Thus effective strategies must be devised and implemented to universalize the concept "no one is left behind." Economic sustainability is suggested by diversifying economies to boost income per capita and employment, introducing sustainable finance for raising financial strength and attracting foreign investment by providing substantial incentives in terms of quality infrastructure, investment-friendly environment, and openness. Economic and political stability for policy continuation is also recommended to achieve economic sustainability. To ensure social sustainability, the provision of health and education facilities and removing exclusion is recommended by increasing concerned budgets and providing free education and medical services to all. Gender equality is recommended by empowering women and increasing their participation in the socioeconomic scenario. Access to energy is also recommended for the improved living of the people. Communicative manifestation is recommended for effective interaction between people that introduces significant changes in society's economic, social, and political behaviors. Social peace and cohesion are recommended by strengthening institutions and extending transparent law and order practices. Finally, environmental sustainability could be attained by reducing GHGs, protecting forest areas, optimal utilization of land, boosting soil quality, and conserving natural resources.

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