

Progress assessment methodology for UNIDO SDG 9 indicators 12.05.2020

Assessing progress in Sustainable Development Goal 9 (SDG 9) can provide valuable information on inclusive and sustainable industrialisation across countries. This methodological note therefore presents two new indices to track countries relative advances in the manufacturing-related indicators presented in Table 1.

Table 1: SDG 9 manufacturing-related targets.

SDG	Indicator	Description
9.2.1	<i>MVA_{pc}</i>	Manufacturing value added (MVA) per capita (constant 2015 US\$)
9.2.1	<i>MVA_{sh}</i>	MVA as a proportion of GDP (%)
9.2.2	<i>EMPL</i>	Manufacturing employment as a proportion of total employment (%)
9.b.1	<i>MHT</i>	Proportion of medium and high-tech industry value added in total value added (%)
9.4.1	<i>CO₂</i>	CO ₂ emissions per unit of MVA (kg of CO ₂ per constant 2015 US\$)

SDG Target 9.2 aims to “significantly raise industry’s share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries” (UNIDO 2019, p. 9). We evaluate progress in this target and introduce additional indices for a more comprehensive assessment across countries and SDG 9 indicators. These indices track countries’ current performance as well as the likelihood of achieving their targets by 2030 and are based on those developed by UN ESCAP, for example in Bidarbakhtnia (2020).

In this methodological note, we first provide a brief overview of the approach used to set targets. Second, we present the SDG 9 data and outlier treatment. Third, the SDG 9 progress measures – the Current Status Index and the Achievement Likelihood – are discussed in detail.

Setting targets

How progress in each of the multiple dimensions of inclusive and sustainable industrialisation is understood depends on country-specific circumstances. For example, while some countries have little industrial output at all, others have high levels of manufacturing production but in emissions-intensive industries. Absolute and global targets on industrial development therefore make little sense. To best capture relevant country-specific progress in individual SDG-9 indicators, we instead set relative targets based on countries’ starting points in different indicators.

Our central measure of relative progress in SDG 9 indicators is the average annual growth rate of the three fastest-growing economies in a benchmark group, after eliminating outliers. We consider such levels of growth high but feasible, particularly as they come from countries with similar characteristics. Therefore, we group countries based on either their level of industrial development or geographic region. The economic characteristics and industrial development

goals across countries within those categories can be considered similar enough to provide meaningful targets.

SDG Target 9.2 provides an additional possibility to measure relative progress in industry-related targets: to double 2015 indicator values by 2030. However, such targets are unlikely to be relevant for countries beside LDCs and indicators beside *EMPL* and *MVAsh*.

Table 2 presents an overview of the methodology and parameters to set relative targets discussed in the rest of this note.

Table 2: Overview of SDG 9 progress assessment methodology.

Method	Benchmark group	Target setting
Current Status Index	Comparator countries from the same: - Industrialisation category (UNIDO classification) - Geographical region (UN M49 Level 1)	Average growth rate of the top 3 economies
Achievement Likelihood	Country itself: - Indicator value in 2015	Doubling of base value (but only relevant for LDCs)

Data and outliers

The progress assessment currently covers 128 countries with data for each of the five manufacturing-related SDG indicators presented above. Countries’ growth rates in each indicator are the central measures of progress in achieving their relative targets. Figure 1 shows the distribution of countries’ compound annual growth rates between 2000 and 2017, the most recent year of complete data. There is considerable variation both between countries in each indicator and across indicators. For example, while compound annual growth rates in *MVAsh* are fairly concentrated around the median, those of *CO2* are far more dispersed.

Some countries exhibit exceptionally high or low growth rates. These may be caused by specific circumstances or measurement error and therefore may not be reproducible elsewhere. To avoid distortion caused by these values and to calculate more realistic targets, outliers are identified and removed using z-scores.

Here, we set a z-score of 2 – that means 2 standard deviations from the mean – as the threshold above which values are considered extreme and potentially unreliable. Figure 1 shows that this method leads to variable maximum and minimum growth rates across indicators depending on the distribution of the data. For example, the tolerance for high or low growth rates is higher for the indicator *CO2* as the standard deviation is larger than for the other indicators.

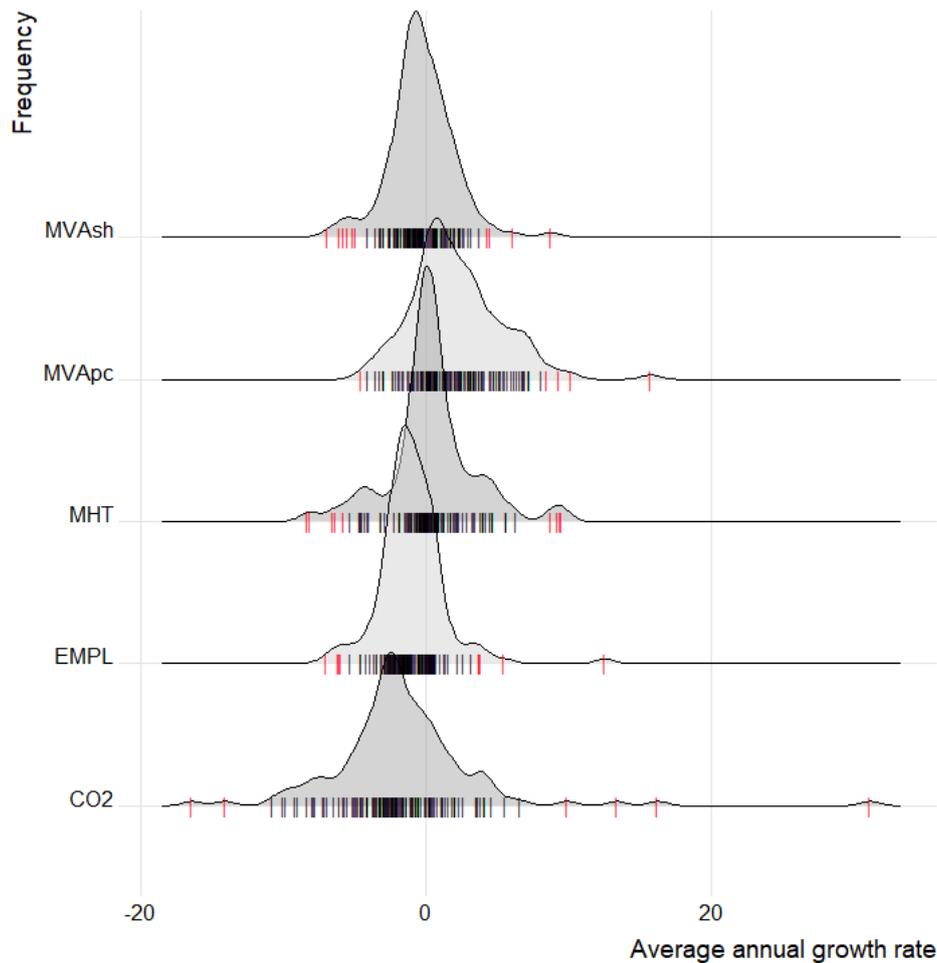


Figure 1: Distribution of compound annual growth rates by indicator.
Dashes indicate countries' average growth rates; those in red are considered outliers.

The Current Status Index

The Current Status Index (CSI) measures countries' progress in SDG 9 indicators between 2000 and 2017, with the level of progress in an indicator measured as the normalised distance to a target value (Bidarbakhtnia, 2020).¹ This allows comparisons across indicators, countries and reference groups. The CSI is calculated as:

$$CSI_{17} = \frac{I_{17} - I_{00}}{|TV - I_{00}|} \times D$$

with I_{17} and I_{00} the indicator values for a specific country in 2017 and 2000 respectively. D denotes whether increases or decreases in the indicator are desirable or not, with

$$D = \begin{cases} 1 & \text{increase desirable for } MVApC, MVAsh, EMPL, MHT \\ -1 & \text{decrease desirable for } CO2 \end{cases}$$

¹ For an overview of normalisation methods refer to OECD (2008).

The target value TV is a measure of what a country could achieve in each indicator by 2030 if it grew at the rate of the top three countries in the benchmark group. For each country it is calculated as:

$$TV = (1 + g_{BG})^{13} \times I_{17} \quad ,$$

with g_{BG} the average annual growth rate of the fastest growing countries in the group.

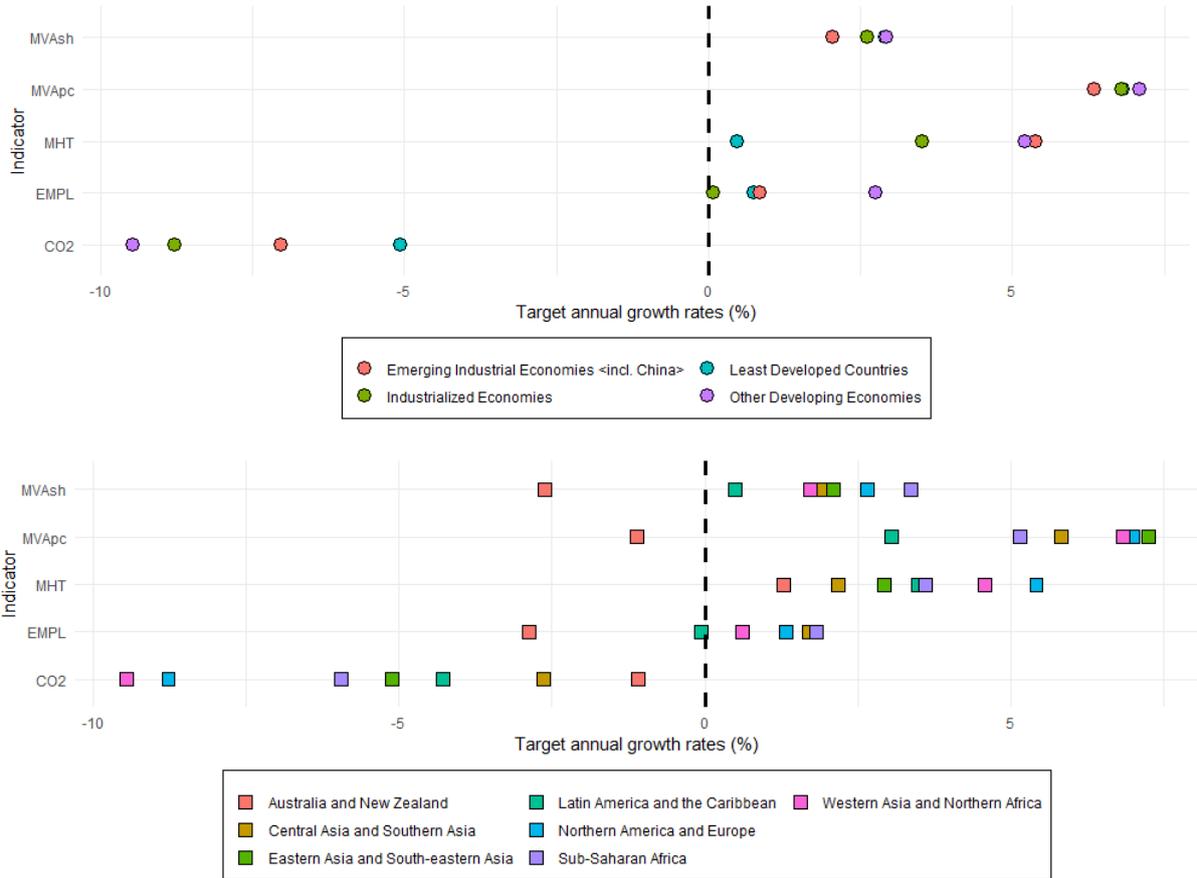


Figure 2: Target growth rates by indicator and UNIDO/geographic benchmark groups (after removal of outliers).

Figure 2 shows the values of g_{BG} for industrialisation categories and geographic regions. There is some variation depending on the specific circumstances of the benchmark group. In some cases, all countries within the benchmark group exhibit negative growth rates and $g_{BG} < 0$, although the desired growth rate is positive. Setting targets with these values implies that a negative target should be pursued. To avoid such cases, the target value is therefore set to maintain existing levels, i.e. $g_{BG} = 0$.²

² For 2017 these are: $MVAsh$, $MVApc$ and $EMPL$ for Australia and New Zealand and $EMPL$ in Latin America and the Caribbean.

To assess progress on SDG Target 9.2 , the TV equation becomes

$$TV = 2 \times I_{15} .$$

For each indicator, there is a bandwidth within which a target value makes sense. The limits are set as the maximum and minimum observed global values, once outliers have been eliminated using a z-score of 3. This creates a realistic and attainable benchmark of the values presented in Table 3.

Table 3: Maximum and minimum values by indicator.

	<i>MVApc</i>	<i>MVAsh</i>	<i>EMPL</i>	<i>MHT</i>	<i>CO2</i>
Maximum	10931.0	29.6	27.87	78.16	2.25
Minimum	21.3	1.05	1.29	0.26	0.02

The resulting CSI falls within the range [-1;1], with positive values implying progress towards the target. The CSI has an upper bound at 1, at which point the target value for 2030 has already been reached. Negative values imply a trend away from the target; indicators that have experienced very strong negative trends are also capped at -1. The CSI results are presented visually as:

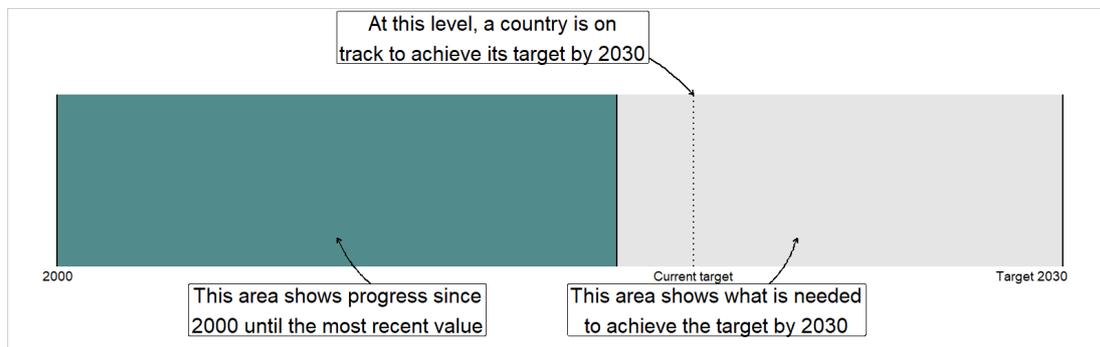


Figure 3: Example visualisation for the CSI.

The Achievement Likelihood

The Achievement Likelihood (AL) adds to the CSI by estimating countries' likelihood of meeting their respective indicator targets, all else being equal. It is calculated as:

$$AL = 1 - \frac{|TV - I_{30}|}{|TV - I_{17}|} .$$

The AL thereby reflects both the countries' expected relative progress between 2017 and 2030 and the absolute distance to the target in both years.³ The indicator value in 2030, I_{30} , is

³ If $TV = I_{17}$ (when g_{BG} is set to 0 as discussed above), this equation cannot be solved. The AL is then set to 0 as observed growth must have been in the undesired direction for this to occur.

estimated using a weighted linear regression. This attaches greater importance to more recent years and is calculated as:

$$I_i = \beta_0 + \beta_1(I_i t_i) \quad , \quad (i = 1, 2, \dots, n) \quad ,$$

with the slope coefficient β_1 as the weighted growth rate used to estimate future indicator values. Weights are assigned as:

$$w_i = \frac{t_i}{t_n} \quad , \quad (i = 1, 2, \dots, n) \quad ,$$

with t_n the most recent year of data for each indicator. This means that recent trends in the data have a greater influence on the forecasted value for 2030.

The resulting value lies in the interval [0,1], with a greater AL as I_{30} approaches TV or with greater progress in the indicator, i.e. a larger gap between I_{30} and I_{17} . While country-specific analysis is required for policy recommendations, in general lower values of the AL indicate a stronger need for reform for the SDG to be met. The AL can broadly be classified as:

- $\left\{ \begin{array}{ll} 0.8 < AL \leq 1 & \text{on track to reach target or little additional growth necessary} \\ 0 < AL \leq 0.8 & \text{need to accelerate growth to achieve target} \\ AL = 0 & \text{need to reverse negative trend to move in direction of target} \end{array} \right. .$

By assigning more weight to recent values to calculate the AL, its results can diverge from those of the CSI if there has been a recent change in the time series. Taken together, the indices can thereby provide insights into what the data tells us about both current and expected inclusive and sustainable industrialisation trajectories.

References

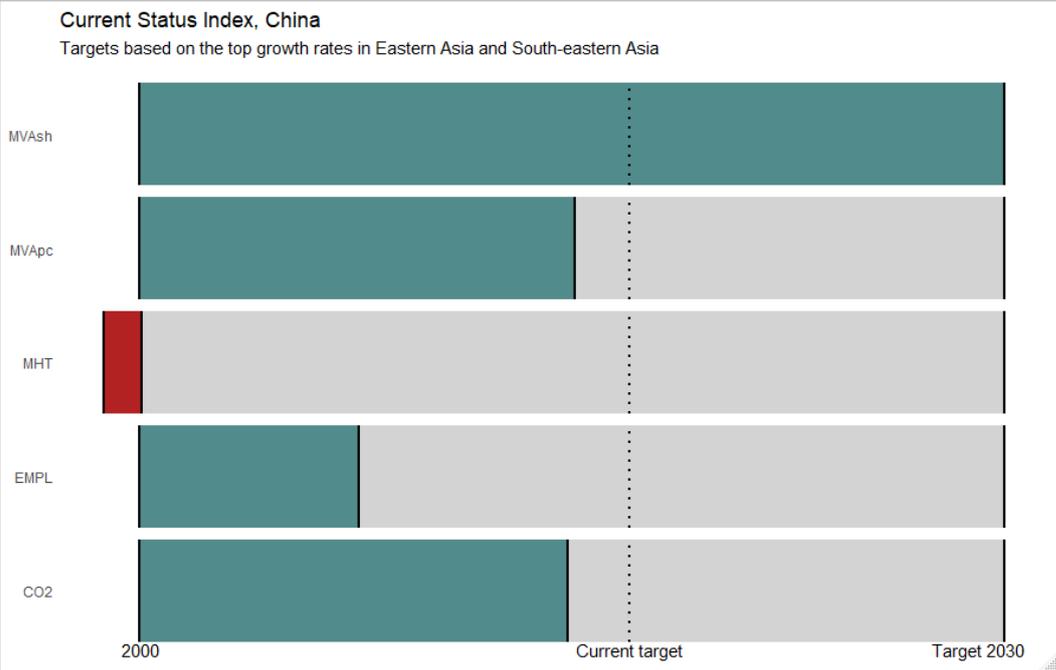
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Examples of the CSI, achievement likelihood, and CSI map:



Current status index for EMPL, Central Asia and Southern Asia

