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Tracking the Progress of Sustainable Development Goals: Applying Three Approaches in South Asia

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Abstract

This study assesses sustainable development in South Asian economies based on their development stages, using three distinct approaches: the traditional "GDP approach," focusing on economic indicators; the "Beyond-GDP approach," incorporating social and natural resource indicators; and the "SDG-based approach," emphasizing quality-of-life metrics aligned with the UN's Sustainable Development Goals (SDGs). A composite indicator method was employed, selecting nineteen indicator groups for analysis. Key findings show that factors like the Corruption Index, foreign direct investments, government debt, energy imports, and vulnerable employment have the most significant impact on sustainable development. Bhutan and the Maldives rank highest across all approaches, while Pakistan and India rank lowest, with Pakistan scoring the lowest in both the GDP and SDG-based approaches. The study recommends using the SDG-based ranking to prioritize development efforts and funding allocation, with specific suggestions for enhancing sustainability in the region.

Keywords: Sustainable Development Goals, Sustainability, Sustainable Development Index, Composite Index, Normalization

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Contents

Abstract

This study assesses sustainable development in South Asian economies based on their development stages, using three distinct approaches: the traditional "GDP approach," focusing on economic indicators; the "Beyond-GDP approach," incorporating social and natural resource indicators; and the "SDG-based approach," emphasizing quality-of-life metrics aligned with the UN's Sustainable Development Goals (SDGs). A composite indicator method was employed, selecting nineteen indicator groups for analysis. Key findings show that factors like the Corruption Index, foreign direct investments, government debt, energy imports, and vulnerable employment have the most significant impact on sustainable development. Bhutan and the Maldives rank highest across all approaches, while Pakistan and India rank lowest, with Pakistan scoring the lowest in both the GDP and SDG-based approaches. The study recommends using the SDG-based ranking to prioritize development efforts and funding allocation, with specific suggestions for enhancing sustainability in the region.

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Introduction

In 2015, all UN members approved a national sustainable development agenda with 17 goals and 169 targets, derived from the 2012 Rio+20 summit. These goals focus on basic needs, social welfare, and environmental sustainability, with greater emphasis on poverty, equality, and environmental issues compared to the Millennium Development Goals (Stevens & Kanie, 2016). The SDGs are structured under social, economic, and environmental dimensions: poverty reduction represents the social dimension; long-term resource sustainability defines the economic

dimension; and environmental sustainability focuses on protecting natural resources (Goodland, 1995; Kori & Gondo, 2012; Kwatra et al., 2020). Achieving these goals requires coordinated efforts from policymakers to promote economic growth, end poverty, and provide equal access to employment, health, and education without harming the environment. Governments must integrate the SDGs into national development strategies, ensuring the efficient use of natural, economic, and human resources to achieve interconnected goals (Golusin et al., 2014; Kynčlová et al., 2020). The establishment of Globalization and interdependency across nations is also a helpful tool for making progress toward sustainable development (NAZ, KHAN, & KHAN, 2022)

The debate about the measurement of progress to achieve sustainable development goals has attracted the attention of policymakers, researchers, and other participants (Costanza et al., 2016; Holden, Linnerud, & Banister, 2014). Further, the general applicability of the global agenda by 2030 and the selection of targets and related indicators to represent sustainable development goals have enhanced this debate (Allen, Metternicht, & Wiedmann, 2018; Liu et al., 2018).

Sustainable development is evaluated using proxy indicators that assess economic, social, and environmental dimensions based on a conceptual framework. These indicators are often combined into composite sustainability indices to compare countries' achievements. This approach captures the complexity of sustainable development in rapidly changing societies by analyzing interconnected causes without hierarchical causality. Despite potential biases, composite indices are valuable for simplifying complex constructs and drawing attention (Salvati & Carlucci, 2014). Measuring sustainable development with single indicators is challenging due to its multidimensional nature, requiring an integrated framework to link social, economic, and environmental aspects. Composite indices summarize diverse information into a single number, making them more effective for public discussions than individual scores, which can lead to selective interpretation (Lafortune et al., 2020).

Numerous measures have been used for capturing sustainable development- the human development index, living planning index, ecological footprint, city development index, genuine saving index, and environmentally adjusted domestic product index literature. However, these indices failed to capture all aspects of sustainability and to make the policy recommendation (Diaz-Sarachaga, Jato-Espino, & Castro-Fresno, 2018). To overcome this problem the construction of the SDGs index was first time suggested in a report issued by the Bertelsmann Foundation with the help of the United Nations Sustainable Development Solution Network for the OECD countries (Kroll, 2015).

Bertelsmann Stiftung and the Sustainable Development Solutions Network (SDSN) jointly issued the first SDGs index and dashboard in July 2016. Schmidt-Traub, Kroll, Teksoz, Durand-Delacre, and Sachs (2017) presented the composite index comprising the 17 goals of sustainable development goals with the global indicators data. They call for 193 economies, but they exclude 44 countries due to a lack of data and do not meet the threshold developed by authors to include the economies with a population of one million or more. They included 149 developing and developed economies for analysis and compared the SDG index with the former available sustainable indices. This composite SDGs index has the attribute of updating annually. In the follow-up in 2018 Lafortune, Fuller, Moreno, Schmidt-Traub, and Kroll (2018) developed a robust monitoring framework for 156 economies with detailed methods of index formulation. They identify the need for standardized data and investment to accomplish the SDGs by economies.

There are a number of global indices available to measure sustainable development in different aspects for different countries. Various frameworks and strategies are used to develop the sustainable development goals indices at the

global level; however, limited work has been done at the regional level. Besides the numerical measures available for sustainable development public awareness is also important to achieve this global agenda (Javeed, Khan, Rehman, & Khurshid, 2021). The indices are helpful tools to measure the current situation of economies and provide guidance to policymakers and regulators to formulate policies and development projects that would lead the regions toward sustainability (Kwatra, Kumar, & Sharma, 2020).

To address this issue, many countries are focusing on prioritizing the SDGs by developing their own national indicators. However, this self-prioritization process carries the risk of adopting arbitrary weighting techniques or relying on previously unsuccessful methods. Ensuring that selected goals and targets comprehensively cover all dimensions and accurately reflect national progress remains a significant challenge. To mitigate difficulties in selecting indicators at national and regional levels, effective techniques are needed. A robustness test is essential to avoid selecting easily achievable indicators that may not accurately represent the true status of SDGs. New studies are emerging that explore analysis techniques to better prioritize national targets (Nilsson, Griggs, & Visbeck, 2016; Weitz, Strambo, Kemp-Benedict, & Nilsson, 2017).

The objective of this research is to provide various indicators to quantify sustainable development progress using different evaluation approaches. The study employs three sets of indicators: the SDG-based approach, which aligns with United Nations Sustainable Development Goals to assess economic, social, and environmental aspects; the GDP-based approach, focusing on economic sustainability; and the Beyond-GDP approach, which emphasizes human welfare and natural wealth. These approaches, using a limited number of indicators, are analyzed with "The Analysis Algorithm" using data from the South Asia region. The results will guide policymakers on how different sets of SDG indicators impact sustainable development levels.

Literature Review

The World Commission on Environment and Development explained sustainability in 1987 as: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In spite of the universal consensus on this definition of sustainability, the achievement of this goal was a big challenge for all. The systems approach attempted to recognize that economies can attain sustainable development by maximizing the economic, social, and environmental characteristics of society (Barbier, 1987; Barbier & Burgess, 2017; Barbier & Markandya, 2013; Costanza et al., 2016). The set of three systems comprising the economic, social, and ecological systems for the progress of sustainability was first identified by (Barbier, 1987).

In 2015, the United Nations presented a Global challenge for sustainable development by 2030, to address this issue number of measures were adopted by member countries. The main challenge for economies is to cover the economic, social, and environmental aspects of sustainable development. A number of indicators have been used for measuring the progress of economies toward sustainability, but there is space vacant for standard benchmarks. Diaz-Sarachaga et al. (2018) analyzed the suitability of composed SDGs index comprising on 99 indictors for assessing the progress of 157 economies. The finding of this study suggested the need for the development of regional indices to improve low-performing goals.

Examining sustainability practices reveals that assessing sustainable development (SD) involves methodological challenges, primarily related to indicator selection, data management, and result interpretation. Lior, Radovanovic, and Filipovic (2018) argue that SD should be measured according to economic development levels, recommending separate indicator sets for highly developed, moderately developed, and underdeveloped countries. Their study examined 13 nations in Southeast Europe (SEE), plus Germany and the Russian Federation for

comparison. These countries, with varying development levels and political and socioeconomic conditions, were analyzed using three approaches based on GDP factors, socio-economic factors, and SDG factors defined by the United Nations.

Lafortune et al. (2018) analyzed index and dashboard trends for 193 member countries, excluding 37 due to data limitations. This study helps measure economic performance and guides policy formulation for sustainable development progress. Jabbari et al. (2020) argue that using environmental and development indicators to represent the SDG index can be misleading and propose the DEVI composite index, based on a statistical algorithm, to better monitor development. The algorithm classifies economies by DEVI scores into developed and developing and declared 43 and 40 developed countries in 2017 and 2018, respectively.

Rahma, Fauzi, Juanda, and Widjojanto (2019) investigated the integration of economic, social, and environmental aspects into indicators of regional sustainable development through the use of a newly developed composite index. The index was composed using a simple method that can be helpful for policy implementation. They used three developed metrics of indices: entropy-based, geometric, and arithmetic to compare the sustainability performance of different regions. The findings of the study were helpful regarding the policy analysis and provided recommendations for implementing the appropriate index for the measurement of sustainability. In order to determine the elements promoting sustainable development, Henderson and Loreau (2023) integrate the 17 goals into a socio-ecological model. They conclude that the current population size and usage of resources are insufficient to achieve any goal or combination of goals. Din, Khan, Khan, and Nilofar (2022) used the SDG index composed of five factors related to socio-economic and environmental dimensions. They observed the strong impact of SDGI on adjusted net savings in Asian economies.

It is a challenge for researchers to select an appropriate set of indicators for the representation of SDGs and an approach to measure sustainable development. Because the different sets of indicators and approaches may have potential priority on a regional basis, which can be changed over time with the economic, political, and globalization variations (Akimoto et al., 2012; Dasgupta, 2007; Lior, Radovanovic, & Filipovic, 2018). Schmidt-Traub et al. (2017) also explore the need for a measure that can comprehensively cover all the aspects of sustainability and develop a composite framework to measure the performance of countries. In another study, the sensitivity of climate change was measured by composing the index of climate change (Wahab, Khan, Khan, Mushtaq, & Sustainability, 2023). Therefore, it is imperative that the adopted approach has the ability to monitor, and aggregate data and understand uncertainty (Desbordes & Koop, 2016).

This study employs three approaches, each using a limited number of indicators to quantify sustainable development through "The Analysis Algorithm." Data for the South Asia region was utilized, and while many indicators are interconnected, this study focuses on the individual impacts of these indicators due to the complexity of examining thousands of possible combinations. The "findings" section presents and discusses these interconnections, and the "analytical algorithms" section provides a detailed cause-and-effect analysis of the indicators to explain their impacts.

Data and Method

A number of studies have been conducted to measure the progress of economies toward sustainable development based on global SDGs indicators (Campagnolo, Carraro, et al., 2018; Campagnolo, Eboli, Farnia, & Carraro, 2018; Diaz-Sarachaga et al., 2018; Guijarro & Poyatos, 2018; Lafortune, Fuller, Schmidt-Traub, & Kroll, 2020; Miola & Schiltz, 2019; Muff, Kapalka, & Dyllick, 2017; OECD, 2019; Sachs, Kroll, Lafortune,

Fuller, & Woelm, 2022). A set of available indicators is composed into an aggregate index to measure the sustainable development progress of economies by many researchers. This composite index enables the researchers to rank the economies according to their SDG performance. Normalization of data is required to aggregate the data on a single measurement unit (OECD, 2008).

Normalization against a target value has widely been used in the literature (Çolak & Ege, 2011); OECD, 2008, 2019; Pasimeni & Development, 2012). However, only a few SDG targets are quantitative and provide a clear threshold against which countries' performance could be measured; thus, some studies defined 'ideal' target values based on scientifically defined thresholds or on average values of the top-performing countries (OECD, 2019; Sachs et al., 2022; Sachs et al., 2019). This results in an index that measures the performance of countries in relation to each other (Hametner & Kostetckaia, 2020; Miola & Schiltz, 2019) rather than the absolute progress the countries have achieved.

The study includes the seven South Asian countries: Pakistan, India, Bangladesh, Bhutan, Maldives, Nepal, and Sri Lanka.

Three Approaches for Sustainable Development Evaluation

This study explores development levels in Asian countries using three methods. The first, the GDP-based approach, relies on conventional economic indicators and is widely used by developed and developing countries, as governments prioritize economic growth. However, since GDP alone cannot fully capture sustainable development, a more comprehensive set of indicators is needed to address human well-being and natural resource preservation, leading to the Beyond-GDP approach. Key issues like eliminating extreme poverty and reducing wealth disparity often remain unaffected by GDP growth, and higher GDP can increase demand for ecological services.

To address these issues, it is necessary to increase the income and wealth distribution uniformity while taking future generations' requirements and resource availability into full consideration. There has been substantial progress in assessing the societal worth of all the capital assets of an economy, rather than only relying on its GDP. As a result, there is increasing scrutiny of the GDP's role as the main indicator of sustainability and success (A. Dasgupta, 2017; P Dasgupta, 2007; Partha Dasgupta et al., 2015; Partha Dasgupta & Ramanathan, 2014; Dipietro & Anoruo, 2006). Actually, a de-growth strategy is believed to encourage the growth of interpersonal relationships as opposed to market connections and demand to replace the growth addiction that drives demand's exponential rise.

The "Beyond-GDP" strategy was developed for South Asia by introducing sustainability metrics that better reflect the region's economic and social history. While still using GDP-PPP per capita, other indicators focus on social status and natural wealth to better capture the standard of living. Notably, Bhutan and Maldives have higher public spending on health and education compared to other countries, while the Happiness Index and Social Progress Index values are close to each other. The statistic of personal remittances received, expressed as a percentage of GDP, is particularly significant in many South Asian countries due to its high value. This form of income was included in the GDP of the migrants' home country, although it is uncertain whether it aided in a seamless transfer (Horvat, 2004). This study included it because of the substantial presence of individuals from South Asia residing and working in affluent countries such as those in the Middle East and Western Europe, who offer monetary support to their families in their home countries.

The SDG-based Approach is founded on the 169 indicators and 17 SDGs set by the UN as a framework for sustainable development (SD) across all nations, with the aim of fostering economic growth, social integration, and environmental preservation. The next step on this agenda is to carry out and accomplish these sustainability goals (Stafford-Smith et al., 2016).

Allen, Metternicht, Wiedmann, and Policy (2016) and Shahadu (2016), are recent instances of SDG indicator-based assessments that allow for a deeper study of the relationships and dynamics between the SDGs and are primarily devoted to enhancing conditions in the world's poorer nations and areas.

It's fascinating to observe that some countries have large quantities of natural resources, but they don't provide enough benefits for the majority of the population, therefore they have low standards of living (Kronenberg & Hubacek, 2016). This contributes to rising discrimination (OECD, 2011). A greater emphasis on household financial security, emancipatory values, and health status is necessary to improve human well-being; additional policy objectives should be prosperity and political stability (Ngamaba, 2016; Oishi & Diener, 2014).

Normalization Method

In previous studies, data was analyzed using the technique of composite indicator, which was composed using the weight coefficient method (ISPRA, 2008; N. Lior & Kim, 2018; N. J. D. Lior, 2017; N. J. E. B. Lior, 2015; Singh, Murty, Gupta, & Dikshit, 2009b). According to Blanc, Friot, Margni, and Jolliet (2008), it enables the subjective accounting of an indicator's significance at a specific time and economy, and it can analyze data expressed in different forms of units.

Two steps are applied in this study to analyze the data:

The purpose of scaling approaches was to change (normalize) variables such that they may be compared using a single unit.

This study applies a normalizing technique for each country in a selected group of N economies (i=1 to N) and for each indicator type j (e.g., per capita income, energy consumption, carbon emissions), where j=1 to J. The normalized indicators $Z(i,j)$ for the South Asian countries in the study (N=7) were determined using the min-max method, based on raw indicator values $X(i,j)$ sourced from relevant databases. The approach enables the comparison of the diverse data set (Zhou, Ang, & Poh, 2007) and only at the level of SD with respect to the other nations in the study set (Lindholm, Greatorex, & Paruch, 2007; Streimikiene, Balezentis, Krisciukaitienė, Balezentis, & reviews, 2012). Thus

$$Z_{i,j} = \frac{X_{i,j} - X_{min,j}}{X_{i,j} - X_{min,j}} \quad (1)$$

Here, i represents countries, and j denotes indicator types. $Z(i,j)$ represents the normalized values of indicators, while $X(i,j)$denotes the pre-normalized ("raw") indicator values. $X(max,\ j)$ and $X(min,j)$ are the highest and lowest values of indicators before normalization, respectively, among the selected countries. All X values have dimensions (e.g., $, tons, %, etc.) and can be either positive or negative.

The values of $X(max,j)$ and $X(min,j)$ used for normalization [by Eq. (1)] were selected appropriately, considering that some indicators reflect positive aspects, such as GDP or the Happiness Index, while others represent unsustainable features, like population growth rate or mortality rate.

For instance, within the group countries, $X_{max,j}$ was assigned the greatest GDP-PPP value, and $X_{min,j}$ the lowest GDP value for indicators that represent sustainable features, such as GDP-PPP. As a result, the countries with greater GDP-PPP values were ranked higher. Higher rankings for countries with lower total unemployment rates can be attributed to metrics representing unsustainable qualities, such as TER, where $X_{max,j}$ was assigned the lowest value and $X_{min,j}$ the greatest TER value across the country group.

This method of ranking is significant because it ranks the sustainability level of the countries according to the relative magnitude of their "raw" indicators, $X_{i,j}$. $Z_{i.j}$ is scaled from 0 to 100, with $Z_{i.j}$ =0 representing the countries with the lowest raw indicator's value, $X_{min,j}$, and $Z_{i.j}$ =100 representing the countries with the highest value of the "raw" indicator, $X_{max,j}$.

Weighting and aggregation are the final stages in creating a composite score. This study employs the indicators aggregation method. The outcome depends on the chosen sustainability metrics and their assigned weights. To assess variation among countries, standard deviation is measured and analyzed. According to OECD (2008) and N. J. E. B. Lior (2015), aggregation involves combining system-selected indicators, often by their weights, to produce a single statistic that facilitates comparison between countries over time.

The total composite sustainability index (TCSI) value is here determined using a method defined by the equation, based on determined values and weight coefficients:

$$TCSI_i^t = \sum_{j=1}^{j} W_{i,j}^t . Z_{i,j}^t \quad (2)$$

This method assumes (as usual) that the number of indicators is equal to the number of corresponding weights J, indexed as j=1, 2,..., J, where:

$TCSI_i^t$: The country-specific, dimensionless Composite Sustainability Index at time t. For country i at time t, $Z_{i,j}^t$ is the value of the normalized indicator z indexed by weight type j. J is the number of indicator types, which is equal to the number of corresponding weights employed; in this case, 19 indicators were selected, thus J=19. $W_{i,j}^t$: The weight at time t (%) or simply dimensionless, corresponding to each indicator zt i,j.

An indicator's weight quantifies its relative importance in the study. Creating a composite indicator rating involves weighting individual indicators, a crucial yet often arbitrary process. Weighting methods include expert or public survey feedback (e.g., budget allocation, analytical hierarchy process, and conjoint analysis), statistical techniques like equal weight allocation (where all indicators hold equal weight), and methods like principal component analysis (PCA), factor analysis (FA), data envelopment analysis (DEA), and regression analysis (RA) (ISPRA, 2008).

Unlike the indicators, which provide quantitative data about a country's environment, economy, and society, weights are subjective and can change over time. This study excludes the effects of weights, focusing solely on the indicators and effectively giving each the same weight. However, the impact of weights can be easily incorporated into the study if desired. This eliminates Eq. (2)

$$CSI_i = \frac{1}{j} \sum_{j=1}^{j} Z_{i,j} \quad (3)$$

so that the CSI_i (in%) represents the comparative sustainability position of countries i, ignoring time dependency and accurately computing the indicator-averaged CSI; that is, according to this technique, the higher the value of a country's CSI, the more sustainable it is.

The Input Data

The raw data of indicators to measure sustainable development is presented in Tables 2,3 and 4. An approach comprised of the traditional indicators used for economic progress is named the GDP-based approach. A new approach is introduced to incorporate other factors like quality of life, natural environment, Renewable energy resources, and social welfare called Beyond the GDP-based approach.

The approach named SDG-based includes indicators representing the basic characteristics of 17 sustainable development goals and data are extracted from the SDR United Nations database. A detailed explanation of indicators is mentioned in the appendix.

Table 1

Indicators used for presenting the GDP-based approach, Beyond the GDP and sustainable development in the South Asia Region

GDP-Based Approach	Beyond the GDP-Based Approach	SDG-Based Approach
GDP PC (current international $;+)	GDP PC (current international $;+)	Pub Edu Exp (% of GDP; +)
Unemp rate (% of labor force; -)	CPI (-)	Pub Health Exp (% of GDP; +)
Inf rate (%; –)	GINI (–)	Unemp rate (%; –)
Ind Growth (annual %; +)	Pub Edu Exp (% of GDP; +)	PD (physicians per 1000 people; +)
GDP growth (annual %; +)	Pub Health Exp (% of GDP; +)	Pop pov (%; –)
FDI Inf (% of GDP; +)	Exp G&S (% of GDP; +)	Ineq-adj HDI (+)
PC flow (% of GDP; +)	Rem received (% of GDP; +)	CPI (+)
BC to AR (%; –)	Ineq-adj HDI (+)	NR rent (% of GDP; +)
GS (% of GDP; +)	GI Index (–)	Imp WS (% of population with access; +)
Exp G&S (% of GDP; +)	Pop pov (%; –)	Ene imp (% of energy use; –)
Rem received (% of GDP; +)	Inf MR (in 1000; –)	Arable land (% of total land; +)
Pop pov (%; –)	Unemp rate (% of labor force; -)	Int Users(% of population; +)
Pub Health Exp (% of GDP; +)	CI (–)	CD Emis (tonnes; -)
Ener supply & FF (% of total;-)	Int Users(% of population; +)	Water dep (% of water received from neighbore countries; –)
Ene imp (% of energy use; –)	CD Emis (tonnes; -)	Adj Sav(% of gross national income (GNI);-)
CD emission (tonnes; -)	Ener supply & FF (% of total;-)	Ter and Mar area (% of total territorial area; +)
Arable land (% of total land; +)	Forest (% of total; +)	Urb Pop (%; –)
Water dep (% of water received from neighbore countries; –)	Water dep (% of water received from neighbore countries; –)	Pens recp (% of statutory pension age population; +)
Forest (% of total; +)	SPI (+)	Vulner Emp (% of the labor force engaged as unpaid workers;-)

Results from Analysis

The main objective of this study is to quantify the three different sets of indicators to assess the sustainable development progress of South Asian Countries. Tables 2,3 and 4 presented the raw values of indicators before normalization. Tables 5,6 and 7 depict the normalized values of all indicators and their Total Composite sustainability index (TCSI). The value of CSI is calculated by

Dividing the TCSI by a number of indicators. The value of CSI in percentage is used for the relative ranking of countries, which is presented in Table 8. Figure 1 depicts the comparative progress of economies by using the average values of CSI under the three approaches based on GDP, beyond the GDP, and SDG.

Following are the brief findings of the study and a summary of ranking results by approach.

By applying the GDP-based approach Bhutan, Maldives & Nepal have the highest ranking in the South Asia Region. Bhutan had the highest ranking in the list due to the highest industrial growth (40.63% --- highest in the list), Private capital flow (41.35%), zero dependency on water on neighboring countries, and Forest area (69.70% ---- highest in the list). Maldives, the second-ranked country showed the highest GDP per capita (6733.05 --- highest across the economies), foreign direct investment net inflows (7.66% -- highest among the countries), Exports of goods & services (75.51 %-- highest across the economies), Public health expenditures (8.64%) and independence of water resources. For Bhutan, it is due to Gross savings (33.19%--- 2nd highest among group countries), Remittances received (18.95%), public health expenditures (4.90% ---- 2nd highest among group countries), and Forest area (41.23%--- second highest among the sample).

Table 2

GDP Based Indicators

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
GDP PC (current international $;+)	1040.37	1272.51	964.61	2281.51	6733.05	670.18	2633.69
Unemp rate (% of labor force; -)	1.8	5.65	4.16	2.71	6.50	2.24	5.70
Inf rate (%; –)	7.85	6.22	6.31	4.16	3.11	6.39	7.86
Ind Growth (annual %; +)	19.15	28.21	25.32	40.63	10.46	14.92	28.23
GDP growth (annual %; +)	4.07	5.79	5.98	6.42	3.93	4.21	4.71
FDI Inf (% of GDP; +)	1.17	1.63	0.90	1.28	7.66	0.24	1.27
PC flow (% of GDP; +)	12.46	23.58	21.28	41.35	37.06	19.51	19.71
BC to AR (%; –)	8.78	7.231	5.64	14.203	21.356	11.215	8.39
GS (% of GDP; +)	16.5809	32.61	35.18	31.25	20.82	33.19	25.26
Exp G&S (% of GDP; +)	12.25	19.66	15.67	37.54	75.51	12.198	26.069
Rem received (% of GDP; +)	5.35	3.17	7.18	1.14	0.168	18.95	8.007
Pop pov (%; –)	40.42	29.63	36.18	14.47	8.2	25.2	8.73
Pub Health Exp (% of GDP; +)	2.76	3.68	2.33	3.79	8.64	4.90	3.92

Ener supply & FF (% of total;-)	60.16	68.25	66.55	0	0	11.58	45.42
Ene imp (% of energy use; –)	23.43	25.44	15.80	0	0	11.88	45.34
CD emission (tonnes; -)	0.81	1.29	0.33	0.93	2.64	0.194	0.75
Arable land (% of total land; +)	39.53	53.15	60.65	2.93	11.77	15.42	18.29
Water dep (% of water receive from neighbor countries; –)	76.17	30.52	91.44	0	0	5.71	0
Forest (% of total; +)	5.34	23.36	14.57	69.698	2.73	41.225	34.04

Bangladesh and India scored the 4th and 5th number consecutively in the Group countries. Srilanka and Pakistan are low ranked countries in the list due to the lowest GDP growth and other related indicators. Both countries are facing high inflation rates (7.86%, 7.85%) and public debt ratio to GDP (66.75%, 86.084%). In addition, Pakistan has the lowest industrial growth (19.15%--- lowest in the Group) and a big problem of poverty, there is 40.42 % population below the basic poverty line. Sri Lanka had the highest unemployment rate in the region (5.70%) and India had the second highest (5.65%). Pakistan and Sri Lanka have the lowest spending on public health (2.76%, 3.92%).

Table 3

Beyond the GDP-Based Approach Indicators

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
GDP PC (current international $;+)	1040.37	1272.51	964.61	2281.51	6733.05	670.18	2633.69
CPI (-)	104.25	107.73	108.82	113.67	103.75	111.67	98.29
GINI (–)	31.42	35.17	32.78	38.8	37	38.3	38.8
Pub Edu Exp (% of GDP; +)	2.45	3.44	1.95	6.02	4.48	3.82	2.123
Pub Health Exp (% of GDP; +)	3.23	3.68	2.33	3.79	8.64	4.9	3.92
Exp G&S (% of GDP; +)	12.26	19.66	15.67	37.54	75.51	12.198	26.069
Rem received (% of GDP; +)	5.35	3.17	7.18	1.14	0.168	18.95	8.008
Ineq-adj HDI (+)	0.37	0.44	0.43	0.46	0.55	0.41	0.67
GI Index (–)	0.55	0.55	0.57	0.48	0.37	0.49	0.405
Pop pov (%; –)	40.42	29.63	36.18	14.47	8.2	25.2	8.73

Inf MR (in 1000; –)	67.079	46.55	41.42	37.21	14.795	39.69	10.24
Unemp rate (% of labor force; -)	1.8	5.65	4.16	2.71	6.5	2.24	5.7
CI (–)	56.76	44.31	64.4	0	53.16	41.12	41.99
Int Users(% of population; +)	9.3	9.61	5.61	12.61	26.42	6.91	10.21
CD Emis (tonnes; -)	0.795	1.29	0.33	0.93	2.64	0.19	0.75
Ener supply & FF (% of total;-)	59.91	68.25	66.55	0	0	11.58	45.42
Forest (% of total; +)	5.34	23.36	14.57	69.71	2.73	41.22	34.04
Water dep (% of water receive from neighbor countries; –)	76.17	30.52	91.44	0	0	5.71	0
SPI (+)	5.31	4.59	4.72	5.21	5.2	4.69	4.328

While considering the social and human welfare aspects in the Beyond GDP-based approach, the countries ranking differs from the GDP-based approach. Maldives, Bhutan, and Sri Lanka are top-ranked countries. The Maldives replaced the Bhutan in ranking list and became the leading country in the South Asia region. A significant change was observed in Sri Lanka's position, which switched from six numbers to three in the group countries. Maldives is leading due to the highest public education expenditures (4.48% --- 2nd highest in the group) and health expenditures (8.64%--- highest in the group). In addition, Maldives had the highest percentage of exports of goods and services. Bhutan is spending the highest amount on education (6.02%) in the Group countries. Sri Lanka has improved its performance due to high GDP per capita (2633.69---- second highest in the group) and a good amount of exports of goods and services (26.07%). India remained in the middle order country due to high unemployment (5.65%), 3rd highest poverty level (29.63%), and the second highest infant mortality rate (46.55%). The low-ranking countries are Pakistan and Bangladesh in the Beyond the GDP approach.

Table 4

SDG Based indicators

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
Pub Edu Exp (% of GDP; +)	2.45	3.44	1.95	6.016	4.48	3.82	2.12
Pub Health Exp (% of GDP; +)	3.23	3.68	2.33	3.79	8.64	4.9	3.92
Unemp rate (%; –)	1.8	5.65	4.16	2.71	6.5	2.24	5.7

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
PD (physicians per 1000 people; +)	0.81	0.65	0.38	0.27	1.9	0.67	0.67
Pop pov (%; –)	40.42	29.63	36.18	14.47	8.2	25.2	8.73
Ineq-adj HDI (+)	0.37	0.44	0.44	0.46	0.55	0.41	0.67
CPI (+)	30.2	39	11.86	66	35.33	30.5	37.7
NR rent (% of GDP; +)	1.7	3.22	0.95	3.66	0.006	1.03	0.15
Imp WS (% of population with access; +)	36.87	0	55.83	33.31	0	26.31	0
Ene imp (% of energy use; –)	23.25	25.44	15.803	0	0	11.88	45.34
Arable land (% of total land; +)	39.49	53.15	60.65	2.93	11.77	15.42	18.29
Int Users(% of population; +)	9.3	9.598	5.96	12.61	26.42	6.898	10.21
CD Emis (tonnes; -)	0.795	1.29	0.33	0.93	2.64	0.19	0.75
Water dep (% of water receive from neighbor countries; –)	76.17	30.52	91.44	0	0	5.71	0
Adj Sav[% of gross national income (GNI);-)	1.33	1.57	0.68	2.069	0.006	0.74	0.07
Ter and Mar area (% of total territorial area; +)	9.79	3.48	4.89	48.007	0.05	23.63	3.38
Urb Pop (%; –)	35.015	31.051	30.6	34.54	35.697	16.88	18.33
Pens recp (% of statutory pension age population; +)	3	25.2	38	18.8	100	66.1	38.4
Vulner Emp (% of the labor force engaged as unpaid workers;-)	60.14	80.29	61.67	71.85	26.485	81.025	40.08

The integrated set of SDGS indicators demonstrates the ranking of countries as follows. The Maldives is the top-ranked country in the Beyond the GDP approach due to the highest public health expenditures (8.64% - highest in the listed countries) higher physician density (1.90-highest in the group), lowest population below the poverty line (8.2 %- lowest in member countries), old age pension benefit recipient is 100%. Bhutan is 2nd ranked country in South Asia. Bhutan is spending a big portion of the amount on the public education sector (6.016%--- highest in-

group members). It has covered the highest marine protected area (48.007%---highest in the group), and the vulnerable employment rate is also high with a percentage of 71.85. Nepal and Sri Lanka have switched their ranking with each other due to a change of indicators presenting the SDGs index. Nepal has scored a higher position than Sri Lanka due to higher old age pension benefits and vulnerable employment 66.1% and 81.025% consecutively. Bangladesh, India, and Pakistan are at the lowest ranks due to higher water dependency rates on neighboring countries i.e. 91.44%, 30.52%, and 76.17%. The poverty rate is also high in these countries. Pakistan´s population is facing a poverty rate (40.42%--highest in group countries).

Comparison of Different Approaches

Tables 5,6,7 and Fig 1 are used to represent the comparative result of three different approaches on the basis of CSI for ranking the countries. This study considers 7 countries and three approaches based on 19 different indicators to find out the cause-and-effect relationship among variables. This study is limited in its scope to only address the major aspect of ranking of group countries, it can be expanded to another aspect like sensitivity analysis by using different techniques i.e. weighting the indicators.

The factors contributing highly toward sustainable development in this group of countries are Gross domestic products, Socia Progress index, infant mortality, physician density, Forest area, Arable land, Foreign direct investment, Terrestrial & marine protected area, vulnerable employment, private capital flow, exports of goods & services and industrial growth.

The unemployment rate, crime index, Gender inequality index, and population below the poverty line are creating problems for these countries to achieve sustainable development. High inflationary trends and water dependency on neighboring countries in Pakistan are significant hurdles to achieving sustainability.

Results and Discussions on the Basis of Normalized Values.

In Table 5 the GDP base approach the conventional method and the calculation of CSI have categorized the countries in the same ranks. Bhutan, Maldives, and Nepal are the top-ranking countries in South Asia with values of 58.67, 56.92, and 53.67.

Table 5

Normalized Value GDP Based indicators

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
GDP PC (current international $;+)	6.11	9.93	4.86	26.58	100	0	32.39
Unemp rate (% of labor force; -)	100	19.42	51.04	80.31	0	91.47	21.09
Inf rate (%; –)	0	34.26	32.13	74.23	100	29.92	4.47
Ind Growth (annual %; +)	28.35	57.62	49.06	100	0	14.06	57.85
GDP growth (annual %; +)	11.5	77.04	88.76	100	0	18.72	35.3
FDI Inf (% of GDP; +)	11.22	17.77	8.55	11.9	100	0	12.77
PC flow (% of GDP; +)	0	33.82	27.35	87.02	100	22.42	17.22

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
BC to AR (%; –)	29.31	54.86	100	0	70.65	91.32	6.46
GS (% of GDP; +)	60.83	82.61	83.88	10.05	0	100	65.3
Exp G&S (% of GDP; +)	0	85.72	100	86.39	68.93	91.04	48.9
Rem received (% of GDP; +)	0.31	9.14	4.49	30.62	100	0	15.79
Pop pov (%; –)	27.66	15.6	36.57	3.6	0	100	40.77
Pub Health Exp (% of GDP; +)	0	47.89	24.18	77.57	100	45.67	95.82
Ener supply & FF (% of total;-)	6.43	19.72	0	19.17	100	42.55	23.76
Ene imp (% of energy use; –)	15.18	0	0.66	100	100	82.31	34.59
CD emission (tonnes; -)	49.39	36.99	67.04	100	100	71.66	0
Arable land (% of total land; +)	76.72	55.19	94.75	66.41	0.00	100.00	77.98
Water dep (% of water receive from neighbor countries; –)	63.89	87.39	100	0	16.12	21.59	28.09
Forest (% of total; +)	16.7	66.62	0	99.53	82.66	93.76	100
GDP PC (current international $;+)	3.81	30.54	17.39	100	0	56.85	46.08
TCSI	507.4	842.15	890.72	1173.36	1138.36	1073.34	764.62
CSI	25.37	42.11	44.54	58.67	56.92	53.67	38.23

Few studies are available in the South Asia region on this issue, as Sun, Mohsin, Alharthi, and Abbas (2020) focus on measuring environmental sustainability in their study. That study covers only the environmental aspect of sustainability with limited indicators, while this study covered a large set of indicators to represent the social, economic, and environmental aspects of sustainability. India, Sri Lanka, and Pakistan have the lowest CSI values i.e. 42.11, 38.23, and 25.37 in group countries. It is observed that India has the lowest value of CSI despite the fact that it has a significant development in many fields among other economies. Bhutan and Maldives have scored the highest ranking due to the abundance of natural resources and industrial growth.

Table 6

Normalized Beyond the GDP-Based Approach Indicators

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
GDP PC (current international $;+)	6.11	9.94	4.86	24.27	100	0	32.39

CPI (-)	54.7	34.6	26.97	0	70.98	5.83	100
GINI (–)	100	41.9	84.2	0.44	37.9	91.82	0
Pub Edu Exp (% of GDP; +)	15.69	41.78	2.96	100	59.1	50.92	0
Pub Health Exp (% of GDP; +)	5.94	19.72	0	20.59	100	42.55	23.76
Exp G&S (% of GDP; +)	0.31	9.14	4.49	29.6	100	0	15.79
Rem received (% of GDP; +)	27.66	15.6	36.57	3.6	0	100	40.77
Ineq-adj HDI (+)	0	21.99	15.25	38.5	63.73	6.21	100
GI Index (–)	15.57	6.66	0	21.5	100	28.77	91.34
Pop pov (%; –)	0	47.89	24.18	77.57	100	45.67	95.82
Inf MR (in 1000; –)	0	41.11	49.65	56.47	93.5	52.3	100
Unemp rate (% of labor force; -)	100	19.42	51.04	80.31	0	91.47	21.09
CI (–)	0	33.32	11.89	100	7.25	24.91	33.8
Int Users(% of population; +)	10.78	18.92	0	43.58	100	10.59	25.06
CD Emis (tonnes; -)	76.93	55.19	94.75	68.08	0	100	77.98
Ener supply & FF (% of total;-)	14.76	0	0.66	100	100	82.31	34.59
Forest (% of total; +)	3.81	30.54	17.39	100	0	56.85	46.08
Water dep (% of water receive from neighbor countries; –)	16.7	66.62	0	99.53	82.66	93.76	100
SPI (+)	55.09	25.83	24.69	100	51.31	16.39	0
TCSI	549.99	595.81	479.4	1157.44	1243	894.13	921.56
CSI	27.5	29.79	23.97	57.87	62.15	44.71	46.08

In Table 6 beyond the GDP-based technique, results are quite different from the GDP GDP-based approach. Maldives leads the group countries with a significant rise in CSI value 62.15 by using the social set of indicators. Over Maldives, Bhutan, and Nepal remained the highest-scoring countries with CSI values of 62.15, 57.87, and 44.71. Beyond the GDP-based approach, Sri Lanka improved its progress and jumped to 4th position. India remained in the same position. Bangladesh dropped its position from 4th to 7th number. Pakistan upgraded one rank to its position.

Table 7

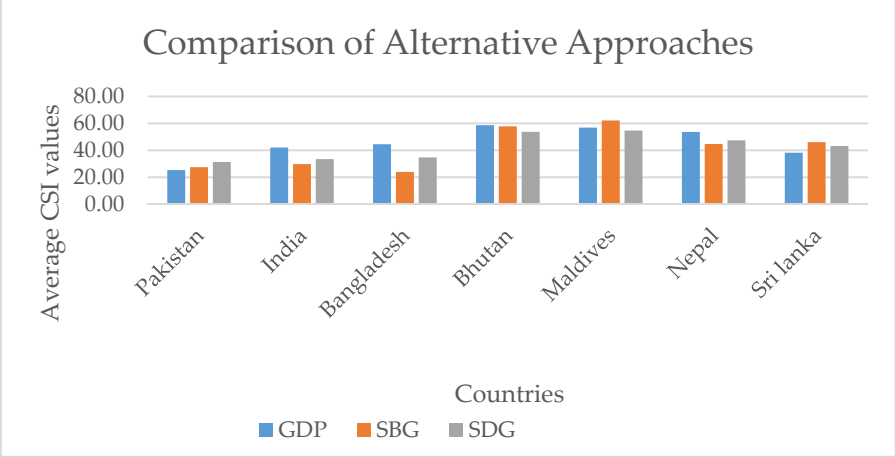
Normalized SDG Based indicators

Indicators	Pakistan	India	Bangladesh	Bhutan	Maldives	Nepal	Sri Lanka
Pub Edu Exp (% of GDP; +)	15.69	41.78	2.96	100	59.1	50.92	0
Pub Health Exp (% of GDP; +)	5.94	19.72	0	20.59	100	42.55	23.76
Unemp rate (%; –)	100	19.42	51.04	80.31	0	91.47	21.09
PD (physicians per 1000 people; +)	34.79	25.26	8.81	0	100	13.45	27.73
Pop pov (%; –)	0	47.89	24.18	77.57	100	45.67	95.82
Ineq-adj HDI (+)	0	21.99	14.69	38.5	63.73	6.21	100
CPI (+)	10.26	30.27	4.32	100	0	5.93	36.74
NR rent (% of GDP; +)	46.37	87.77	26.05	100	0	27.64	3.64
Imp WS (% of population with access; +)	65.85	0	100	59.93	0	46.7	0
Ene imp (% of energy use; –)	50	36.99	67.04	100	100	71.66	0
Arable land (% of total land; +)	63.77	87.4	100	0	16.14	21.6	28.1
Int Users(% of population; +)	10.78	18.92	0	43.58	100	10.59	25.06
CD Emis (tonnes; -)	76.93	55.19	94.75	68.08	0	100	77.98
Water dep (% of water receive from neighbor countries; –)	16.7	66.62	0	99.53	82.66	93.76	100
Adj Sav[% of gross national income (GNI);-)	36.4	26.16	67.46	0	100	65.31	97.26
Ter and Mar area (% of total territorial area; +)	20.34	7.17	10.11	100	0	49.17	6.96
Urb Pop (%; –)	4.6	25.14	26.5	5.49	0	100	93.28
Pens recp (% of statutory pension age population; +)	0	22.89	36.08	16.29	100	65.05	36.49
Vulner Emp (% of the labor force engaged as unpaid workers;-)	37.94	1.86	35.74	16.41	100	0	73.83
TCSI	596.32	636.12	660.53	1020.69	1038.96	901.09	820.4
CSI	31.39	33.48	34.76	53.72	54.68	47.43	43.18

Table 7 demonstrates the results of the SDG-based approach, in which Maldives (54.68), Bhutan (53.72), and Nepal (47.43) remained the top-ranked countries followed by Sri Lanka (43.18) and Bangladesh (34.76). India dropped its position from 5th to 6th number with CSI 33.48. Pakistan is at the lowest ranked in the GDP-based approach.

Figure 1

Composite sustainability index based on three different approaches named: GDP, Beyond the GDP, and SDG



Summary of Results on the Basis of Comparative Approaches

Table 8 demonstrates the ranking categories of countries by approach. There is a small ranking disparity observed in the results of applied approaches. Bhutan(1:2:2) and Maldives (2:1:1) are the top-ranked countries in applied approaches with small differences. Nepal(3:4:3) and India (5:5:6) also observed a small ranking disparity in different approaches. The disparity in ranking positions is greatest for Bangladesh (4:7:5) and Sri Lanka (6:3:4), with all other countries displaying differences of two or more ranking levels. Nepal's ranking is positioned in the middle of the group. India(5:5:6) and Pakistan (7:6:7) are low-ranked categories with a difference of one ranking level. Based on this methodology, the CSI values and rankings of Bangladesh and Sri Lanka among group countries diverge more noticeably.

Table 8

Ranking of countries on the basis of three applied approaches

Country and Approach	GDP-based approach	Beyond GDP-based Approach	SDG-based approach
Pakistan	7	6	7
India	5	5	6
Bangladesh	4	7	5
Bhutan	1	2	2
Maldives	2	1	1
Nepal	3	4	3
Srilanka	6	3	4

In this study different sets of indicators are used to construct the index in applied approaches, it is hard to provide general guidance on which approach is best for sample countries.

However, some important findings are as follows:

- All three approaches produce a top ranking for Bhutan and Maldives with small differences.
- Beyond the GDP-based approach ranked Bangladesh lowest in comparison to other approaches.
- GDP-based and SDG-based approaches ranked Pakistan lowest among group countries.
- Bhutan and Maldives ranked highest level in the GDP-based approach due to the abundance of natural resources and industrial growth.
- Generrally the GDP approach showed the highest values of CSI relative to other approaches.
- SDG-based approach depicts the improved value of CSI for Pakistan.
- Even though human well-being is equally important for countries under-developing, all emerging countries showed unsustainable economic results in this study. Nevertheless, it is a fact that these countries use the traditional GDP approach, or economic growth, to determine their sustainability level.
- They should adopt a Beyond-GDP and SDG-based strategy as soon as they reach a certain level of development and leave the tumultuous transition phase for a more stable one, for the benefit of both global and domestic sustainability.

Conclusion

This study aims to quantify sustainable development progress using different sets of indicators through a sustainability evaluation and analysis approach. Three sets of indicators are employed to measure SDG progress, covering economic, social, and environmental aspects. The study adopts three approaches: the GDP-based approach, focusing on GDP-related indicators; the Beyond-GDP approach, emphasizing human welfare and natural wealth; and the SDGs-based approach, which aligns with United Nations indicators. Each approach, using a limited number of indicators, is analyzed with "The Analysis Algorithm" using data from the South Asia region.

It is found that the main contributing factors toward sustainable development are FDI, GDP growth, Forest area, natural resources, marine protected area, water dependency, public debts, and corruption index. Bhutan (58.67, 57.87, 53.72) and Maldives (56.92, 62.15, 54.68) are the top-ranking countries under applied approaches with the highest CSI values. Nepal remained the middle country with the CSI value (53.67,44.71, 47.43). In the list of countries with low scores are Pakistan (25.37,31.39,27.5) and India (42.11,33.48,29.80), with Pakistan having the lowest ranking in GDP-based and SDG-based approach. Bangladesh dropped its ranking beyond the GDP-based approach relative to other approaches with CSI figures (44.54,34.76,23.97). Overall SDG-based approach depicts the improved value of CSI for Pakistan.

In conclusion, selecting indicators with comprehensive data is crucial for constructing effective composite indices that evaluate SDG progress at the national level. Changes in the distribution of SDG Index indicators and the inclusion of spillovers can significantly impact accuracy. The study suggests using customized SDG indices to enhance evaluations for specific regions and countries. Ranking economies using the SDG approach can help prioritize development projects and financing to achieve the SDGs. Recommendations for improving sustainability efforts are provided based on the study's findings. The results will guide policymakers on how different sets of SDG indicators affect sustainable development levels.

This study was applied to the South Asia region with three approaches with a limited set of indicators to represent the composite indices. This

study covers a limited sample due to the unavailability of data. It can be applied with extensive data sets on other regions. Further, this study can be expanded by comparative analysis among economies as well as approaches to attain better findings.

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