Measuring Sustainable Development Goals (SDGs): an inclusive approach

Arman Bidarbakhtnia*

*United Nations Economic and Social Commission for Asia and the Pacific

1. Introduction

SDGs progress measurement approaches are diverse in their underlying assumptions and statistical features. They do not measure the same thing and should not be interpreted in the same way. Nonetheless, this is not obvious to the general user as all methods are often referred to as "SDG progress". This paper aims to answer two questions: *what is an appropriate method for assessing SDG progress?* and *how to "leave no-one behind" in measuring progress towards the SDGs?*. It provides an overview of the existing approaches for assessing progress towards the SDGs and proposes an inclusive approach for measuring SDGs progress "for all".

2. SDG progress assessment: UNESCAP approach

Two indices are used by UNESCAP to assess progress towards the SDGs: *current status* and *anticipated progress gap*. The current status index measures progress towards specified targets since 2000. The anticipated progress gap measures the gap between the predicted value of the indicator and specified target for 2030. Both indices are constructed at indicator level and can be aggregated at target and goal levels as desirable. The indices answer two different questions:

- Current status: How much progress has been made since 2000?
- Anticipated progress gap: How likely will the targets be achieved by 2030?

Current status index

Denoting indicator values for 2000 and the current year by I_{00} and I_{cv}, and the target value for 2030 by TV, and setting normalized values of the indicator in 2000 and 2030 at 0 and 10 respectively, normalized value for the indicator at the current year on the scale of 0 to 10 can be calculated as follows when desirable direction is clear:

$$(1) \qquad P_{cs} = \frac{I_{cv} - I_{00}}{|TV - I_{00}|} \times D \quad in\ which\ \ D = \begin{cases} 10 & increasing\ values\ are\ desirable \\ -10 & decreasing\ values\ are\ desirable \end{cases}$$

For parity indicators the value is:

$$(2) \qquad P_{cs} = 10 - \frac{|TV - I_{cv}|}{|TV - I_{00}|} \times 10$$

The above metrics are computed for each indicator and averaged under targets and goals to measure "average progress made" in achieving each of the targets and goals.

If the region (or subregion) has progressed since 2000, the average of normalized values under each goal ($\overline{P_{cs}}$) provides an index that is between 0 and 10. But if the region has regressed, the value is negative and indicates the size of regression.

Anticipated progress gap

Denoting the predicted value of indicator I for the target year by I_{30}, and value in the base year by I_{15}, one can approximate the progress gap by P_{pg} as follows when desirable direction is clear from the target:

$$P_{pg} = \frac{|TV - I_{30}|}{|TV - I_{15}|} \times 10 \quad (3)$$

In the case of parity indicators, we consider no regression has occurred if $|TV - I_{30}| \leq |TV - I_{15}|$.

Extrapolation and imputation methods

Producing the two measures of progress requires prediction of future values as well as imputation of missing values in the current and previous years. These values were estimated using a weighted regression model which uses time-related weights (Bidarbakht-Nia, 2017b), assuming that the importance attached to the indicator values should be proportional to how recent the data is.

Suppose that n data points are available on indicator I for a given country/region over a period of T years, and we are interested in estimating the indicator value for the year t. $T = t_f - t_l$ where t_f and t_l are the earliest and the latest years, respectively, for which data on indicator I are available. The time-related weights work as multipliers that inflate/deflate the rate of change in each period, in proportion to the temporal distance to the target year (t). Time-related weight for the i^{th} data point for a given country/region for estimating indicator values of the year t is:

$$w_i = \frac{|t - t_f|}{|t - t_i|} \quad (t_f < t_i < t_l) \quad (4)$$

Setting regional target values

Of the 169 SDG targets, only 30% have specific (implicit or explicit) target values. For the remainder, estimating progress indices requires setting target values. For the majority of such indicators, UNESCAP has applied a "champion area" approach (Bidarbakht-Nia, 2017a). The idea is to identify the region's outstanding countries (top performers) and set their average rate of change as the region's target rate. In other words, if the region as a whole can perform as well as its champion area over 15 years (starting from 2015), we should expect to achieve the target value by 2030.

3. What is an appropriate measure of progress?

This section highlights that the three major approaches that are currently employed to measure SDGs progress serve completely different purposes and answer very different sets of questions. An assessment of various methods (Table 1) shows that they are very different in nature and even if exactly the same set of data and indicators are used (which is not the case), we should not expect identical progress narratives from them.

Table 1

Table 1 clearly shows that choice of progress assessment method depends heavily on the purpose of analysis (what do we want to measure?). If we apply the three methods on the same data, we should not expect the same outcome. Table 2 shows results of applying the three methods on data for population living in poverty at less than $1.90 a day for three countries in Asia and the Pacific region. It shows three different scenarios in which countries have not made any progress (country A), regressed since 2000 (country B), or significantly reduced poverty (country C).

Table 2

4. Counting everyone: Inclusive measure of SDG progress

The 2030 agenda is the people's agenda. It puts people first and its core principle is leaving no-one behind. The world cannot uphold to this principle unless the SDG progress assessment frameworks embrace it. This section introduces modifications in *current status* and *anticipated progress gap* indices that adjust for progress by vulnerable groups. The idea is to introduce a multiplier factor that adjusts the overall progress made in one indicator for the progress of the most vulnerable group.

To account for this in compilation of the progress index, one can multiply the overall progress on each indicator by progress of the most vulnerable population group. This may have a negative or positive impact on the overall progress depending on the progress of the most vulnerable group in relation to the overall progress. Diagram 1 demonstrates a weighting structure to implement this approach. In this scenario there are two indicators (malnutrition and stunting) under target 2.2, each receiving a weight factor equal to 0.5. The malnutrition indictor has two types (wasting and overweight) for which disaggregated values of prevalence are available for boys and girls under-5, as well as across urban and rural population groups. Those with higher prevalence are considered the vulnerable group. For each type, vulnerable group is the sub-population with the highest prevalence.

Diagram 1

In general, the number of data series (indicator, sub-indicator or disaggregation) that can be used for assessing progress against one SDG target is $n = NS + S + V$, where NS is number of indicators without any sub-indicator, S is total number of sub-indicators, and V is number of vulnerable groups. In other words, V is number of indicators or sub-indicators for which at least one disaggregation is available.

Current status and anticipated progress gap indices introduced in formulas (1), (2) and (3) must be constructed for each of the n data series prior to aggregating at the target level. Weighted average of current status and anticipated progress gap at goal level will be compiled as follows:

$$\overline{P_{cs}} = \sum_j \sum_k a_k \times P_{cs}^k \quad (j = 1,2,..,N), (k = 1,2,3,..,n) \tag{5}$$

In which N is number of measurable targets under the goal, a_k is the weight of data series k, and P_{cs}^k is current status index compiled for data series k. And,

$$\overline{P_{pg}} = \sum_j \sum_k a_k \times P_{pg}^k \quad (j = 1,2,..,N), (k = 1,2,3,..,n) \tag{6}$$

in which P_{pg}^k is anticipated progress gap index compiled for data series k.

An alternative (and intuitive) way of compiling $\overline{P_{cs}}$ and $\overline{P_{pg}}$ without using weights is to average data series in three separate phases when relevant; first average over each sub-indicator and its vulnerable groups, then over all sub-indicators of each indicator, and finally average over all indicators. This is identical to the weighted sums in (5) and (6).

References

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Table1. A comparison of three major methods used for SDG progress assessment

Method	What is being measured?	Formula	Setting target value	Basis of comparison	Static/ dynamic	Data intensity	aggregation
SDSN	Compared to the worst performer, how close the country is to the target Speed required for a country to achieve targets, relative to the current speed	$\frac{I_{cv} - I_{min}}{TV - I_{min}}$ *Average of annual % changes*	Direct from target/ scientific value/ top five values	Worst performing country	Static Dynamic	At least one data point At least two data points	Over countries: -- Over indicators: Index- average Dashboard- average of 2 worst indicators
UN-ESCAP	Progress a country/region has made towards targets since 2000, as a share of total progress it needs to make Expected distance from targets in 2030, judging from a country/region's past progress	$\frac{I_{cv} - I_{00}}{TV - I_{00}}$ $\frac{TV - I_{30}}{TV - I_{15}}$	Direct from target/top five rates of change	Past progress in the same country/region	Dynamic Dynamic	At least two data points At least three data points	Over countries: Median value over countries (unweighted) Over indicators: Weighted average of all data series (equal weights to targets)
OECD	Compared to the worst performer, how close the country is to the target Whether or not a country is moving in a right direction towards the target	$\frac{I_{cv} - TV}{SD(I_{cv})}$ $\rho(I_t, t)$	Direct from target/ scientific value/ top five values	Distribution of values across peer countries	Static Dynamic	At least one data point At least two data points	Over countries: population weighted average Over indicators: arithmetic average of all indicators

I_{00}, I_{15}, I_{cv}, I_{30}: Indicator values in 2000, 2015, current year, and prediction for 2030

I_{min}: minimum value of indicator across all countries TV: target value for indicator $\rho(I_t, t)$: spearman correlation between indictor values and time
$SD(I_{cv})$: standard deviation of the indicator values

Table 2. Progress scores for population below international poverty line in three countries using three different methods

	2000	2015	SDSN	UNESCAP	OECD
Country A	13%	13%	8	**0**	8
Country B	9%	16%	7	**-9**	7
Country C	46%	23%	6	**6**	6

Diagram 1. Weighting structure under SDG target 2.2 on malnutrition