A note on assessing progress towards the SDG targets

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Abstract:
This work describes some challenges related to the prevalent approaches used for SDGs progress assessment, in particular (i) monitoring the "current" distance to the SDG targets, and (ii) assessing whether the SDG targets can be reached by 2030, the deadline for the achievement of the 2030 Agenda for Sustainable Development. These distinct objectives have been translated in various methods that often include also a way for identifying a quantitative target even when not explicitly set by the 2030 Agenda, and procedures to obtain regional and global aggregates (that can be extended to aggregates by target and goal). This paper takes stock of the work previously done by the authors (Gennari and D'Orazio, 2020) and introduces a relatively new approach to improve the assessment at regional/global level.

Keywords:
SDG indicators; distance to the target; pace of progress; regional aggregates; index of dissimilarity

1. Introduction:

The 2030 Agenda for Sustainable Development, endorsed by the UN Summit in September 2015, encompasses 17 Sustainable Development Goals (SDGs) and 169 targets, expected to be reached, for the most part, by the year 2030[1]. The global SDG indicator framework (endorsed by the UN General Assembly in July 2017) establishes a set of measurement tools that should help governments to assess country performances in a comparable way, and to identify the most appropriate policy interventions to actually achieve the SDG targets by the set deadline.

In the last few years some leading regional/international agencies have proposed two fundamentally different methodological approaches to assess progress towards the SDG targets: (i) the current distance to the target, and, (ii) the probability that the SDG target will be achieved, at current trends, by the established deadline.

Gennari and D'Orazio (2020) provide a critical overview of the proposed procedures and alternative metrics proposed to implement these methodological approaches. They highlight that the intrinsic risk of using different definitions and different tools to measure SDG progress is that of generating uncertainty and confusion among users, especially because the assessment results are often inconsistent or contradictory. This risk is not only the effect of using different assessment approaches, but also the consequence of monitoring exercises conducted using different sets of indicators, not always corresponding to those included in the global indicator framework. This work follows the path outlined in Gennari and D'Orazio (2020) and focuses on some issues related to the assessment at regional/global level, by proposing some new summary measures aimed at improving the assessment and facilitating the interpretation of the results.

[1] Out of the 169 SDG targets, 21 should have been achieved by 2020 and 3 should be achieved by 2025. All the remaining 145 SDG Targets are expected to be reached by 2030.

2. Methodology:

The measurement of the current distance to the SDG target (or its "current" status of implementation), can be assessed by comparing the latest available value of the SDG indicator with the set target. For this purpose, Gennari and D'Orazio (2020) consider a normalized distance to the target:

$$d_{it} = \begin{cases} \dfrac{x^* - x_{it}}{x^* - x_t^{(w)}}, & \text{when the normative direction is the increase over time} \\ \dfrac{x_{it} - x^*}{x_t^{(w)} - x^*}, & \text{when the normative direction is the decrease over time} \end{cases}$$

where x_{it} is the value of the chosen SDG indicator for the country *i* at time *t* (latest available data point); $x_t^{(w)}$ is the worst observed country value at time *t*; and, x^* is the target value for the given SDG indicator. Basically, the denominator (scaling factor) is an estimate of the range of the indicator in the year *t*, and therefore d_{it} can be seen as a kind of city-block (or Manhattan) distance to the target, normalized by the range of the indicator.

In analysing the results of this metrics, d_{it} is usually transformed in a categorical variable in order to facilitate its interpretation. For instance, the FAO 2020 SDG Progress Report[2] considers 5 categories of distance to the target.

The distance d_{it} is basically the complement to 1 of the Sachs et al (2019) summary measure that considers the worst scenario as the reference. Gennari and D'Orazio (2020), however, do not support the estimation of the target x^* when it is not explicitly set by the SDG Agenda, contrarily to other agencies (OECD 2019; Sachs et al, 2019) that use the top-performing countries to estimate a "statistical" target. The targets, as the Goals, have already been defined by the policy-makers, while the statisticians' role should be limited to provide the best possible assessments of progress towards the targets.

The other approach to measuring SDG progress consists in assessing the likelihood that a country or a region, at observed trends, will achieve the SDG targets by 2030. FAO (2020), in line with Eurostat (2019) and Sachs *et al.* (2019) methods, compares the actual growth with the growth required to reach the target:

$$CR_i = CAGR_{Ai}/CAGR_{Ri}$$

where

$$CAGR_{Ai} = \left(\frac{x_{it}}{x_{it_0}}\right)^{\frac{1}{t-t_0}} - 1 \quad \text{and} \quad CAGR_{Ri} = \left(\frac{x^*}{x_{it_0}}\right)^{\frac{1}{T-t_0}} - 1$$

In practice, the annual growth is estimated by considering the *compound annual growth rate* (CAGR), that corresponds to assuming a geometric growth over time (as in Eurostat, while Sachs et al. consider a linear growth). Such a simple approach requires the availability of just two data points, the latest available value of the indicator (x_{it}) and the value in the baseline year (x_{it_0}; usually $t_0 = 2015$, when the SDG Agenda was endorsed); it is therefore particularly suitable for short time-series typical of the SDG indicators, many of which have been developed only after 2015. In fact, even in the best scenario, the time series start in 2015 and 5-6 is the maximum number of total data points (the time series can be even shorter for indicators requiring two or more years to be compiled and disseminated).

A common practice for analyzing the results of this metrics, consists in classifying the values of the ratio CR_i in 4-5 categories that signal whether the pace of progress of the indicator

[2] The FAO 2020 "Tracking progress on food and agriculture-related SDG indicators" report. http://www.fao.org/publications/highlights-detail/en/c/1307574/.

over time: a) ensures the achievement of the target by 2030; b) proceeds in the required direction, but at a rate of progress that is insufficient to reach the target by the set deadline; c) does not show any progress with respect to the baseline year; or, worst, d) moves progressively away from the target. Both FAO and Eurostat, in absence of a specific target for the indicator, prefer to limit the assessment to evaluating only the actual growth ($CAGR_{Ai}$). On the contrary, as for the assessment of the current status, Sachs et al (2019) prefer estimating a "statistical" target from the top-performing countries.

The statistical methods proposed to evaluate the current distance to the target and pace of progress towards the target are designed to assess the performance of the countries in an internationally comparable way.

When the assessment is conducted at regional or global level, some challenges arise in the "aggregation" procedures. For instance, d_{it} can be directly applied to regional SDG values when the SDG indicators are expressed as proportions (whose theoretical range is 1). In other cases, the regional distance to the target should be estimated by averaging the d_{it} of the countries belonging to the relevant region. Gennari and D'Orazio (2020) are critical of this approach: firstly, they suggest using the median as a more robust alternative to the simple average; secondly, they are not in favor of introducing a weighting scheme when calculating regional/global averages, contrarily to the OECD (2019) and Sachs et al (2019), which use the country population as weighting variable. In fact, the results at regional/global levels obtained using this weighting procedure masks country differences and tend to be dominated by the few countries with very large population size. The assessment presume that there was no country, with its peculiar structural problems and specific policies, but just a single state that would group the entire population of the region/world. For this reason, Gennari and D'Orazio (2020) note that averaging alone is unable to describe the heterogeneity of the situation in the region, for which some summary measure should be provided.

The assessment of the pace of progress over time for a region overlooks this problem as many of the proposed approaches use directly regional time series. In practice, by analyzing the SDG data at regional level it is possible to assess whether the actual regional growth will permit to reach the target. The main obstacle in this case is the lack of country data, or in other words, the number of countries in the region with available SDG data is not sufficient to allow compiling reliable regional aggregates (normally the country coverage should exceed 50% both in terms of number of countries and in terms of total population).

Like for the assessment of the distance to the target, also measuring the pace of progress over time at regional level would benefit from having an indication of heterogeneity within the region. This need is addresses by the OECD's approach that reports the distribution of counties in the region with respect to three categories of progress ("progress towards the target", "movement away from the target", or "no significant trend detected").

This note aims to address the issue of improving regional summary assessments by an indication of the heterogeneity within the region. The underlying idea is that of exploiting the categorization of the chosen assessment indicator and the corresponding estimated distribution within the region.

Let's consider the distance to the target d_{it}. Following the FAO's approach, the distance is classified in 5 classes, for which it is possible to estimate the regional distribution as shown in the following table.

Category	No. of countries
Target already met	n_{g1}
Vary close to the target	n_{g2}
Close to the target	n_{g3}
Far from the target	n_{g4}
Very far from the target	n_{g5}
Total	n_g

In the “ideal” scenario the country assessments should concentrated in the first two categories, and leave no country in the remaining categories, i.e.:

Category	Observed	Ideal
Target already met OR Vary close to the target	$n_{g1} + n_{g2}$	n_g
Close to the target	n_{g3}	0
Far from the target	n_{g4}	0
Very far from the target	n_{g5}	0
Total	n_g	n_g

In this setting, by comparing the observed distribution with the ideal situation it is possible to get a reliable picture of the whole regional situation. A simple way of comparing the distributions is to estimate the *index of dissimilarity* or the *total variation distance*:

$$\Delta_g = \frac{1}{2}\sum_{h=1}^{H}\left|f_{gh}^{(obs)} - f_{gh}^{(best)}\right|$$

where $f_{gh} = n_{gh}/n_g$ denote the relative frequencies. This index of dissimilarity can vary between 0 and 1 ($0 \leq \Delta_g \leq 1$), the value of 0 is achieved when the observed distribution is equal to “ideal” distribution, while $\Delta_g = 1$ indicates the maximum distance from the reference distribution. Agresti (2002) suggests that $\Delta_g \leq 0.03$ indicates a distribution very close to the reference one. The dissimilarity index has also a simple interpretation as it indicates the fraction of countries in the region *g* that need to change their status to achieve the best scenario. It is worth noting that it is possible to frame the assessment in term of *overlap* between the observed and “ideal” distribution:

$$O_g = 1 - \Delta_g$$

In this case $O_g = 1$ indicates the optimum, i.e. maximum overlap (equality) between the observed and the “ideal” distribution; following the Agresti’s rule-of-thumb, $O_g \geq 0.97$ indicates an observed distribution very close to the “ideal” one.
The same approach can be applied to the assessment of progress over time when the summary judgement is based on categorization of CR_i (or, in other words, of $CAGR_i$ when the indicator has not a target set in the SDG Agenda).
It is worth noting that Δ_g (and conversely also $O_g = 1 - \Delta_g$) can also be calculated by introducing a weighting scheme to aggregate country results; the formula remains unchanged, while the appropriate weights should be used in estimating the observed distribution of countries in the region according to the chosen judgement criteria (e.g. using GDP and land area for economic and environmental indicators, respectively).
The next section reports an example of application of the proposed summary measures to the SDG indicator 2.1.1. Prevalence of undernourishment, one of the two official indicators to measure target 2.1 (“hunger target”).

3. Results:

In this section we provide an example of the application of the proposed summary assessment at regional level of the SDG indicator 2.1.1-Prevalence of undernourishment (PoU). The indicator is available for a large fraction of countries up to 2018 and has a quantitative target set in the agenda at an absolute level that corresponds to 0 (“By 2030, end hunger […]”). In practice, the threshold used for the analysis is $x^* = 0.025$, mainly because the uncertainty in the estimation process is such that an estimate of the PoU less than or equal to 0.025 cannot be said significantly different from 0 (in addition, a target value equal to 0 would create problems when estimating $CAGR_{Ri}$).

In the FAO 2020 SDG Progress Report the distance to the target is assessed by simply calculating $d_{it} = x_{it} - x^*$, as the indicator is a proportion whose theorical range is 1 (denominator); d_{it} is calculated at both country and regional level and, for summary purposes, the judgement criteria listed in Table 1 are adopted.

Table 1- Criteria for judging the current distance from the target of the PoU

Bounds	Group	Symbol
$d_{it} = 0$	Target already met	+++
$0 < d_{it} \leq 0.05$	Very close to the target	++
$0.05 < d_{it} \leq 0.10$	Close to the target	+
$0.10 < d_{it} \leq 0.25$	Far from the target	-
$d_{it} > 0.25$	Very far from the target	--

When performing the assessment at regional level the ideal scenario would correspond to having countries concentrated in the first two categories ("+++" or "++"). Considering this reference ideal scenario and calculating the estimated distance (Δ_g) from it, the following results can be obtained for the year 2018.

Table 2 – Summary results for regions' distance to the target for PoU in 2018

Regions	Trend FAO Report	No. Countries	Delta	Overlap
Australia and New Zealand	+++	2	0	1
Central Asia	++	4	0	1
Eastern Asia	+++	5	0.40	0.60
Europe	+++	38	0	1
Latin America and the Caribbean	++	28	0.43	0.57
Northern Africa	++	5	0.20	0.80
Northern America	+++	2	0	1
Oceania	++	5	0.40	0.60
South-eastern Asia	+	9	0.67	0.33
Southern Asia	-	7	0.71	0.29
Sub-Saharan Africa	-	32	0.81	0.19
Western Asia	+	13	0.31	0.69

The results show that while the status of a region, calculated considering the regional SDG value, may be considered very positive, on the contrary the observed distribution of the countries' situation within the region can be rather distant to the ideal scenario. This is particularly evident for Eastern Asia, where the regional distance can be qualified as "target already met", but unfortunately 40% of the countries in the region should change their status to reach the target. A similar situation is shown by Latin America and Caribbean, which is on average "very close to the target", while the performance of 43% of the countries in the region should be significantly improved.
The same argument applies to the assessment of the pace of progress of the PoU, which in the FAO's Progress Report is evaluated using 5 categories (see Table 3)

Table 3- Criteria for judging progress over time for PoU in FAO's SDG progress report

Level or ratio CR	Color	Assessment category
$x \leq x^*$	Dark green	Target already met (TAM)
$CR \geq 0.95$	Green	On-track to achieve the target (>>)
$0.10 < CR < 0.95$	Yellow	On-path, but too slow to achieve the target (>)
$-0.10 \leq CR \leq 0.10$	Orange	No improvement (stagnation) since baseline (=)
$CR < -0.10$	Red	Deterioration/movement away from the target (<<)

The ideal scenario at regional level would correspond to a distribution of countries concentrated in the first two categories ("TAM" or ">>"). In comparison with this reference distribution, the results related to the regional trends from 2015 to 2018 are summarized in Table 4. This table shows that for some regions, while the trend calculated on the aggregated series indicates a very positive outcome, the observed distributions of countries within the region is far from the ideal scenario. This is particularly evident in Central and Eastern Asia. In these cases, while the analysis at regional level indicates a target already met (Eastern Asia) or about to be achieved (Central Asia), the dissimilarity index is equal to 40% and 50% respectively, meaning that almost half of the countries in Central and Eastern Asia should change their status to achieve a positive assessment (TAM or "on-track to achieve the target").

Table 4 – Summary results for regions' progress over time of PoU.

Regions	Trend FAO Report	No. Countries	Delta	Overlap
Australia and New Zealand	TAM	2	0.00	1.00
Central Asia	>>	4	0.50	0.50
Eastern Asia	TAM	5	0.40	0.60
Europe	TAM	38	0.08	0.92
Latin America and the Caribbean	<<	28	0.82	0.18
Northern Africa	<<	5	0.60	0.40
Northern America	TAM	2	0.00	1.00
Oceania	<<	5	0.80	0.20
South-eastern Asia	>	9	0.67	0.33
Southern Asia	>	7	1.00	0.00
Sub-Saharan Africa	=	32	1.00	0.00
Western Asia	<<	13	0.62	0.38

4. Discussion and Conclusion:

This note follows the arguments contained in Gennari and D'Orazio (2020) and aims to suggest additional indicators to improve the assessment of both the "current distance to the target" and the "pace of progress towards the target" at regional/global level. The proposal goes in the direction of introducing a simple well-known tool (index of dissimilarity) that has an easy interpretation and can be understood also by users without a statistical background. The proposed index can be adapted to different methodological approaches, since it can be calculated also in presence of a weighting scheme to obtain regional/global aggregates. The results obtained with this index, however, depend crucially from the initial categorization of the SDG progress assessments currently used, the "current distance to the target" and the "pace of progress toward the target".

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