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An Analytical Exploration of the Indicator Framework for Post-2030 International Development Goals

Ichiro Sato*

Abstract

The target year of 2030 for the United Nations (UN) Sustainable Development Goals (SDGs) is fast approaching. While the international political discourse currently focuses on speeding up efforts to meet the SDGs, discussions will soon begin for establishing international development goals beyond 2030. Recognizing this need, this study proposes an indicator framework for the post-2030 international development goals based on a review of the challenges facing the SDG global indicator framework. The challenges include, among others, insufficient availability of indicator data, overlaps between some indicators, and indicators' misalignment with local contexts and monitoring needs of countries. Addressing such challenges, the proposed framework consists of three components: (a) a concise set of global core indicators that require all countries to provide data, (b) a long list of global optional indicators to be adopted by countries at their discretion, and (c) custom indicators to be developed by countries according to their respective policy priorities, monitoring needs, and local contexts. To examine the feasibility of identifying the global core indicators, this study undertook an analysis of official UN SDG data from 2000 to 2023, and selected 47 disaggregated indicators (DIs) utilizing statistical correlations between DI pairs. DIs are detailed indicators that are broken down from the original SDG indicators by indicator-specific categories such as age group, education level, or activity type. The analysis showed that the 47 core DIs could produce country SDG progress scores similar to those calculated with a much larger dataset of 1,112 DIs. The results indicated the usefulness of the proposed approach in selecting the global core indicators for the post-2030 international development goals while also highlighting the need to combine it with other complementary approaches to address its limitations.

Keywords: Sustainable Development Goals, SDGs, Indicator Framework, Positive Correlation

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1. Introduction

In 2015, the Sustainable Development Goals (SDGs) were adopted at the General Assembly of the United Nations (United Nations 2015), laying out the aspirations of the international community for sustainable development to be achieved by 2030. The SDGs consist of 17 goals and 169 targets. Progress toward the goals and targets is measured by the global SDG indicator framework developed and managed by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs), which includes 231 unique indicators (excluding overlapping indicators) as of January 2025. Despite the seemingly straightforward mechanism of progress monitoring, measuring the progress of SDGs and their targets using the indicators presents significant challenges.

1.1 Challenges involved in the SDG indicator framework

The most frequently cited challenge with the SDG indicators is data deficiency (e.g., Dang and Serajuddin 2019; Nilashi et al. 2023). The United Nations (UN) has published the Sustainable Development Goals Report annually since 2016 to disseminate information on global progress toward the SDGs. The report has repeatedly highlighted the insufficient availability and timeliness of data as a major challenge. The most recent report for 2024 pointed out that although the data coverage has steadily improved, about half of the indicators had not been populated with at least two data points since 2015 for more than half of all countries (United Nations 2024a).

There are multiple reasons behind this data gap. First and foremost, the sheer volume of data required for SDG indicators overwhelms the statistical capacity of many countries (Nilashi et al. 2023). While the number of unique SDG indicators is 231, many indicators have sub-indicators organized by "series." As of January 2025, there were more than 800 data series registered in the SDG Data Structure Definition managed by the IAEG-SDGs (IAEG-SDGs 2024). Furthermore, some sub-indicators require data disaggregation based on various attributes, such as age, sex, area type (urban/rural), education level, disability status, occupation, income level, product type (e.g., crops, clothing, and fossil fuels), and activity type (e.g., manufacturing, services, and agriculture). Although not all data are required from all countries, the immense volume and complexity of data requirements pose significant challenges for data compilation, particularly for countries with limited statistical capacity and resources. A report by the Global Partnership for Sustainable Development Data (2016) estimated that the total cost for low- and middle-income countries to provide data for SDG indicators could amount to USD 44–45 billion over the period from 2015 to 2030. Another reason for these challenges is related to the "country first" approach of SDG data collection, where official data provided by member states are prioritized over data from international organizations (MacFeely 2020). Although countries' claims to ownership of data used to monitor progress toward SDGs is understandable, it creates a heavy burden of data collection on countries, leads to a low rate of data sufficiency, and raises issues of data quality, comparability and consistency (MacFeely 2020).

Redundancy of indicators is another problem, potentially creating confusion and unnecessary burdens of data compilation. Some overlaps of indicators are officially acknowledged; as of January 2025, 13 indicators serve multiple targets (United Nations, n.d.). While such overlaps are not inherently problematic, other indicators are quite similar yet treated as distinct, unique indicators (Dang and Serajuddin 2019). For example, the indicator "11.7.2 Proportion of persons victim of non-sexual or sexual harassment, by sex, age, disability status and place of occurrence, in the previous 12 months" is similar to the indicator "16.1.3 Proportion of population subjected to (a) physical violence, (b) psychological violence and/or (c) sexual violence in the previous 12 months," but they are treated as different unique indicators. Partial overlaps at the series or disaggregated data level can also be observed. For instance, the indicator "5.5.1 Proportion of seats held by women in (a) national parliaments and (b) local governments," and the indicator "16.7.1 Proportions of positions in national and local institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to national distributions, by sex, age, persons with disabilities and population groups" exhibit a partial overlap. Furthermore, there is potential redundancy between many indicators due to their close linkages to each other although this type of overlaps may not be immediately apparent. It is well known that positive linkages[1] can be observed between many pairs of SDG indicators (e.g., Anderson et al. 2022; Lusseau and Mancini 2019; Warchold et al. 2022). Based on this observation, some scholars suggested streamlining the number of indicators by leveraging these interlinkages (Shuai et al. 2021).

The incompleteness of the indicator set also poses a challenge. Some SDG targets are broad, ambiguous, complex, multifaceted, or any combination of these characteristics. Arguably, the current set of SDG indicators, despite their large number, is not capable of capturing the full dimensions of all targets (MacFeely 2020). Based on this understanding, Kim (2023) argues that SDG indicators should be augmented rather than streamlined. One of his proposed approaches to augmentation is to add more indicators until the most critical aspects of the targets are adequately captured.

[1] Throughout this article, a positive correlation or a positive linkage refers to a relationship between a pair of variables where if one variable increases, the other also does so.

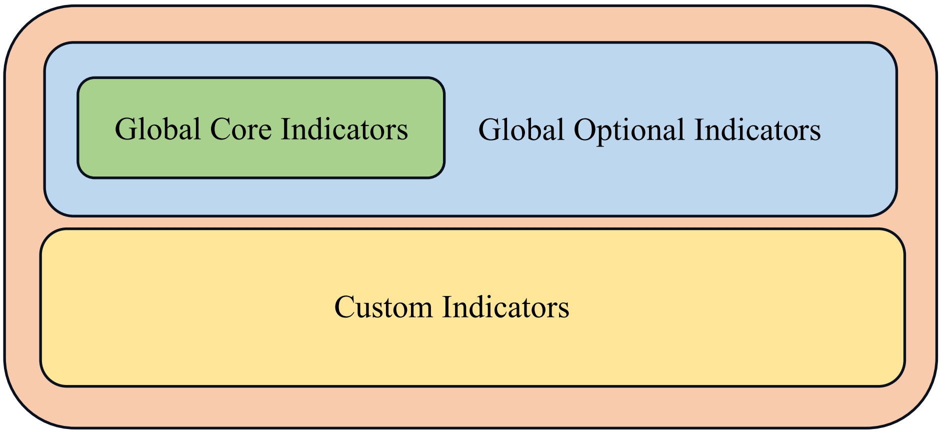
1.2 A possible approach to designing the indicator framework for post-2030 international development goals

According to the resolution adopted by the UN General Assembly (United Nations 2017), the global SDG indicators are to be refined annually, with comprehensive reviews occurring in 2020 and 2025. These processes have led to significant improvements in the clarity and specificity of individual indicators. A notable example is the elimination of Tier 3 indicators[2]—62 indicators that lacked internationally established methodology or standards as of May 2018 (Kapto 2019). Tier 3 indicators were phased out following the 51st session of the United Nations Statistical Commission held in 2020 (IAEG-SDGs, n.d.).

However, any fundamental reform of the global SDG indicator framework to address the perceived challenges mentioned above does not seem practically feasible. Rather, it is deemed more realistic to establish a new indicator framework for international development goals after 2030, the target year of the SDGs, building on the experience of monitoring the SDGs. While there is no consensus on what such post-2030 development goals may look like, UN member states have agreed to discuss how to advance sustainable development after 2030 at the UN General Assembly in September 2027 (United Nations 2024b). This suggests that some form of post-2030 international goals for sustainable development will likely be agreed upon, including the option of extending the current SDGs beyond 2030 (Fuso Nerini et al. 2024). When the post-2030 platform is discussed, it is important to allocate sufficient time to discussing its indicator framework. Without the support of an effective indicator framework to monitor progress and achievements, defining meaningful goals and targets will be challenging.

To contribute to these discussions, I propose an indicator framework for the post-2030 international goals for sustainable development (Figure 1). The framework consists of global indicators, represented by the top row of Figure 1 and custom indicators, on the bottom row.

[2] SDG indicators adopt a tier classification system. Tier 1 indicator is "conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant." (IAEG-SDGs, n.d.) Tier 2 indicator is the same as Tier 1 indicator except its data are not regularly produced by countries. Tier 3 indicator lacks internationally established methodology or standards.



Source: the author

Figure 1: Proposed indicator framework for post-2030 international development goals
Custom indicators are set by regional organizations, national governments, or local authorities.

The global core indicators form a subset of the global indicators, and all member states are required to provide data for the core indicators regularly by conforming to internationally established methodologies and standards. The purpose of setting core indicators is to reduce the burden of data collection and compilation for countries, compared to the current SDG indicator framework, and still make it possible to monitor the general progress towards the goals at the global and country levels. By limiting the number of indicators with data submission requirements, countries can concentrate their resources on improving the data quality of core indicators. The resource concentration could also be applied to external statistical capacity development support for developing countries.

The global optional indicators include all global indicators except the core indicators, and the use of optional indicators is at the discretion of individual countries based on their respective development strategies. The optional indicators are provided as a long list of potentially valuable metrics that countries can use to monitor the progress of their sustainable development, accompanied by the guidance of methodologies and standards for data compilation. Such a list may be beneficial for countries with limited statistical capacity and resources.

Custom indicators are any indicators that are not included in the global core or optional indicators, which are set at the regional, national, or local level. They include ones adapted from global indicators or unique ones. To highlight the importance of custom indicators, Chen et al. (2024) provide useful insights for understanding SDG data gaps and suggest three aspects that potentially affect countries' data provision: applicability, relevance, and priority. Some SDG indicators apply to only a subset of member states (e.g., "14.5.1 Coverage of protected areas in relation to marine areas" does not apply to landlocked countries). Some other indicators may be applicable but not relevant to certain countries (e.g., "17.3.2 Volume of remittances as a proportion of total GDP" may be irrelevant to some countries where remittances from overseas do not play an important role in the economy). Yet other indicators may be applicable and relevant but not a priority for some countries.

Chen et al. point out that while the applicability can be assessed objectively, relevance and priority depend on the local political contexts and policy priorities, which are inherently tied to the subjective perceptions of individual countries. This subjectivity makes it difficult to develop common global indicators that are meaningful for all countries and, at the same time, underscores the merit of giving a greater role to custom indicators. If countries regard some indicators as neither relevant nor a priority for them, they are less likely to invest resources in the data compilation for such indicators, just for the sake of populating cells of spreadsheets. What they may choose to do, instead, is to provide proxy data—if available—for the indicators, raising concerns over cross-country comparability. Given these ongoing data gaps and data comparability issues, it is likely that there are more than a few SDG global indicators that are neither relevant nor a priority for many countries. If this is the case, greater emphasis should be given to the use of custom indicators, which are tailored to specific local contexts and priorities.

The underlying assumption of this proposal for the greater use of custom indicators is that member states will seek to maintain the "country first" approach for the indicator framework of the post-2030 development goals. As an alternative approach, countries may rely more on international organizations to compile global indicator data on their behalf, thereby reducing the burden of data compilation, standardizing data quality, and improving data comparability. As such, progress monitoring based on a combination of global and custom indicators resembles the monitoring mechanism of the Paris Agreement under the UN Framework Convention on Climate Change. This mechanism is primarily based on voluntarily submitted Nationally Determined Contributions, while global progress is monitored by, for example, global greenhouse gas emissions or global mean temperature. In both cases, countries (or local authorities) have the discretion to decide how they contribute to the global goals by setting their own targets and indicators in line with local contexts and political priorities.

1.3 Purposes and relevance of this study

The components of the proposed indicator framework depicted in Figure 1 are not novel. Scholars and experts have called for streamlining global indicators (Lyytimäki 2019; van Vuuren et al. 2022). The use of the custom indicators is already integrated into the current SDGs indicator framework (Kanie 2020). The UN General Assembly resolution that established the SDG indicator framework explicitly states that global indicators "will be complemented by indicators at the regional and national levels, which will be developed by Member States" (United Nations 2017 para. 1). What is intended in this framework is to reinvigorate the use of custom indicators.

One of the principal factors determining the practicality of the proposed framework is the feasibility of identifying the core indicators that are significantly fewer in number than the SDG indicators while remaining theoretically sound and acceptable for use by all countries. There are multiple approaches to selecting such core indicators. For example, they may be selected and agreed upon through consultations and negotiations among experts and stakeholders. The global SDG indicators were developed using this approach, with statistical experts representing member states of IAEG-SDGs—in consultation with international agencies specialized in the subject matter of respective SDGs and a few civil society representatives—discussing and determining the global indicators (Kapto 2019). Another common approach is based on a set of explicitly defined selection criteria (hereafter called "the criteria-based approach"), which may include both qualitative and quantitative factors. A well-known example of this type of approach is the methodology used to produce the Sustainable Development Goals Index, where indicators are selected based on five criteria: global relevance and applicability, statistical adequacy, timeliness, coverage, and measurability of distance to targets (Sachs, Lafortune, and Fuller 2024). Similarly, a study by van Vuuren et al. (2022) used seven criteria to identify 36 targets and corresponding indicators to measure the progress toward the SDGs.

Although these are all legitimate approaches, they still run the risk of producing indicator redundancy—as explained in Section 1.1—if considerations of interlinkages between indicators are not adequately taken into account. To mitigate the issue of redundancy, there is an alternative approach to narrowing down indicators by eliminating overlaps by leveraging statistical analyses. While there is a vast volume of literature investigating interlinkages between goals, targets, and indicators of SDGs (e.g., Anderson et al. 2022; Asadikia, Rajabifard, and Kalantari 2021; Laumann et al. 2022; Lusseau and Mancini 2019; Pradhan et al. 2017; Warchold et al. 2022), only a few studies use the interlinkages to select a set of SDG indicators. Among them, Kubiszewski et al. (2022) found that only eight SDG indicators can represent 84% of the variance in life satisfaction survey scores of countries. The eight indicators were identified through the least absolute shrinkage and selection operator (LASSO) algorithm. Using statistical correlation between indicators, Shuai et al. (2021) identified 147 indicators that can explain more than 90% of the annual variation in 351 World Bank SDG indicators although the number of the selected indicator is not significantly smaller than that of the official SDG indicators. Zong et al. (2023) identified priority indicators at the provincial level in China using network analysis and the order of preference by similarity to the ideal solution (TOPSIS) technique. However, no studies so far have proposed a statistical methodology for identifying a relatively small set of indicators that can roughly represent countries' overall progress in SDGs using the official SDG indicator data.

Based on the understanding described thus far and to address the above-mentioned research gap, this study proposes and demonstrates a statistical approach to identifying the core indicators included in the proposed indicator framework for post-2030 international development goals. It is imperative to make it clear from the outset that a statistical approach cannot be used in isolation to determine the core indicators. Rather, it is envisaged for use in combination with other approaches, such as the criteria-based approach whose examples are given earlier in this sub-section.

2. Materials and methods

Although this study proposes and demonstrates an approach to identifying the global core indicators for the post-2030 international development goals, it uses the current SDG indicators and the official SDG indicator dataset. This is because it is not possible to prejudge the post-2030 development goals and their indicators. Based on the assumption that the post-2030 framework will retain the "country first" approach, the use of current official SDG indicator data has merit for demonstration purposes, as it provides a realistic setting of data availability and characteristics.

2.1 Materials

This study uses the official SDG indicator data downloaded from the SDG Indicators Database (United Nations Department of Economic and Social Affairs, n.d.) on September 18, 2024. This study used data for the Tier 1 indicators based on the tier classification by IAEG-SDGs (IAEG-SDGs, n.d.) as of March 6, 2024, which was the most recent classification available at the time of undertaking the analysis. According to the tier classification, Tier 2 indicators differ from Tier 1 indicators in that data are not regularly produced by countries. This study excluded Tier 2 indicator data to improve the reliability of correlation analyses to be undertaken at a later stage by using indicators with reasonably good data availability. Thus, the Tier 1 indicator data for all countries and areas—where data were available—were extracted for the period from 2000 to 2023. Non-numerical data were eliminated.

The official SDG indicator data have many attributes. All data have attributes of country[3], year, SDG indicator number, and series code (uniquely assigned to each data series). Some data additionally have one or more disaggregation attributes (e.g., sex, age group, and income level)

[3] The attribute, "country," comprise country and sub-national area because some SDG indicators include data for both countries and sub-national administrative areas. Examples of the latter include Puerto Rico (the United States), French Polynesia (France), and Greenland (Denmark). For simplicity, however, the attribute is called "country" throughout this article.

depending on the indicator. For ease of data management and analysis, a composite attribute was created, combining the SDG indicator number, series code, and all relevant disaggregation attribute(s). This composite attribute is hereafter called "disaggregated indicator" (DI). For instance, "3.2.1_under five mortality rate/male", "3.2.1_under five mortality rate/female", and "3.2.1_under five mortality rate/both sex" are treated as different DIs, and a unique DI code is assigned to each. An example of DI having multiple disaggregation attributes is "16.2.2_detected victims of human trafficking/male/under 18 years of age."

Then, all extracted data were grouped into five different year periods corresponding to the years 2000–2004, 2005–2009, 2010–2014, 2015–2019, and 2020–2023. If two or more data points had the same combination of DI, country, and year period, their average value was used. Based on the data processing thus far, all data have three attributes, i.e., DI, country, and year period.

Further, several data screening procedures were applied. DIs with binary data entry and zero variance across all countries within the same year period were removed.[4] Indicator 13.2.2 regarding greenhouse gas emissions has two data series, i.e., the one for Annex-I countries and the other for non-Annex-I countries of the UN Framework Convention on Climate Change. These two data series were collapsed into one new data series that included all countries. To improve the reliability of correlation analyses to be undertaken at the later stage, DIs with data from less than 100 countries, regardless of the year period were removed. As for overlapping indicators, only DIs related to the indicator of the smallest goal number were retained while others were removed. For example, Indicator 7.b.1 overlaps with 12.a.1 and, thus, DIs related to 12.a.1 were removed to avoid duplication in the dataset to be used for analyses.

Some indicators have two data series for the same metric of interest, i.e., one for a simple value, and the other for a relativized value. For example, indicator 1.5.1 Number of people affected by disasters has two data series, one for the number of affected people and the other for the number of affected people per 100,000 population. Where there were two such data series, the DIs for simple values were removed. For indicators that had no data series of a relativized value but a relativized value was deemed preferable for correlation analyses in the later stage, the data for the DIs related to such indicators were relativized by either population, current or constant Gross Domestic Product (GDP) (current or constant 2015 United States Dollar (USD)), or territory's land area. The data for population and GDP were retrieved from the World Development Indicators (World Bank, n.d.). The choice between the use of current or constant GDP was made

[4] DIs with binary data entry are typically those that count the number of countries that meet set criteria (1 = meeting criteria, 0 = not meeting criteria). An example of DIs with zero variance across all country/area within the same year period is 10.6.1 Proportion of voting rights of developing countries in the UN General Assembly (or other institutions where all member states have the voting right with an equal weight).

depending on the unit of measurement for the value to be relativized. For instance, the data for 1.5.2 Direct economic loss attributed to disasters is provided in the current USD. Thus, the values of DIs related to this data series were relativized by the current USD. A five-year average of population and GDP (current and constant) were calculated for the respective country and year period to be applied to the relativization. Data for the territory's land area is included in the official SDG dataset as a data series of indicator 15.1.1. The data for the closest year of the countries and the year period was used. The list of data series whose related DI data were relativized is provided as Table A-1 in the Appendix.

As a result of these screening processes, the remaining dataset had 1,033 DIs, which belonged to 148 indicators and 335 data series.

2.2 Methods

In this study, the core indicators were selected based on the number of positive correlations with other indicators. In principle, indicators with more positive correlations with others are preferred in the selection over those with less correlations. The reason for this selection criterion is that the data for the core indicators can be used to estimate the data of other indicators that are correlated with the core indicators using statistical models of the observed correlations. The core indicators are intended for enabling rough assessments of countries' progress towards development goals and targets but not for developing effective policies and measures to advance towards them. For the latter purpose, more detailed indicators and the understanding of causal relationships between them will be necessary, which is beyond the scope of this study. Trade-off correlations were not counted when selecting the core indicators because efforts should be made to change the trade-off relationships and, therefore, they could not be assumed to be left unchanged.

The correlation analysis for selecting the core indicators was undertaken at the DI level rather than the indicator level or data series level because it was anticipated that, for some data series, DIs with disaggregated attributes could have more positive correlations than the corresponding DIs without them. For example, a DI with the attribute of female might have more positive correlations than the corresponding DI for both sexes. More concrete examples are given in the paragraph right after Table 1. Therefore, the core indicators were selected at the DI level. Henceforth, they are called the "core DIs."

Before undertaking the correlation analysis, DIs were classified into two groups; the first group included the more-is-better type of DIs (e.g., the proportion of the population using basic drinking water services), and the second included less-is-better DIs (e.g., the proportion of population below the international poverty line). The data values of the latter groups were multiplied by -1.

By this procedure, if the sign of a correlation coefficient of a pair of DIs is plus (+), the DI pair is considered to have a positive linkage. If the sign is minus (-), the correlation represents a trade-off relationship. In some cases, it was not clear whether a DI fits in the more-is-better or less-is-better group. In such cases, the judgment was made according to the intention of the SDG target that the DI belonged to. For instance, it is not objectively clear whether a large agriculture value-added share of GDP is good, as it will depend on each country's development strategy. However, because it belongs to target 2.a, which is intended to enhance agricultural productive capacity in developing countries, a large agricultural share of GDP is regarded as better. This dataset, for which less-is-better DIs were multiplied by -1, was used for the subsequent analysis unless otherwise stated.

The correlation analysis was undertaken in four stages.

In the first stage, a rough screening was implemented to detect correlations between all possible pairs of DIs through Spearman's rank correlation analysis (Spearman 1904) because it can capture both linear and non-linear monotonic correlations (Pradhan et al. 2017). For each pair of all possible combinations of DIs, a data value of one DI was matched with the data value of the other DI for the same country and year period. The number of matches made varied widely among respective DI pairs due to the difference in data availability. Spearman's rank correlation coefficient was calculated only when a DI pair had 50 or more data matches, in consideration of the reliability of the calculated coefficients. Furthermore, the analysis was not undertaken for any pairs of DIs that belonged to the same SDG indicator. This exclusion was necessary to avoid a selection bias in the later stage of core DI selection towards DIs that belonged to indicators that had many disaggregation attributes. This is because such DIs would naturally have many correlations with other DIs under the same indicator. Thus, only cross-indicator interlinkages were analyzed. A DI pair was considered to have a positive correlation when the calculated Spearman's rank correlation coefficient was larger than 0.8 and a trade-off when it was less than -0.8.

In the second stage, the preliminary selection of DIs in each SDG was undertaken. For each SDG, the top five DIs were selected based on the number of positive correlations they have with other DIs. Trade-off correlations were disregarded. Readers are reminded that correlations between DIs belonging to the same SDG indicators were not analyzed and, therefore, not counted in this process. When the top DI was selected, it was removed from the pool of DIs, and all records of correlations involved in the top DI were deleted from the linkage dataset before selecting the second DI to avoid double counting. The same procedure was repeated until the fifth DI was selected or there was no longer any correlation linkage left in the dataset that involved the remaining DIs under the SDG in question. If multiple DIs had the same number of positive correlations, the DI with the data values covering the largest number of countries was selected. The DIs selected from 17 SDGs form a group of candidate DIs.

In the third stage, the simple linear ordinary least squares regression analysis was applied to all positive linkages that each candidate DI (selected in the second stage) had. This analysis used a dataset in which less-is-better DIs were not multiplied by -1. Three functional forms, i.e., (a) linear, (b) exponential, and (c) logarithmic, were used to model the relationship of each pair, as described in the following equations:

$$\mathrm{x}_{it}{}^{*} = \begin{cases} x_{it}, & if \;\; x_{min} > 0 \\ x_{it} + 1 - x_{min}, & if \;\; x_{min} \leq 0 \end{cases}, \tag{1}$$

$$\mathrm{y}_{it}{}^{*} = \begin{cases} y_{it}, & if \;\; y_{min} > 0 \\ y_{it} + 1 - y_{min}, & if \;\; y_{min} \leq 0 \end{cases}, \tag{2}$$

$$(a)\ linear\text{:}\ \mathrm{y}_{it}{}^{*} = \alpha \mathrm{x}_{it}{}^{*} + \beta + \epsilon_{it}\ , \tag{3}$$

$$(b)\ exponential\text{:}\ ln\, \mathrm{y}_{it}{}^{*} = \alpha \mathrm{x}_{it}{}^{*} + \beta + \epsilon_{it}\ , and \tag{4}$$

$$(c)\ logarithmic\text{:}\ \mathrm{y}_{it}{}^{*} = \alpha\ ln\, \mathrm{x}_{it}{}^{*} + \beta + \epsilon_{it}\ , \tag{5}$$

where x_{it} denotes a data value for a candidate DI (i.e., *x*) in country i in year period *t*; y_{it} represents a data value for a DI (i.e., *y*) with a positive linkage with x in country *i* in year period *t*; x_{min} and y_{min} are the minimum values of *x* and *y*, respectively; α and β are regression coefficients to be estimated; and ϵ_{it} denotes the error term. $\mathrm{x}_{it}{}^{*}$and $\mathrm{y}_{it}{}^{*}$are adjusted values of x_{it} and y_{it} in case their minimum values are zero or negative so that the logarithm of $\mathrm{x}_{it}{}^{*}$ and $\mathrm{y}_{it}{}^{*}$ exist for all data values of *x* and *y*. Theoretically, the monotonic positive correlations detected by Spearman's rank correlation analysis could be better represented by other functional forms except the above three. However, only these three were applied for simplicity. After estimating the regression models for a pair of DIs using the three functional forms, the best model with the largest coefficient of determination (typically notated as R^2) among the three was selected. If the largest coefficient of determination was less than 0.64, no model was adopted, and it was determined that there was no positive linkage for the pair.

In the fourth stage, the core DIs were selected from the candidate DIs. The selection was based on the number of positive linkages that each candidate DI had, as determined in the third stage. First, the DI that had linkages with the largest number of indicators was selected. These indicators included the one to which the selected DI directly belonged, as well as others that were connected through the confirmed positive linkages with DIs under them. Then, the first DI was removed from the group of candidate DIs, and all positive linkages involving the first DI were deleted from the linkage records to avoid double counting. Next, the second DI was selected based on its linkages with the largest number of new indicators, excluding those already connected to the first DI. After selection, the second DI was removed from the group of candidate DIs, and all positive linkages involving the second DI were deleted to prevent double counting. This process was repeated until no more linkages with a new indicator could be formed by selecting any one of the remaining DI candidates. If multiple DIs had linkages with the same number of additional indicators, the DI with the data values that covered the largest number of countries was selected. The selection process continued by selecting the DI that had the largest number of positive linkages among the remaining candidates, and the linkage records were deleted. If multiple DIs had the same number of positive correlations, the DI with data values covering the largest number of countries was selected. This process was repeated as long as the inclusion of the additional DI formed six or more new positive correlations with other DIs. This termination threshold was arbitrary and allowed consideration of two competing objectives: the first was to increase the number of positive correlations that the selected core DIs collectively have with other DIs, and the second was to reduce the number of the core DIs. The process resulted in a set of DIs that formed the core DIs.

After the core DIs were selected, their ability to represent the characteristics of all DIs under each SDG was assessed. This assessment was conducted by comparing two scores for each country for each SDG—that is, the one calculated with the core DIs (hereafter called "estimated score"), and the other calculated with all DIs that remained after the screening process described in Section 2.1 above (hereafter called "reference score"). The country (or area) score was calculated using the following equation:

$$S_G^a = \frac{1}{n^G}\sum_{j=1}^{n^G}\left\{\frac{1}{m^j}\sum_{k=1}^{m^j}\left(\frac{x_a^{jk} - x_{min}^{jk}}{x_{max}^{jk} - x_{min}^{jk}}\right)\right\}, \quad (6)$$

where S_G^a denotes the score for country a for goal G, n^G denotes the number of indicators under goal G, m^j denotes the number of DIs under the j-th indicator of goal G, x_a^{jk} denotes the data value for country a of k-th DI under the j-th indicator, x_{max}^{jk} and x_{min}^{jk} denote the maximum and minimum data value, respectively, among all countries' values of k-th DI under j-th indicator. With equation (6), reference scores were calculated using all available DI data values, whereas estimated scores were calculated using the DI data values of the core DIs and estimated data values of DIs that had positive correlations with the core DIs. DIs with data for less than 50 countries were not used for the calculation of the reference scores. The estimations of the data values of the correlated DIs were conducted using the regression models established in the third stage. If a DI had correlations with multiple core DIs, the average of the values estimated from the relevant core DIs was used for the data value of the DI.

3. Results and discussions

As a result of Spearman's rank correlation analysis (the first stage of the analysis), correlations were found for a total of 674 pairs of data series, among which 96% showed positive linkage and 4% were trade-offs. No pair of data series had both positive and trade-off correlations. Likewise, correlations were found for 383 pairs of indicators, among which 95% showed positive linkage only, and 4% were trade-off only. Two pairs of indicators (indicator pairs 7.1.2-8.4.2 and 8.3.1-8.4.2) had both positive and trade-off correlations among different pairs of data series under them. Overall, positive linkages outweigh trade-off linkages, which corroborated the results of existing studies (e.g., Warchold et al. 2022; Warchold, Pradhan, and Kropp 2021).

The fourth stage of the analysis described above resulted in a group of 29 DIs selected as the core DIs (Table 1). Collectively, they had 287 confirmed positive linkages with other DIs, not including linkages within the core DIs, based on the regression analysis in the third stage. The regression models that best fit the 287 linkages consisted of 115 linear, 98 exponential, and 74 logarithmic models. It should be noted that the core DIs are selected by a statistical analysis and, therefore, the inclusion in Table 1 does not necessarily mean the indicators' intrinsic value to represent the goals they belong to.

Table 1: List of core DIs

Order of selection	Indicator number	Data series	Direction of progress	Disaggregation attributes	Additional indicators covered	Additional DI linkages
1	3.2.1	Under-five mortality rate, by sex (deaths per 1,000 live births)	↓	Both sexes	25	24
2	3.8.1	Universal health coverage (UHC) service coverage index	↑		6	22
3	8.a.1	Total official flows (disbursement) for Aid for Trade, by recipient countries (millions of constant 2022 United States Dollar (USD)): transformed relative to millions of constant 2015 USD	↑		4	3
4	8.3.1	Proportion of informal employment, by sector and sex – 13th International Conference of Labour Statisticians (ICLS) (%)	↓	Female, 15 years +, All activities	3	21
5	15.1.2	Average proportion of Terrestrial Key Biodiversity Areas (KBAs) covered by protected areas (%)	↑		3	2
6	17.11.1	Developing countries' and least developed countries' share of global merchandise imports (%)	↑		3	2
7	5.5.1	Proportion of seats held by women in national parliaments (% of the total number of seats)	↑		2	1
8	1.a.1	Official development assistance grants for poverty reduction, by recipient countries (percentage of Gross National Income)	↑		2	1
9	10.5.1	Regulatory capital to assets (%)	↑		2	1
10	3.1.1	Maternal mortality ratio	↓		1	17
11	1.4.1	Proportion of population using basic sanitation services, by location (%)	↑	Both urban and rural	1	15
12	9.5.2	Researchers (in full-time equivalent) per million inhabitants (per 1,000,000 population)	↑		1	9
13	8.6.1	Proportion of youth not in education, employment or training, by sex and age – 19th ICLS (%)	↓	Female	1	8
14	17.9.1	Total official development assistance (gross disbursement) for technical cooperation (millions of 2022 USD): transformed relative to millions of 2015 constant USD	↑		1	1
15	6.3.1	Proportion of safely treated domestic wastewater flows (%)	↑		1	1
16	1.a.2	Proportion of total government spending on essential services (%)	↑		1	1

17	5.3.1	Proportion of women aged 20–24 years who were married or in a union before age 18 (%)	↓		1	1
18	3.2.2	Neonatal mortality rate (deaths per 1,000 live births)	↓	Both sexes	0	16
19	6.1.1	Proportion of population using safely managed drinking water services, by urban/rural (%)	↑	Both urban and rural	0	15
20	3.9.1	Age-standardized mortality rate attributed to household air pollution (deaths per 100,000 population)	↓		0	13
21	4.1.2	Completion rate, by sex, location, wealth quintile and education level (%)	↑	Male, Primary education, Both urban and rural, All income levels	0	12
22	4.5.1	Adjusted location parity index for completion rate, by sex, wealth quintile, and education level	↑	Both sexes, Lower secondary education, All income levels	0	12
23	7.1.1	Proportion of population with access to electricity, by urban/rural (%)	↑	Both urban and rural	0	11
24	7.1.2	Proportion of population with primary reliance on clean fuels and technology (%)	↑	Rural	0	11
25	4.a.1	Proportion of schools with access to electricity, by education level (%)	↑	Primary education	0	11
26	17.6.1	Fixed broadband subscriptions per 100 inhabitants, by speed (per 100 inhabitants)	↑	All speed	0	9
27	1.1.1	Proportion of the population below the international poverty line (%)	↓	Both sexes, Both urban and rural, All ages	0	7
28	4.1.1	Proportion of children and young people achieving a minimum proficiency level in reading and mathematics (%)	↑	Both sexes, Primary education, Reading	0	7
29	17.8.1	Proportion of individuals using the Internet (%)	↑	Both sexes	0	6

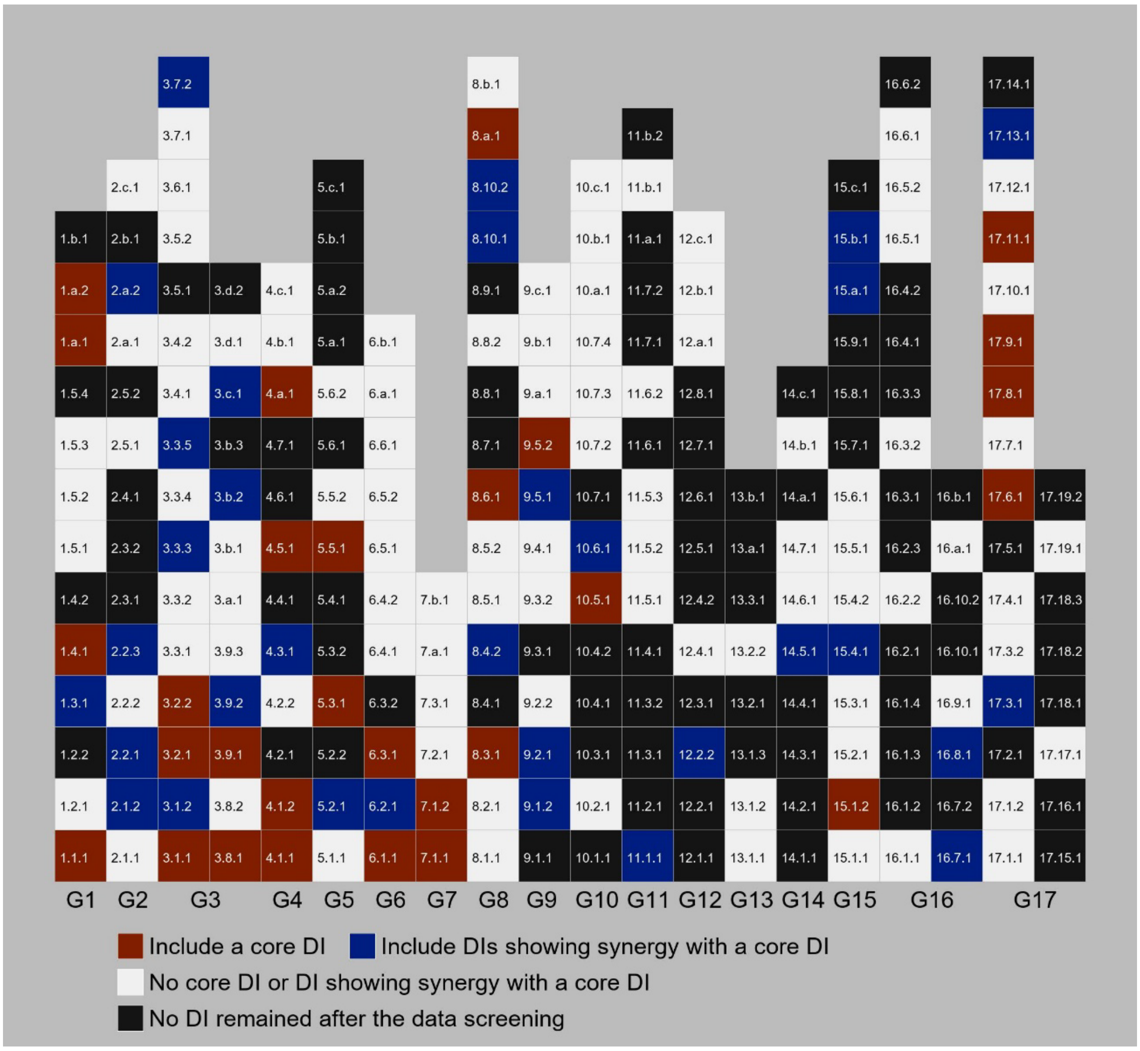
"Direction of progress" shows ↑ for more-is-better indicators and ↓ for less-is-better indicators. "Additional indicators covered" means the number of indicators newly added to the network of linkages (either by direct belonging to or positive correlations) with the core disaggregated indicators (DIs) by adding the DI concerned, on top of the indicators already added to the network by the DIs listed above the DI concerned. "Additional DI linkages" mean the number of new pairs of inter-DI positive correlations added to the network, on top of the positive correlations already added to the network by the DIs listed above the DI concerned.

The list of core DIs in Table 1 indicates that some DIs have more positive correlations with other DIs than the corresponding DIs with a lesser degree of disaggregation. For example, DIs for females of "8.3.1 Proportion of informal employment (≧15 years, all activities)," and "8.6.1 Proportion of youth not in education, employment or training" were selected rather than the corresponding DIs for both sexes. Likewise, "4.1.2 Completion rate of primary education (both urban and rural, all income levels)" for males was selected instead of the same for both sexes, and "7.1.2 Proportion of population with primary reliance on clean fuels and technology" for rural areas was selected instead of the same for both urban and rural areas. These examples suggest that, despite requiring greater efforts for data compilation, disaggregation pays off, at least for some indicators, in analyzing positive correlations between indicators.

As to the distribution of the 29 selected DIs across 17 SDGs, SDG3 (Good health and well-being) has the largest share (five DIs), followed by SDG1 (No poverty), SDG4 (Quality education), and SDG17 (Partnerships for the goals) (four DIs each). In contrast, SGD2 (zero hunger), SDG11 (Sustainable cities and communities), SDG12 (Responsible consumption and production), SDG13 (Climate action), SDG14 (Life below water), and SDG16 (Peace, justice and strong institutions) have no DIs selected. In the second stage of the analysis, only up to five DIs were selected from each SDG. If this ceiling of five DIs was not set, the share of DIs under SDG3 became larger.

Figure 2 shows the distribution of indicators that include the 29 core DIs (red blocks) and DIs that have positive correlations with the core DIs (blue blocks) across 248 SDG indicators, including overlaps. Indicators represented by white blocks have neither core DIs nor DIs with positive correlations with the core DIs. However, they have at least one DI that remains in the dataset after the data screening process described in Section 2.1. Indicators represented by black blocks have no DI remaining after the data screening.

Figure 2 illustrates a skewed distribution of core DIs. Goals with two or more DIs are concentrated in SDGs 1 to 8, with the exception of SDG 2 and SDG 17. A disproportionate share of core DIs are found under the first indicator of the first target for SDGs 1, 3, 4, 6, and 7. Although there is no evidence indicating that the order of indicator numbers reflects their priorities, it would not be unreasonable to infer that the first indicator of the first target is a key indicator for each SDG. Despite the value-agnostic approach taken to selecting the core DIs in this analysis, many of the selected core DIs overlap with these seemingly key indicators of respective SDGs.



Source: Author

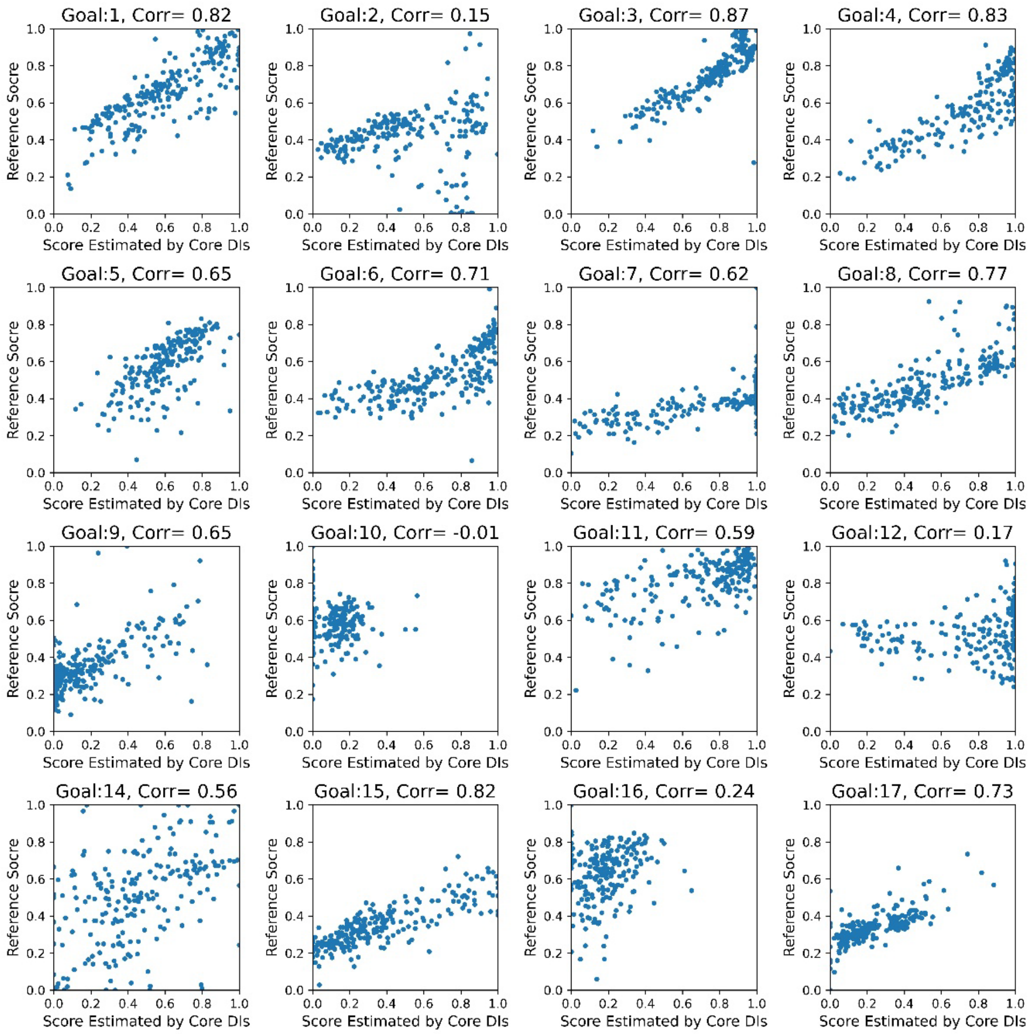
Figure 2: Distribution of indicators with core DIs and their positive correlations

G1 to G17 represent the 17 Sustainable Development Goals (SDGs). DI stands for a disaggregated indicator. Numbers in the colored blocks indicate SDG indicator numbers, including overlapping indicators. Red blocks indicate SDG indicators that include a core DI. Blue blocks are indicators that do not include a core DI but include one or more DIs showed positive linkage to a core DI. White blocks include neither a core DI nor one showed positive linkage to a core DI, although they include at least one remaining DI after the data screening process. Black blocks represent indicators that have no DI left after the data screening.

Another observation from Figure 2 is that black blocks representing indicators with poor data availability are concentrated in SDGs 11 to 16. The proportion of black blocks in the total number of indicators exceeds 50% for SDG 5 and SDGs 11 to 16, except for SDG 15. These SDGs with low data availability roughly correspond to thematic areas such as gender, cities and settlements, environmental sustainability, and peace and justice. They require greater efforts to devise relevant indicators with reasonable data availability or additional investments in data compilation.

3.1 Assessment of the core DIs

Figure 3 shows the results of the assessment of the core DIs to represent the overall characteristics of all available DI data for each SDG explained in the final part of Section 2.2. For this assessment, the datasets for the periods 2015–2019 and 2020–2023 were used. The intention was to conduct the assessment with the most recent data. However, two core DIs had data for less than 50 countries in the period 2020–2023. Therefore, the average values of the periods 2015–2019 and 2020–2023 were used.



Source: Author

Figure 3: Comparison of country scores estimated by the core DI data and by all available data

Each dot represents a score for a country. Corr denotes Pearson's correlation coefficient between the country scores calculated by the data of the core DIs ("Score Estimated by Core DIs") and by all available data ("Reference Score"). The graph for SDG 13 is not shown because its country scores cannot be calculated due to the absence of core DIs and DIs showed positive linkage to core DIs under SDG 13.

Data for 1112 DIs, belonging to 336 data series and 157 indicators, were used for the calculation of reference scores. To calculate the estimated scores, data for the 29 core DIs, belonging to 29 data series and 29 indicators—as well as estimated data for 65 DIs belonging to 40 data series and 32 indicators—were used. These numbers separately count overlapping data series and indicators. The number of data series used for the estimated scores was 21% ((29+40)/336) of that for the reference scores. The equivalent percentage for the indicator number was 39% ((29+32)/157).

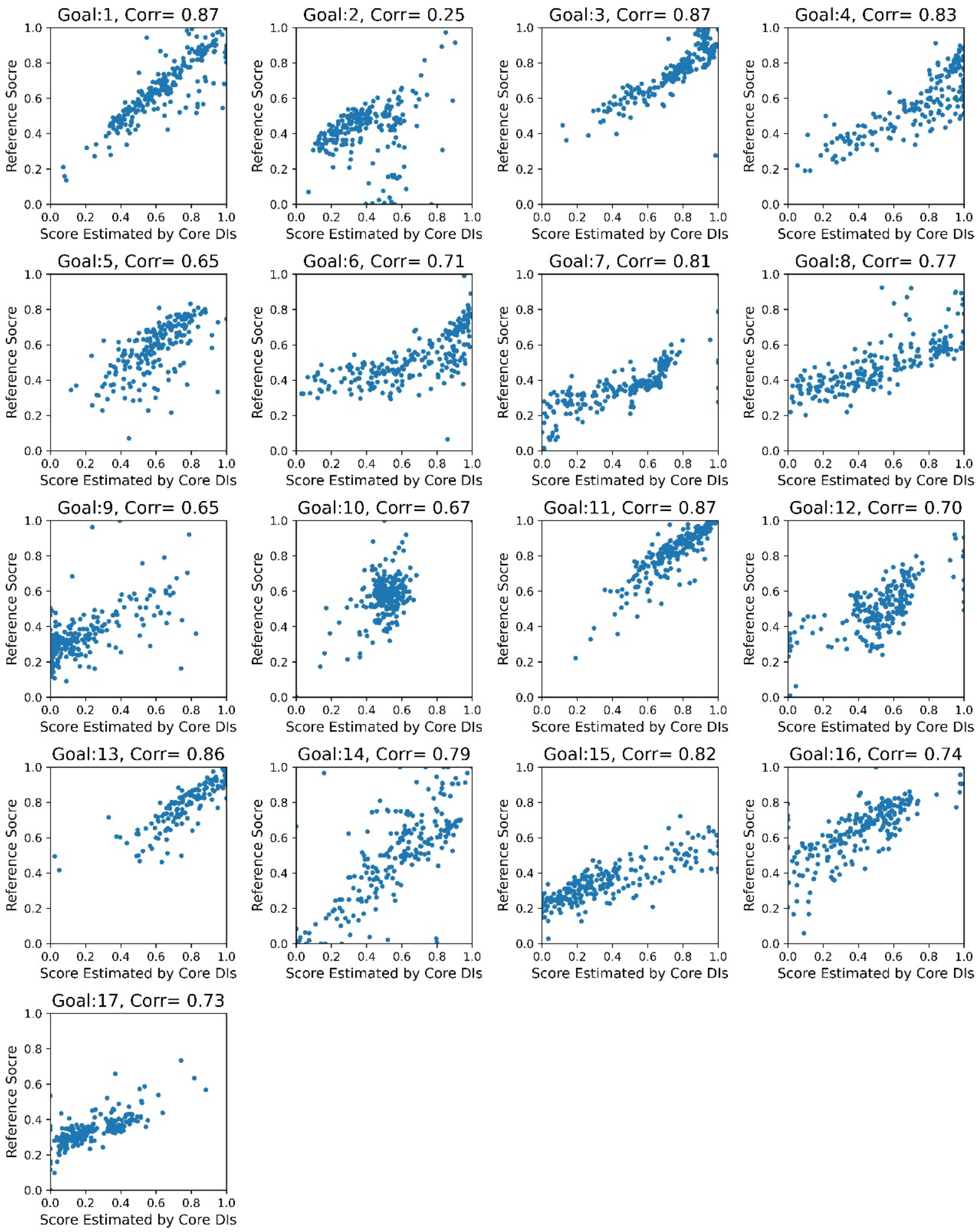
The graphs illustrate that the estimated scores have relatively good correlations with the reference scores for SDGs 1, 3, 4, 6, 8, 15, and 17. In contrast, the correlations are low for SDGs 2, 10, 11, 12, 14, and 16. An observation of Figure 2 elucidates that these SDGs with low correlations have low coverage of the core DIs (red blocks) and positively-linked DIs (blue blocks). Furthermore, the graph for SDG 13 is not shown because its country scores are not calculable due to the absence of core DIs and DIs with positively-linked core DIs under SDG 13.

To improve the ability of the core DIs to represent the overall characteristics of the dataset, two DIs were added to the core DIs for SDGs 2, 10, 11, 12, 14, and 16. The two additional DIs were selected based on the number of countries covered for the whole dataset from 2000 to 2023. The DIs with the top two largest numbers of country coverage for each target SDG were chosen, excluding those under the indicators that are already covered by the core DIs or DIs with positive linkage to the core DI. After choosing the first additional DI, all other DIs of the same indicator were removed from the list to avoid selecting the top two additional DIs from one indicator. The list of additional DIs is presented in Table 2, which includes four overlapping DIs. SDGs 11 and 13 shared the same overlapping DI, which ranked within the top two in terms of coverage, and this DI was therefore selected to serve for both SDGs. Therefore, there are 13 additional unique DIs or 18 additional DIs with overlaps. The new core DI set—including these additional DIs—is hereafter referred to as the "extended core DIs." The extended core DIs have 42 unique DIs or 47 DIs, including overlaps.

Table 2: List of complementing DIs added to the core DI set

Indicator number	Data series	Direction of progress	Disaggregation attributes
2.5.1	Number of transboundary breeds (including extinct ones)	↑	
2.a.1	Agriculture value added share of GDP (%)	↑	
10.a.1	Proportion of tariff lines applied to imports with zero-tariff (%)	↑	All products
10.7.4	Number of refugees per 100,000 population, by country of origin (per 100,000 population)	↓	
11.6.2	Annual mean levels of fine particulate matter (population-weighted), by location (micrograms per cubic meter)	↓	All areas
11.5.1 (overlapping with 13.1.1 and 1.5.1)	Number of deaths and missing persons attributed to disasters per 100,000 population (number)	↓	
12.a.1 (overlapping with 7.b.1)	Installed renewable electricity-generating capacity (watts per capita)	↑	All renewables
12.c.1	Fossil-fuel subsidies (consumption and production) per capita (nominal United States dollars)	↓	
13.1.2 (overlapping with 11.b.1 and 1.5.3)	Score of adoption and implementation of national DRR strategies in line with the Sendai Framework	↑	
14.b.1	Degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries (level of implementation: 1 lowest to 5 highest)	↑	
14.6.1	Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing (level of implementation: 1 lowest to 5 highest)	↑	
16.1.1	Number of victims of intentional homicide per 100,000 population, by sex (victims per 100,000 population)	↓	Both sexes
16.a.1	Countries with National Human Rights Institutions in compliance with the Paris Principles (0 = No status; 1 = Status B, partially compliant; 2 = Status A, fully compliant)	↑	

"Direction of progress" shows ↑ for more-is-better indicators and ↓ for less-is-better indicators.



Source: Author

Figure 4: Comparison of country scores estimated by the extended core DIs data with additional core DIs and by all available data

Each dot represents a score for a country. Corr denotes Pearson's correlation coefficient between the country scores calculated by the data of the extended core DIs ("Score Estimated by Core DIs") and by all available data ("Reference Score").

Figure 4 shows the results of the assessment of the ability of the extended core DIs to represent the overall characteristics of all available data. The reference scores were the same as in Figure 3. To calculate the estimated scores, data for the 47 extended core DIs (including five overlaps), belonging to 47 data series and 47 indicators—as well as estimated data for 65 DIs belonging to 40 data series and 32 indicators—were used. These numbers separately count overlapping data series and indicators. The number of data series used for the estimated scores was 26% ((47+40)/336) of that for the reference scores. The equivalent percentage for the indicator number was 50% ((47+32)/157). The share of the number of data series and indicators of the extended core DIs in the whole dataset used was 14% (47/336) for data series and 30% (47/157) for indicators, respectively.

The correlations are improved or remained the same compared to Figure 3 for all SDGs. Significant improvements are observed for SDGs 10, 11, 12, 14, and 16 as a result of adding additional DIs for these goals. The comparison is newly made for SDG 13, which shows a good correlation. The correlation for SDG 2 is improved but still low. An in-depth analysis of the selection of core DIs for SDG 2 is required to improve the correlation. Nonetheless, the results of the analysis indicate that a relatively small set of the extended core DIs can reasonably estimate the country scores calculated by all available datasets for most SDGs. It suggests that the approach demonstrated in this study could be useful for selecting global core indicators.

3.2 Limitations of this study and research gaps

One of the principal limitations of this study is that the approach demonstrated for selecting the core indicators is solely based on the number of positive correlations with other indicators and the data availability. This resulted in the omission of indicators that have fewer correlations with other indicators or low data availability. However, it by no means indicates that such indicators are not important. Likewise, this study may have omitted potentially important indicators due to the lack of data availability, and disregarded potentially important aspects of goals and targets due to the lack of availability of adequate indicators. The approach demonstrated in this study should be applied in combination with other approaches based on the assessment of the relevance and importance of indicators. Further research is needed to demonstrate the effectiveness and feasibility of such combined approaches.

In calculating country scores for each SDG, this study took a simple average of normalized DI values. However, this method may be problematic in that it bundles together DIs with diverse nature and data distribution characteristics. There could be better methods of integrating the data value of DIs in consideration of their nature and statistical characteristics. Or there may be entirely different and more appropriate approaches to assessing a country's progress in the SDGs without counting on a single score per goal for comparison. Further methodological exploration is required in future research.

The SDGs consist of 17 goals. However, considering the many positive correlations observed among indicator data across different goals, it may be possible to devise more effective groupings of issues for sustainable development, reflecting the positive linkages. For example, issues with strong positive linkages may be grouped into the same goal even if they are typically separated under conventional thematic classifications. Exploration of such an alternative approach to goal and target setting, leveraging on statistical analyses, may be useful for designing post-2030 international development goals for sustainable development.

4. Conclusions

International political discourses on the international goals for sustainable development after 2030 will commence soon. Intending to contribute to such discourses, this study proposed an indicator framework for post-2030 international goals for sustainable development, consisting of (a) a relatively small set of global core indicators, (b) a long list of optional global indicators that countries (or any other entities) may selectively adopt if they see fit, and (c) custom indicators to be developed by countries or other entities to cater for their local monitoring needs and priorities, reflecting on unique local contexts.

To demonstrate the feasibility of the identification of the core indicators (i.e., the component (a) of the proposed framework), this study conducted correlation analyses at the DI level to narrow down the list of indicators from the current SDG indicators while preserving specific characteristics of the global SDG indicator set. The result showed that 42 unique DIs, or 47 DIs including five overlapping DIs, could produce similar country scores for most SDGs as those calculated by 1112 DIs, belonging to 336 data series and 157 indicators. It suggests the usefulness of the methodology in identifying the global core indicators for post-2030 development goals.

The results also revealed the limitations of the approach. Notably, indicator selection based on statistical correlation analysis failed to identify suitable indicators for some SDGs for which the indicators had relatively low correlations with others. Considering that there should be important but independent indicators (independent in that they have low correlations with others), the approach demonstrated in this study is not for use in isolation but needs to be applied in combination with other approaches that can complement its weaknesses, which is a worthy goal for future research.

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Appendix

Table A-1: List of data series whose related DI data were relativized

Indicator	Series Code	Description	Relativized by
1.5.1	VC_DSR_IJILN	Number of injured or ill people attributed to disasters (number)	Population
1.5.1	VC_DSR_MISS	Number of missing persons due to disaster (number)	Population
1.5.1	VC_DSR_MORT	Number of deaths due to disaster (number)	Population
1.5.1	VC_DSR_PDAN	Number of people whose damaged dwellings were attributed to disasters (number)	Population
1.5.1	VC_DSR_PDLN	Number of people whose livelihoods were disrupted or destroyed, attributed to disasters (number)	Population
1.5.1	VC_DSR_PDYN	Number of people whose destroyed dwellings were attributed to disasters (number)	Population
1.5.2	VC_DSR_AGLH	Direct agriculture loss attributed to disasters (current United States dollars)	GDP (current USD)
1.5.2	VC_DSR_CHLN	Direct economic loss to cultural heritage damaged or destroyed attributed to disasters (millions of current United States dollars)	GDP (millions of current USD)
1.5.2	VC_DSR_CILN	Direct economic loss resulting from damaged or destroyed critical infrastructure attributed to disasters (current United States dollars)	GDP (current USD)
1.5.2	VC_DSR_DDPA	Direct economic loss to other damaged or destroyed productive assets attributed to disasters (current United States dollars)	GDP (current USD)
1.5.2	VC_DSR_GDPLS	Direct economic loss attributed to disasters (current United States dollars)	GDP (current USD)
1.5.2	VC_DSR_HOLH	Direct economic loss in the housing sector attributed to disasters (current United States dollars)	GDP (current USD)
2.a.2	DC_TOF_AGRL	Total official flows (disbursements) for agriculture, by recipient countries (millions of constant 2022 United States dollars)	GDP (millions of constant 2015 USD)
3.3.5	SH_TRP_INTVN	Number of people requiring interventions against neglected tropical diseases (number)	Population
3.4.1	SH_DTH_NCD	Number of deaths attributed to non-communicable diseases, by type of disease and sex (number)	Population
3.b.2	DC_TOF_HLTH	Total official development assistance to	GDP (millions

	L	medical research and basic health sectors, gross disbursement, by recipient countries (millions of constant 2022 United States dollars)	of constant 2015 USD)
3.b.2	DC_TOF_HLTHNT	Total official development assistance to medical research and basic health sectors, net disbursement, by recipient countries (millions of constant 2022 United States dollars)	GDP (millions of constant 2015 USD)
4.b.1	DC_TOF_SCHIPSL	Total official flows for scholarships, by recipient countries (millions of constant 2022 United States dollars)	GDP (millions of constant 2015 USD)
6.6.1	EN_WBE_INWTL	Extent of inland wetlands (square kilometers)	Territory's land area (square kilometers)
6.6.1	EN_WBE_MANGN	Mangrove area (square kilometers)	Territory's land area (square kilometers)
6.a.1	DC_TOF_WASHL	Total official development assistance (gross disbursement) for water supply and sanitation, by recipient countries (millions of constant 2022 United States dollars)	GDP (millions of constant 2015 USD)
7.a.1	EG_IFF_RANDN	International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems (millions of constant 2021 United States dollars)	2015 constant GDP (million USD)
8.a.1	DC_TOF_TRDCML	Total official flows (commitments) for Aid for Trade, by recipient countries (millions of constant 2022 United States dollars)	2015 constant GDP (million USD)
8.a.1	DC_TOF_TRDDBML	Total official flows (disbursement) for Aid for Trade, by recipient countries (millions of constant 2022 United States dollars)	GDP (millions of constant 2015 USD)
9.a.1	DC_TOF_INFRAL	Total official flows for infrastructure, by recipient countries (millions of constant 2022 United States dollars)	GDP (millions of constant 2015 USD)
10.7.3	SM_DTH_MIGR	Total deaths and disappearances recorded during migration (number)	Population
10.b.1	DC_TRF_TOTL	Total assistance for development, by recipient countries (millions of current United States dollars)	GDP (millions of current USD)
12.4.2	EN_MWT_GENV	Municipal waste generated (tons)	Population
12.4.2	EN_TWT_GENV	Total waste generation, by activity (tons)	Population
12.5.1	EN_MWT_RCYV	Municipal waste recycled (tons)	Population

13.2.2	EN_ATM_GHGT	(Modified from original description) Total greenhouse gas emissions without LULUCF (Mt CO2 equivalent)	Population
14.1.1	EN_MAR_BEALIT_EXP	Exported beach litter originating from national land-based sources (tons)	Territory's land area (square kilometers)
15.2.1	AG_LND_FRSTCERT	Forest area certified under an independently verified certification scheme (thousands of hectares)	Territory's land area (hectares)
15.a.1	DC_ODA_BDVL	Total official development assistance for biodiversity, by recipient countries (millions of constant 2022 United States dollars)	GDP (millions of constant 2015 USD)
16.1.1	VC_IHR_PSRCN	Number of victims of intentional homicide, by sex (number)	Population
16.2.2	VC_HTF_DETV	Detected victims of human trafficking, by age and sex (number)	Population
16.2.2	VC_HTF_DETVFL	Detected victims of human trafficking for forced labour, servitude and slavery, by age and sex (number)	Population
16.2.2	VC_HTF_DETVFLR	Detected victims of human trafficking for forced labour, servitude and slavery, by age and sex (per 100,000 population)	Population
16.2.2	VC_HTF_DETVR	Detected victims of human trafficking, by age and sex (per 100,000 population)	Population
16.2.2	VC_HTF_DETVSX	Detected victims of human trafficking for sexual exploitation, by age and sex (number)	Population
16.2.2	VC_HTF_DETVSXR	Detected victims of human trafficking for sexual exploitation, by age and sex (per 100,000 population)	Population
16.7.1	SG_DMK_PARLCC_LC	Number of chairs of permanent committees, by age sex and focus of the committee, lower chamber or unicameral	Population
16.7.1	SG_DMK_PARLSP_LC	Number of speakers in parliament, by age and sex, lower chamber or unicameral	Population
17.13.1	BN_KLT_PTXL_CD	Portfolio investment, net (Balance of Payments, current United States dollars)	GDP (millions of current USD)
17.17.1	GF_COM_PPPI	Amount of United States dollars committed to public-private partnerships for infrastructure, million USD nominal	GDP (millions of current USD)
17.17.1	GF_COM_PPPI_KD	Amount of United States dollars committed to public-private partnerships for infrastructure, million USD real	GDP (millions of constant 2015 USD)
17.19.1	SG_STT_CAPTY	Dollar value of all resources made available to strengthen statistical capacity in developing countries	GDP (current USD)

		(current United States dollars)	
17.3.1	DC_OSSD_GRT	Gross receipts by developing countries of official sustainable development grants (millions of United States dollars)	GDP (millions of current USD)
17.3.1	DC_OSSD_MPF	Gross receipts by developing countries of mobilised private finance (MPF) - on an experimental basis (millions of United States dollars)	GDP (millions of current USD)
17.3.1	DC_OSSD_OFFCL	Gross receipts by developing countries of official concessional sustainable development loans (millions of United States dollars)	GDP (millions of current USD)
17.3.1	DC_OSSD_OFFNL	Gross receipts by developing countries of official non-concessional sustainable development loans (millions of United States dollars)	GDP (millions of current USD)
17.3.1	DC_OSSD_PRVGRT	Gross receipts by developing countries of private grants (millions of United States dollars)	GDP (millions of current USD)
17.3.1	GF_FRN_FDI	Foreign direct investment (FDI) inflows (millions of United States dollars)	GDP (millions of current USD)
17.7.1	DC_ENVTECH_EXP	Amount of tracked exported Environmentally Sound Technologies (current United States dollars)	GDP (current USD)
17.7.1	DC_ENVTECH_IMP	Amount of tracked imported Environmentally Sound Technologies (current United States dollars)	GDP (current USD)
17.7.1	DC_ENVTECH_TT	Total trade of tracked Environmentally Sound Technologies (current United States dollars)	GDP (current USD)
17.9.1	DC_FTA_TOTAL	Total official development assistance (gross disbursement) for technical cooperation (millions of 2022 United States dollars)	GDP (millions of constant 2015 USD)

Note: USD stands for United States Dollars

Abstract (in Japanese)

要　約

国連持続可能な開発目標(SDGs)の目標年である2030年が間近に迫っている。現在、国際政治ではSDGsの達成に向けた努力の加速に焦点が当てられているが、2030 年以降の国際開発目標に関する議論が間もなく開始されるであろう。このような認識の下、本研究では、SDG グローバル指標フレームワークが直面する課題をレビューした上で、2030 年以降の国際開発目標の指標フレームワークを提案する。現在の SDGs 指標の課題とは、指標データが十分に収集できていないこと、一部の指標間の重複、及び各国固有の文脈やモニタリング・ニーズとの不整合などを含む。こうした課題への対応を念頭に、本研究で提案するのは、(a)すべての国にデータ提供を求める比較的少数のグローバル・コア指標セット、(b)各国が必要に応じて任意に採用できるグローバル・オプション指標のロングリスト、(c)各国がそれぞれの政策的優先事項、モニタリング・ニーズ、及び地域の文脈に応じて設定するカスタム指標から構成される枠組みである。グローバル・コア指標を特定することの実現性を検証するため、本研究は、2000 年から 2023 年までの国連 SDG 公式データを用いて分析を行い、細分化された指標ペア間の相関関係をもとに 47 の細分化指標を選定した。細分化された指標とは、年齢層、教育水準、活動タイプなどの各指標固有の分類によって、元の SDG 指標をより細かく分割した指標を指す。分析の結果、47 のコア細分化指標によって算出された各 SDG の国別スコアは、それよりもはるかに数の多い 1,112 の細分化指標によって算出された国別スコアと近いことが示された。分析結果は、2030 年以降の国際開発目標のためのグローバル・コア指標を選択する上での、提案されたアプローチの有用性を示したが、同時にその弱点を補うため、他の補完的アプローチと組み合わせて適用する必要性も示した。

キーワード： 持続可能な開発目標、SDGs、指標枠組み、シナジー