

# 07

## Challenges and way forward

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## 7.1 Indicators and proxy variables

A big challenge in applying the conceptual framework of the Green Growth Index has been finding appropriate indicators to directly measure performance in different green growth dimensions. Desired data or data with high or moderate relevance represented 67 percent of the 36 indicators; the rest are considered “proxy variables” (Table 9). Although proxy variables are not a direct measure of the indicators, they capture underlying relationships between the green growth indicators and dimensions and include a sufficient number of countries to build a global index (Miola, Paccagnan, Papadimitriou, & Mandrici, 2015).

According to OECD & JRC (2008), correlation and sensitivity analyses can be used to check the accuracy of proxy variables. These analyses

were done for the Green Growth Index (see Chapters 5.5 and 5.10), and results showed that the index is relatively robust despite the use of proxy variables. In addition, the GGPM team conducted a literature review to find empirical evidence on the relevance of not only the desired data but also proxy variables to green growth dimensions (Chapter 4.2 and Appendix 1). The proxy variables are expected to be replaced by desired data as data become available. Likewise, the GGPM team envisaged to include additional indicators for efficient and sustainable resource use as well as for green economic opportunities as data become available in order to provide a balance in the number of indicators across all dimensions. This will address the issue of implicitly assigning more weights to the indicators in dimensions with a lesser number of indicators (see Appendix 4).

**Table 9** Relevance of indicators for the Green Growth Index and desired improvements for proxy variables

Codes	Baseline Indicators	Relevance	Desired Improvement
EE1	Ratio of total primary energy supply to GDP (MJ per \$2011 PPP GDP)	High	-
EE2	Share of renewables to total final energy consumption (Percent)	High	-
EE3	-	-	Additional indicator to measure energy productivity
EW1	Water use efficiency (USD per m <sup>3</sup> )	Moderate	Can be replaced with water footprint indicators; to be made available by the Water Footprint Network
EW2	Share of freshwater withdrawal to available freshwater resources (Percent)	High	Improvement of time series data
EW3	-	-	Additional indicator to measure water treatment; data currently scanty
SL1	Average soil organic carbon content (Tons per hectare)	Proxy	Can be replaced with soil nutrients; to be made available by FAO
SL2	Share of organic agriculture to total agricultural land area (Percent)	Moderate	Improvement of time series data
SL3	-	-	Additional indicator to measure sustainable land management; to be made available by FAO
ME1	Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)	High	-
ME2	Total material footprint (MF) per capita (MF tons per capita)	High	-
ME3	-	-	Additional indicator to measure material and waste recycling
EQ1	PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m <sup>3</sup> )	Moderate	To be combined with PM10 as data availability improves
EQ2	DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)	Proxy	Can be replaced with water pollution; no identified sources yet
EQ3	Municipal solid waste (MSW) generation per capita (Tons per year per capita)	Moderate	Improvement of time series data
GE1	Ratio of CO <sub>2</sub> emissions to population, excluding AFOLU (Metric tons per capita)	Moderate	Improvement of time series data

**Table 9** Relevance of indicators for the Green Growth Index and desired improvements for proxy variables (continued)

Codes	Baseline Indicators	Relevance	Desired Improvement
GE2	Ratio of non-CO <sub>2</sub> emissions to population, excluding AFOLU (Tons per capita)	Moderate	Improvement of time series data
GE3	Ratio of non-CO <sub>2</sub> emissions in agriculture to population (Gigagrams per 1000 persons)	High	-
BE1	Average proportion of key biodiversity areas covered by protected areas (Percent)	High	-
BE2	Share of forest area to total land area (Percent)	Proxy	Can be replaced with indicator that measures quality and type of forests; inclusion of mangrove forest
BE3	Soil biodiversity, potential level of diversity living in soils (Index)	Proxy	Can be replaced by soil biodiversity related to land use; to be made available by FAO
CV1	Red list index (Index)	Proxy	Can be replaced by species of relevance to tourism, local, and indigenous communities
CV2	Tourism and recreation in coastal and marine areas (Score)	Proxy	Can be replaced by sustainable eco-tourism in different ecosystems; no identified sources yet
CV3	Share of terrestrial and marine protected areas to total territorial areas (Percent)	Proxy	Can be replaced by protected areas managed by indigenous and local communities
GV1	Adjusted net savings, minus natural resources and pollution damages (Percent GNI)	Proxy	Can be replaced by investment in renewable energy or green technology
GV2	-	-	Additional indicator to measure investment in key biodiversity areas or protected areas will be useful, no identified sources yet
GV3	-	-	Additional indicator to measure investment in human skills in green jobs; no identified sources yet
GT1	Share of export of environmental goods (OECD and APEC class.) to total export (Percent)	Moderate	Improvement in the classification of environmental goods
GT2	-	-	Additional indicator to measure sustainable trade in certified products, to be made available by certification organization; data currently scanty
GT3	-	-	Additional indicator to measure trade in waste materials; no identified sources yet
GJ1	Share of green employment in total manufacturing employment (Percent)	Moderate	Improvement in the indicator to measure green employment in different economic sectors
GJ2	-	-	Additional indicator to measure skills generated in green employment; no identified sources yet
GJ3	-	-	Additional indicator to measure wage gap in green and standard employment; no identified sources yet
GN1	Share of patent publications in environmental technology to total patents (Percent)	Moderate	Improvement in data availability for more countries
GN2	-	-	Additional indicator to measure green innovation in entrepreneurship; no identified sources yet
GN3	-	-	Additional indicator to measure green innovation
AB1	Population with access to safely managed water and sanitation (Percent)	High	-
AB2	Population with access to electricity and clean fuels/technology (Percent)	Moderate	Improvement of the indicator to measure renewable electricity
AB3	Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)	High	-

**Table 9** Relevance of indicators for the Green Growth Index and desired improvements for proxy variables (continued)

Codes	Baseline Indicators	Relevance	Desired Improvement on Indicators
GB1	Proportion of seats held by women in national parliaments (Percent)	Moderate	Can be combined with an indicator on positions held by women in managerial positions; data currently scanty
GB2	Share of female to male with account in financial institution, age 15+ (Percent)	High	-
GB3	Getting paid, covering laws and regulations for equal gender pay (Score)	Proxy	Can be replaced by an indicator measuring gender parity in salary and benefits
SE1	Inequality in income based on Atkinson (Index)	Proxy	It can be replaced by the indicator on Palma ratio; data currently scanty
SE2	Ratio of urban to rural, access to safely managed water/sanitation & electricity (Percent)	Moderate	Improvement of the indicator to measure renewable electricity
SE3	Share of youth not in education, employment or training, aged 15-24 years (Percent)	Moderate	Improvement in time series data
SP1	Proportion of population above statutory pensionable age receiving a pension (Percent)	Moderate	Improvement in time series data
SP2	Healthcare access and quality index (Index)	Proxy	Can be replaced by an indicator that directly measures health protection; no identified sources yet
SP3	Proportion of urban population living in slums (Percent)	Proxy	Can be replaced by indicator on inadequate housing, including homelessness; to be made available by UN-Habitat

## 7.2 Data availability

Availability of data is another important challenge that affects the relevance of the indicators. The GGPM team considered indicators to be of high relevance for the framework if they are not only conceptually relevant but also publicly available. The completeness or lack of the data influences scores of the Green Growth Index. For example, a country with complete data for all indicators for green economic opportunities will have lower scores if one of the four indicators have a value of zero, thus pulling values of other indicators down. In contrast, another country with incomplete data will have a higher score because the fourth indicator, which may also have a value of zero but missing and unknown, will be excluded by default. The lack of data thus causes some level of uncertainty in the results of the Green Growth Index. Allowing missing values is, however, necessary for two reasons: first, to allow substitutability of indicators that represent the same concept as represented by the indicator category; second, to maintain a larger number of countries until the

last level of aggregation. Not allowing for substitutability at the first and second levels of aggregation will exclude countries with missing values. Table 10 provides information on data gaps for indicators in the Green Growth Index by region and their implications on the number of countries.

If there were no missing values, the index could be computed for about 207 countries globally. Due to data gaps, however, the current index has been computed only for 115 countries (Figure 3). The data gap is the largest for the indicators for green economic opportunities, with Oceania and Africa having as high as 83 percent and 61 percent missing values, respectively. There are no data gaps for the indicators for natural capital protection in any of the regions. Data gaps for each country are presented in Table A1.14 (Appendix 1).

**Table 10** Summary of data gaps for indicators in Green Growth Index and its dimensions by region

Region	Number of countries	Green Growth Dimensions				Green Growth Index
		Resource efficiency	Natural capital protection	Green economic opportunities	Social inclusion	
Africa	54	9%	0%	61%	2%	61%
The Americas	43	28%	0%	51%	23%	51%
Asia	49	10%	0%	31%	2%	35%
Europe	43	9%	0%	12%	9%	12%
Oceania	18	67%	0%	83%	33%	83%
Global	207	18%	0%	43%	11%	44%

Note: The percentage refers to the proportion of countries without data for the indicators in their respective regions. Countries with no data for all dimensions were excluded from the count.

## 7.3 Sustainability targets

Sustainability targets provide critical information to benchmark the Green Growth Index. The scores depend on the reliability of these targets. A quarter of the targets for the index are currently based on mean values of the top five performing countries (Chapter 5.6.3), which allow countries to already reach the targets regardless of their performance on a given indicator. For example, the target for the indicator for green innovation, which is the share of export of environmental goods to total export, was based on the top five performing countries. The maximum value for this indicator is only 20 percent, hence limiting the space for increasing performance for green exports because the target is very low. Similarly, the maximum value for the indicator for green employment, which is the share of green employment in total manufacturing employment, is only 14 percent, allowing some countries to have a score of 100, although green employment has not significantly contributed to the economy. Moving forward, sustainability targets for the indicators not included in the

SDG should have valid and sufficient bases. The producer or publisher of data will be requested to recommend targets for the indicator.

Finally, SDG targets are either explicit or implicit. Because implicit SDG targets leave room for interpretation, different targets were given to the same SDG indicator (Table 4). For the Green Growth Index, the GGPM team did not attempt to interpret the SDG targets but used available interpretation, such as that suggested by (OECD, 2019a, 2019b) and by SDSN Sachs et al. (2018, 2019). Whenever the suggestions on the targets diverge, the team adopted the SDSN targets because, as with the Green Growth Index, the SDSN methodology was developed based on the global context. In the future, alignment with the SDG targets will continue to be important to provide consistent policy recommendations to the countries.