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National baselines for the Sustainable Development Goals assessed in the SDG Index and Dashboards

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The Sustainable Development Goals (SDGs) — agreed in 2015 by all 193 member states of the United Nations and complemented by commitments made in the Paris Agreement — map out a broad spectrum of economic, social and environmental objectives to be achieved by 2030. Reaching these goals will require deep transformations in every country, as well as major efforts in monitoring and measuring progress. Here we introduce the SDG Index and Dashboards as analytical tools for assessing countries' baselines for the SDGs that can be applied by researchers in the cross-disciplinary analyses required for implementation. The Index and Dashboards synthesize available country-level data for all 17 goals, and for each country estimate the size of the gap towards achieving the SDGs. They will be updated annually. All 149 countries for which sufficient data is available face significant challenges in achieving the goals, and many countries' development strategies are imbalanced across the economic, social and environmental priorities. We illustrate the analytical value of the index by examining its relationship with other widely used development indices and by showing how it accounts for cross-national differences in subjective well-being. Given significant data gaps, scope and coverage of the Index and Dashboards are limited, but we suggest that these analyses represent a starting point for a comprehensive assessment of national SDG baselines and can help policymakers determine priorities for early action and monitor progress. The tools also identify data gaps that must be closed for SDG monitoring.

To achieve the Sustainable Development Goals[1] (Supplementary Table 1) and implement the Paris Agreement, developed and developing countries alike will need to transform their energy systems, ecosystem management, agriculture and land use, urban management, material use, gender outcomes, health, education, governance and other areas[2,3]. In addition to requiring greater financial resources and political commitments, these transformations will also place major demands on science to devise data and monitoring frameworks[4], to relate planetary boundaries to national sustainability objectives[5,6], to develop innovative solutions and to chart out integrated pathways for achieving the goals[2,7], taking account of the trade-offs and synergies across goals and targets[8,9].

The predecessors to the SDGs, the Millennium Development Goals (MDGs) that expired in 2015, mobilized attention on addressing the challenges of extreme poverty, hunger, illiteracy and disease[10]. The MDGs helped spur advances on many fronts. In health, the MDGs have been associated with a significant acceleration of progress in some of the poorest countries[11–13], which stands in contrast to the lack of progress on environmental sustainability observed under the three Rio Conventions[14] and other MDG priorities, such as access to water supply[13].

The MDG experience suggests that global goals can serve as a management tool and report card that focus attention on complex sustainable development outcomes[10] and accelerate progress towards these outcomes. Yet success is far from guaranteed. *Inter alia*, it will require educating decision makers and the public in sustainable development; mobilizing science for diagnosing challenges, identifying solutions, developing long-term pathways and tracking progress; mobilizing governments, businesses, and civil society for action around shared goals; and cooperation across countries to address planetary boundaries[5] and other areas requiring international collaboration, such as implementing the Paris Agreement or aid-financed investments in developing countries.

Compared with the eight MDGs, which were extracted from the Millennium Declaration by a team of officials working under the former UN Secretary-General Kofi Annan[10], the SDGs represent a political compromise negotiated by the 193 member states of the United Nations that has been critically reviewed[9]. In particular, the goals combine policy ends (such as ending extreme poverty or ending preventable child deaths) with means such as development finance and maintaining a global partnership for development. Many SDGs focus on flows instead of focusing on stocks, as recommended by many scientists[15–17] since the report of the Brundtland Commission[18]. Finally, the goals do not propose a hierarchy among the 17 goals and associated targets. In this paper, we focus on how baselines for the SDGs can be established without aiming to resolve the criticisms of their design.

Good data and clear metrics are critical for each country to take stock of where it stands, devise pathways for achieving the goals and track progress. The UN Statistical Commission has recommended a first set of 230 global indicators to measure achievement of the SDGs, but many suggested indicators lack comprehensive, cross-country data and some even lack agreed statistical definitions[19]. More and better data are needed, but it will take years to build the necessary statistical systems even if adequate resources were mobilized, which is currently not the case[20]. Some governments have begun voluntary national reviews of progress on the SDGs, but they use indicators that are not harmonized internationally and lack comparability[21].

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Table 1 | SDG Index 2016: score and ranking.

Rank	Country	Score	Rank	Country	Score
1	Sweden	84.5	48	Turkey	66.1
2	Denmark	83.9	52	Brazil	64.4
3	Norway	82.3	56	Mexico	63.4
4	Finland	81.0	76	China	59.1
5	Switzerland	80.9	85	Saudi Arabia	58.0
6	Germany	80.5	95	Philippines	55.5
7	Austria	79.1	98	Indonesia	54.4
8	Netherlands	78.9	99	South Africa	53.8
9	Iceland	78.4	110	India	48.4
10	United Kingdom	78.1	115	Pakistan	45.7
11	France	77.9	118	Bangladesh	44.4
13	Canada	76.8	141	Nigeria	36.1
20	Australia	74.5	145	Chad	31.8
25	United States	72.7	146	Niger	31.4
27	South Korea	72.7	147	Congo, Dem. Rep.	31.3
35	Italy	70.9	148	Liberia	30.5
43	Argentina	66.8	149	Central African Republic	26.1
47	Russia	66.4	-	-	-

SDG Index ranking and scores (0 to 100) for the top-ten countries, bottom-five countries, members of the G20 and other countries with a population greater than 100 million. Rankings are out of 149 countries included in the 2016 SDG Index. Data for all countries is provided in Supplementary Table 2.

In the meantime, scientifically robust tools are needed to help operationalize the SDGs at the global, regional, national and sub-national levels in order to begin a process of data-driven and evidence-based implementation and follow-up. Specifically, such tools should address the following questions: (i) What are the 2015 baselines for key SDG indicators at global, regional, national and sub-national levels? (ii) How far is a country from achieving a particular SDG, and which are the country's most important SDG challenges? (iii) How can countries' overall progress towards implementing the 2030 Agenda and the 17 SDGs be assessed, compared and tracked over time? (iv) Which data gaps need to be filled most urgently to support better monitoring and facilitate peer-learning between countries with regard to policies that help achieve the SDGs?

Reporting a large number of indicators alone, while providing much detail about specific domains, eventually leaves open the question of how to measure the aggregate performance of a country. Composite indices have well-known weaknesses[22], but they can synthesize complex information into a single number and may be more effective in stimulating public debates than a large number of individual scores which could result in cherry picking[15,20]. To inform policies for the achievement of complex integrated goals, a combination of composite measures and dashboards are therefore needed for the SDGs. Prominent examples of such composite indices in recent years include the Global Burden of Disease index for the health SDGs[23], the Environmental Performance Index (EPI)[24], the Ocean Health Index[25], the Human Development Index (HDI)[26], the Programme for International Student Assessment education assessment[27], the Global Competitiveness Index[28], the Global Peace Index[29], the Index of Economic Freedom[30] and many others. Some of these composite indices have had significant impact in drawing political attention[31,32], guiding policies, fostering learning across countries, and promoting more research[33,34]. Yet, only the health-related SDG Index by the Global Burden of Disease collaboration was specifically designed to track a part of the SDG agenda.

In order to assist countries in measuring their SDG baselines and to measure future progress, the Bertelsmann Stiftung and the Sustainable Development Solutions Network (SDSN) jointly released the first SDG Index and Dashboards in July 2016, with data covering 149 of 193 UN member states[35]. They build upon an SDG Index published in 2015 by the Bertelsmann Stiftung with the support of SDSN, covering the 34 developed countries that were members of the Organisation for Economic Co-operation and Development (OECD)[36]. In this paper, we present the SDG Index and Dashboards that will be updated and revised annually. We explore differences in countries' performance, consider the empirical relationship to subjective well-being (SWB), and discuss how remaining gaps in data and analysis can be filled.

The SDG Index and Dashboards

The annual SDG Index provides a standardized, quantitative, transparent and scalable composite measure of SDG baselines for 149 countries with sufficient data across the goals. It synthesizes 63 global indicators plus 14 additional indicators for OECD countries into an overall assessment of SDG baselines and ranks countries according to their starting points on the 17 SDGs. We included official SDG indicators[19] with data available for at least 80% of countries with a population greater than 1 million. Indicator gaps were filled using published data from other sources (Supplementary Table 3). The authors consulted widely with expert communities on suitable indicators, including through a public consultation hosted by the SDSN. The methodology follows established principles from the academic[37] and policy literature[22]. The details of the index are summarized in the methods summary

Figure 1 | SDG Dashboards 2016. SDG Dashboard for members of the G20 and other countries with a population greater than 100 million. Dashboards for OECD countries calculated using an augmented set of 77 indicators, compared to 63 global indicators for non-OECD countries. Green signifies that the country has achieved the goal, yellow points to significant challenges that remain and red warns that major challenges must be overcome to meet the goal. Grey indicates an SDG for which there is no data. Icon images courtesy of United Nations.

and detailed in the Supplementary Information, which references all data sources and provides sensitivity analyses showing that the rankings are robust with regard to alternative specifications.

Table 1 shows the SDG Index ranking for a selection of countries. Sweden is ranked first, having covered 84.5 percent of the distance towards the optimum outcome across SDG metrics for which data was included in the index. The annual SDG Dashboards (Fig. 1) present baseline information by SDG to identify implementation priorities for each country.

Interpreting and applying the SDG Index and Dashboards

The SDG Dashboards show that even the wealthiest countries face major challenges in meeting several of the SDGs, confirming the universal relevance of the goals and the need to consider the full SDG agenda to avoid cherry picking. To meet the SDGs, poor countries must make substantial progress in ending extreme poverty, ensuring access to essential infrastructure, curbing environmental degradation and promoting social inclusion. Richer countries face fewer but nonetheless major challenges in addressing climate change, lowering inequalities, halting the loss of biodiversity and contributing their fair share towards the global partnership to achieve the SDGs.

The SDG Index is correlated with per capita gross domestic product, the most widely used indicator of economic progress; the HDI, a composite measure of health, education and income outcomes; the Global Competitiveness Index, a common index of countries' economic competitivenes; the EPI, which comprises a broad range of environmental indicators; and the Global Peace Index, a broad measure of peace and conflict (Fig. 2). The correlation is strongest with the HDI and GDP and weakest with the Index of Economic Freedom and the Global Peace Index.

However, substantial differences exist in performance within regions and across regions and income groups (Table 2). For example, average SDG Index scores for East and South Asia are lower than estimated from the global bivariate relationships except for the EPI, suggesting that these countries have prioritized economic and social development over the environment. The reverse is true in countries in Eastern Europe and Central Asia, and Latin America and the Caribbean that perform better on the EPI than other regions. Sub-Saharan Africa performs worse on the SDG Index than on all other indices, except the HDI. This finding is consistent with significant investments in health and basic education under the MDGs that have yet to be matched by similar investments in other SDG priorities. This illustrates the usefulness of a broader SDG Index in identifying imbalances in countries' development needs.

OECD members and high-income countries score better on the SDG Index than on the other indices suggesting that their development model is more balanced on average. However, as illustrated in the SDG Dashboards, OECD and high-income countries perform poorly on some goals, such as climate change, showing the limitations of only considering the aggregate SDG Index scores.

Tables 3 and 4 therefore disaggregate SDG Index scores by individual SDGs to identify which dimensions of the index drive each country's performance relative to others. Results show that different countries pursue different development models. For example, the United States ranks 9th in per capita GDP[38], but 25th in the SDG Index. Relative to its overall SDG score, the country experiences major deficits in inequality and peace and justice (SDGs 10 and 16), environmental objectives (SDGs 12–15) and partnership for the Goals (SDG 17). Findings are similar for China, Russia and the UK. Meanwhile, continental European countries tend to be more equal, but face major challenges on the environment goals and in some instances on economic performance. Some countries, notably from the Middle-East and North Africa, perform well on meeting basic needs, as measured by the HDI, but fall short on the SDG Index. For example, Saudi Arabia ranks 35th in the HDI but 85th

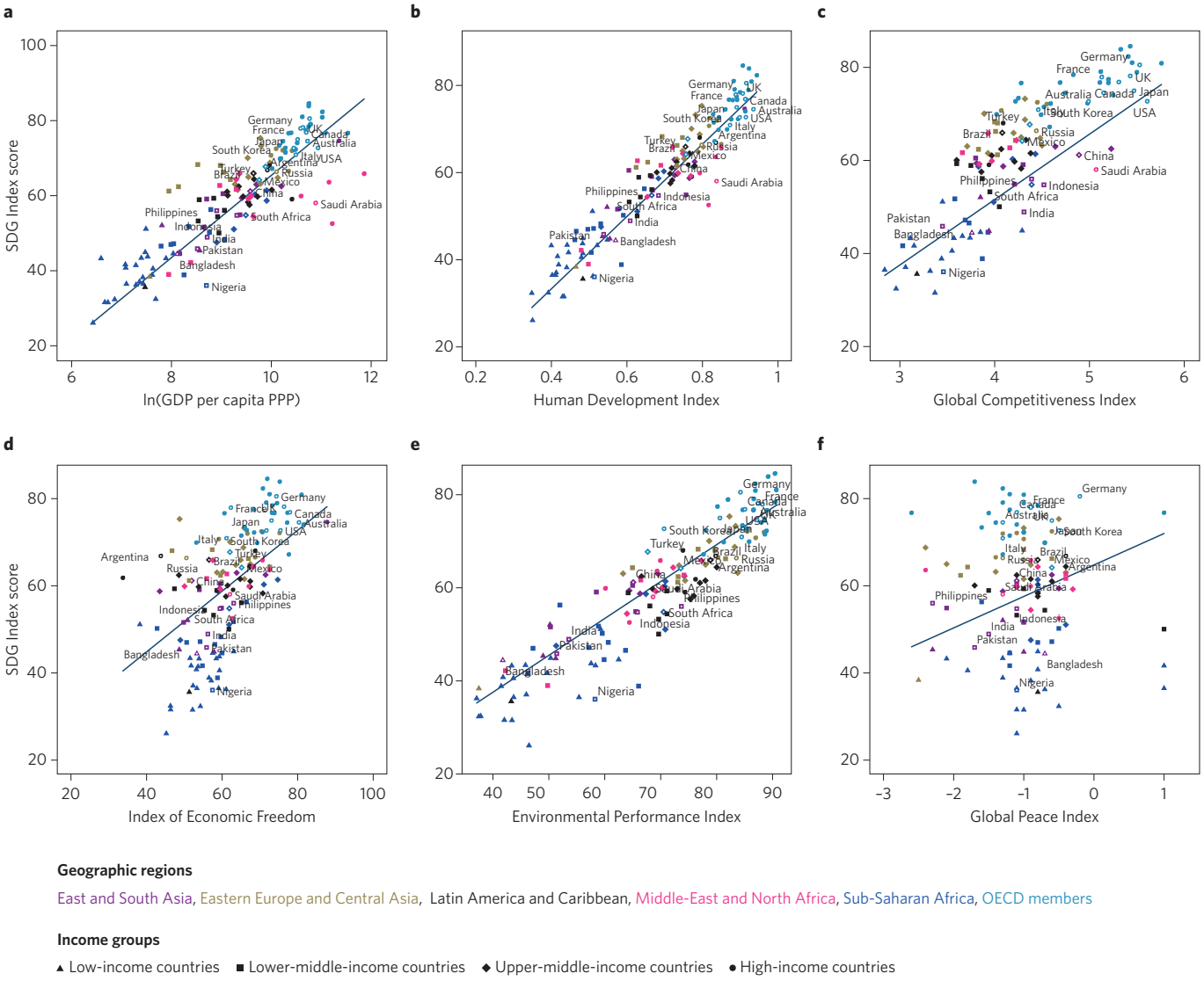

Figure 2 | Correlation of SDG Index with other common development indices. a–f, Pairwise, population-weighted correlation of SDG Index scores by geographic region and income group with: natural logarithm of GDP per capita (PPP)[38] (**a**); Human Development Index[26] (**b**); Global Competitiveness Index[28] (**c**); Index of Economic Freedom[30] (**d**); Environmental Performance Index (**e**); and Global Peace Index (**f**). Countries above trend line perform better on the SDG Index than suggested by correlations.

(both out of 149) in the SDG Index owing to deficiencies in gender and income inequality, and the environment. This shows how a combination of the SDG Index and the SDG Dashboards provide a richer understanding of a country's development challenges.

Supplementary Table 10 reports the SDG Index and its components for each country. This data can help countries identify when their development is imbalanced by benchmarking performance across individual goals with average country performance as well as performance of countries at a similar stage of development.

The SDG Index is also partially correlated with subjective well-being in the presence of common correlates considered in the literature — per capita GDP and unemployment (Box 1). This illustrates the usefulness of the SDG Index in understanding determinants of (and cross-country differences in) SWB and other policy objectives.

Major data gaps for the SDGs

Three types of data challenges need to be addressed to improve the measurement of baselines for the SDGs and to ensure effective monitoring, as summarized in Table 5. First, some SDG priorities lack scientifically robust indicator definitions that can be applied in a broad range of countries. Developing or improving such definitions will require a collaboration between the respective academic communities with statistical offices and policymakers. International organizations could convene such dialogues and support the production of handbooks on new measurement areas, such as the OECD Guidelines on Measuring Subjective Well-being[39].

Second, some indicators require better and more frequent data collection and dissemination, particularly in poor countries and small-island economies where data is either unavailable or estimated too infrequently to allow for the reliable estimation of trends over time. In many instances this will require substantial additional investments in statistical systems and data collection mechanisms[40]. Countries with small populations need to consider alternative methods for approximating some data since standard survey techniques may become inoperable.

Third, in other areas data is collected by scientists or available through big data but is not adequately used to inform official SDG monitoring efforts at national, regional and global levels. This applies particularly to perception-based indicators (for example, on corruption or subjective well-being) but also other metrics, which

Table 2 | Relative performance on SDG Index by region and income group.

	ln(GDP per capita PPP)	Human Development Index	Global Competitiveness Index	Index of Economic Freedom	Environmental Performance Index	Global Peace Index
By region:						
East and South Asia	-1.10	-0.75	-4.11	-0.79	2.19	-6.71
Eastern Europe and Central Asia	4.10	2.13	10.83	12.38	-1.87	6.54
Latin America and the Caribbean	2.18	0.63	10.11	5.85	-2.71	2.64
Middle-East and North Africa	-2.31	0.51	7.80	3.67	1.48	1.66
Sub-Saharan Africa	-0.91	0.45	-6.08	-14.00	-5.72	-20.06
OECD members	2.66	0.98	8.42	6.71	4.17	14.95
By income group:						
Low-income countries	2.66	1.15	-5.74	-11.79	-0.33	-18.33
Lower-middle-income countries	-1.55	-0.44	-3.79	-6.04	-0.52	-10.82
Upper-middle-income countries	-0.28	-0.08	0.71	5.66	1.93	0.77
High-income countries	1.81	0.28	8.69	8.55	2.93	13.87

Table lists average distance of countries in each region from the estimated population-weighted relationship between the SDG Index and natural logarithm of GDP per capita in Purchasing Power Parity, the Human Development Index, the Global Competitiveness Index, the Index of Economic Freedom, the Environmental Performance Index and the Global Peace Index (Fig. 2). All averages are weighted by countries' populations. Negative values suggest that countries in the region are on average below the trend line; that is, their SDG Index score is lower than would be expected from the respective bivariate relationship.

Table 3 | Deviation from average country SDG Index score by SDGs 1–10.

Country	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SDG7	SDG8	SDG9	SDG10
Argentina	33.2	9.3	9.3	24.5	8.0	30.8	19.7	-3.8	-35.1	-17.5
Australia	25.5	-5.1	11.7	21.3	3.1	25.2	9.8	4.7	-0.2	6.3
Bangladesh	-7.9	-6.1	6.3	9.9	6.9	31.5	-1.2	10.5	-38.6	37.7
Brazil	27.0	7.9	2.7	8.7	1.6	26.2	24.8	-1.7	-28.6	-43.6
Canada	23.2	1.8	7.5	8.0	3.3	22.8	14.1	8.4	-13.1	4.1
China	22.6	6.7	12.1	19.8	9.9	25.1	14.8	8.8	-15.7	-5.4
France	22.1	-3.2	6.9	6.5	0.9	20.2	15.4	-10.3	-8.4	8.2
Germany	19.5	6.3	6.8	4.6	-1.3	17.3	6.9	-3.8	-7.6	11.7
India	20.2	-18.5	3.1	12.5	-18.5	21.2	9.1	10.2	-27.1	28.5
Indonesia	22.1	-9.9	-1.0	19.1	7.3	21.3	7.0	9.0	-33.2	11.4
Italy	29.1	-3.2	13.4	16.5	-3.9	26.4	16.9	-10.4	-19.7	0.9
Japan	25.0	0.4	10.3	9.0	-15.3	23.4	12.7	1.6	12.6	7.2
Mexico	31.9	-0.6	9.1	14.0	9.0	26.0	17.1	-1.4	-35.3	-21.9
Nigeria	-13.9	7.5	-16.9	-16.3	-11.9	15.3	2.7	6.0	-19.6	1.8
Pakistan	27.0	7.9	2.7	8.7	1.6	26.2	24.8	-1.7	-28.6	-43.6
Philippines	24.9	-9.8	1.8	10.3	6.9	27.0	11.4	-0.5	-38.8	-2.6
Russia	33.6	-11.3	9.0	16.8	1.3	20.9	18.9	13.2	-21.9	-5.4
Saudi Arabia	42.0	-3.6	14.4	30.8	-18.7	6.6	24.5	14.6	-7.4	-58.0
South Africa	21.1	5.9	-12.9	17.9	26.6	25.7	19.7	-25.8	-12.3	-54.8
South Korea	27.3	6.0	8.4	14.2	-10.0	22.0	16.1	17.5	10.3	13.2
Turkey	31.9	-2.9	6.5	13.4	-25.1	28.7	20.0	-3.9	-24.9	-6.6
United Kingdom	21.9	-0.1	6.6	9.3	3.2	20.9	8.9	-2.0	-5.6	-6.2
United States	27.3	15.7	7.5	2.4	1.7	25.5	14.9	9.8	9.1	-13.6

Difference between the overall SDG Index score (Table 1) and scores for SDGs 1–10 for G20 members and countries with a population greater than 100 million.

are well-accepted scientifically, but not used by many national statistical offices and not included among the proposed official SDG indicators[19]. In some areas such as food loss and waste, greater efforts are needed to bring SDG-relevant commercial data into the public domain and to improve the availability of such data.

As a result of these data gaps some SDGs remain poorly measured. For example, we are unable to include indicators on gender-based violence. SDG 12 on sustainable consumption and production presents some of the greatest data challenges. This is true, for example, in the case of the Material Footprint Index[41], which we did not include in

Table 4 | Deviation from average country SDG Index score by SDGs 11–17.

Country	SDG11	SDG12	SDG13	SDG14	SDG15	SDG16	SDG17
Argentina	22.9	−21.1	15.7	−27.8	−21.5	−24.1	−22.6
Australia	13.2	1.9	−33.8	−24.5	−23.9	−2.2	−33.1
Bangladesh	−30.5	2.8	20.5	−1.6	0.2	1.3	−64.0
Brazil	15.8	−18.9	20.9	−11.8	−8.2	−31.4	−15.4
Canada	10.6	−7.3	−14.6	−20.9	−19.2	2.3	−31.0
China	−18.0	−10.4	−22.0	−29.2	−12.5	−4.5	−35.8
France	7.6	−2.8	5.7	−22.7	−17.5	−6.6	−22.0
Germany	3.6	−1.5	−5.8	−28.7	−7.9	−2.4	−17.7
India	−21.8	4.4	14.2	−9.7	−13.1	9.7	−32.8
Indonesia	−6.0	−8.3	29.2	−12.0	−21.1	4.8	−45.8
Italy	10.1	5.1	7.8	−28.5	−6.7	−15.9	−37.8
Japan	7.8	−4.1	−6.4	−32.3	−21.4	3.1	−33.6
Mexico	21.3	−5.8	21.3	−9.8	−27.6	−24.6	−35.7
Nigeria	−16.6	10.5	52.1	−2.7	36.7	1.2	−36.1
Pakistan	15.8	−18.9	20.9	−11.8	−8.2	−31.4	−43.0
Philippines	13.3	−9.1	27.4	−2.4	−21.0	−3.4	−42.7
Russia	15.7	−13.1	−0.6	−12.1	−6.7	−29.2	−29.2
Saudi Arabia	−58.0	−4.7	−3.9	−6.7	4.4	5.6	−39.9
South Africa	26.0	−8.4	11.2	−10.8	−20.1	−13.0	−12.3
South Korea	−3.2	8.8	−6.3	−42.2	−27.2	−15.2	−39.7
Turkey	14.5	−8.6	16.5	−21.2	−15.9	−11.6	−36.6
United Kingdom	10.7	4.7	−1.7	−28.4	−31.6	0.5	−11.1
United States	15.7	−11.2	−18.7	−27.5	−28.4	−11.8	−18.4

Difference between the overall SDG Index score (Table 1) and scores for SDGs 11–17 for G20 members and countries with a population greater than 100 million.

Box 1 | Applying the SDG Index as a predictor of subjective well-being.

SWB is increasingly considered a key aggregate objective of public policy[17,39]. It is commonly measured using the Cantril Ladder, which asks survey respondents to rate their well-being on a scale from zero to ten, with ten denoting maximum well-being[43]. To assess whether progress in achieving the 17 SDGs — as measured by the SDG Index — is likely to be associated with improvements in SWB, we investigated whether the SDG Index is partially correlated with SWB controlling for the two main macroeconomic correlates of SWB identified in the SWB literature: per capita income and unemployment[44–46]. As shown in Table 6 (column 1), the SDG Index is indeed partially correlated with SWB when controlling for GDP per capita and unemployment ($p = 0.014$). We also tested the partial correlation of SWB with three other widely used synthetic cross-country indexes: the HDI, the Global Competitiveness Index and the Index of Economic Freedom as an extension of a previous analysis that compared three prevalent theories of societal well-being (libertarianism, consumerism and holism)[43]. None of the three alternative indices are partially correlated with SWB at the 0.05 level when controlling for GDP per capita and unemployment (partial correlations 1–5). These results suggest that progress towards the SDGs may well portend a rise in SWB. To investigate which indicators included in the SDG Index account for the partial correlation, we generated partial correlations for each indicator included in the index with SWB. Supplementary Table 12 lists the indicators that exhibited a significant ($p < 0.05$) partial correlation with SWB in the presence of log GDP per capita and unemployment. These preliminary results are consistent with the literature where health status and perceptions of corruption have been shown to play a role in determining SWB[43,46]. They also identify potential regressors for SWB that have not been studied widely in the literature. We emphasize, however, that we have not yet demonstrated causation running from SDG progress to SWB. We intend to pursue these issues in our future research.

the SDG Index for two reasons. First, with the exception of fossil fuels, which are covered under SDG 13, it is not clear how per-capita consumption of specific materials (biomass, construction minerals and metal ores) relates to local and global environmental impact. Second, the Material Footprint Index aggregates consumption across a broad range of different materials on a per-kilogram basis even though one kilogram of biomass might have a different environmental impact than one kilogram of iron ore or building stone.

Another important shortcoming in the current SDG Index and available SDG data is the inadequate measurement of spill-over effects of one country's actions on the ability of other countries to achieve the SDGs, a phenomenon sometimes referred to as leakage. Spill-overs include greenhouse gas emissions, land degradation, endangerment of species, fisheries depletion, forced/child labour, groundwater depletion, financial secrecy and other detrimental effects through global supply chains and international trade. Better addressing spill-over effects as well as sustainable consumption and production patterns in the SDG Index may significantly change the ranking of some high-income countries that for example consume large volumes of environmental resources or promote policies with negative impacts on other countries' SDG baselines. See Supplementary Section 4 for more details.

Table 5 | Principal SDG data issues and gaps.

SDG	Areas requiring more or better data	Principal data issues	Principal data collection methods
1	Extreme poverty	Data availability (frequency, timeliness and international comparability)	Household surveys
2	Agriculture and food security	Indicator concepts (land tenure, food loss and waste, comparable yield gaps by agro-ecological zone, environmental sustainability of key agricultural commodities and farming practices, livestock systems and aquaculture); data availability (diets and major micronutrient deficiencies, use efficiency of agricultural inputs); and use of available data (for example, published data on nitrogen use efficiency, commercial data on fertilizer use, food loss and waste)	Agricultural and household surveys, business data, remote sensing
3	Health	Indicator concepts (affordability of healthcare and financial risks from poor health, mental health metrics)	Administrative data, household surveys
4	Education	Indicator concepts (access and learning outcomes for early childhood development, primary and secondary school)	Administrative data, household surveys
5	Gender	Indicator concepts (economic empowerment of women), data availability (violence against women and its underreporting, gender disaggregation of major surveys) and stratification across survey instruments	Surveys and administrative data
6	Drinking water quality and water pollution	Indicator concepts (effective access to water supply and sanitation), data availability (quality of drinking water, surface water and groundwater)	Household surveys, administrative data, physical sampling
7	Clean energy	Indicator concepts (leading indicators for energy transformation), use of business data	Administrative data, business data
8	Decent work	Indicator concepts (internationally comparable decent work indicators)	Business surveys, household surveys
9	Infrastructure	Indicator concepts (adequacy of transport, water, energy and other infrastructure)	Administrative data
10	Inequality	Indicator concepts (vertical mobility and equality of opportunity), data availability (Gini)	Household surveys, administrative data
11	Transport and waste management	Indicator concepts (access to and affordability of public and private transport, categories of waste and their re-use), better use of scientific data from trade statistics and input-output tables	Administrative data, surveys
12	Sustainable consumption and production patterns	Indicator concepts (to better track environmental impact of material use and relationship to biophysical constraints, recycling and re-use), data availability	Administrative data, trade statistics
13	Climate change mitigation and adaptation	Indicator concepts (harmonized standards for emissions from forestry, carbon prices, trade impact on emissions, adaptation measures), better use of business data (for example, from insurance industry)	Administrative data, remote sensing
14	Ocean ecosystems	Indicator concepts (sustainable fisheries, marine litter, marine protected areas, threatened species, attribution of changes in high seas to countries), better integration of scientific data	Surveys, direct measurement and remote sensing
15	Terrestrial ecosystems	Indicator concepts (protected areas, trade in endangered species, biomes of global significance, leading indicators of ecosystem health), data availability, better integration of scientific data	Surveys, direct measurement and remote sensing
16	Modern slavery and access to justice	Indicator concepts (human trafficking, modern slavery, access to justice, financial secrecy), data availability	Administrative data, household surveys
17	International finance and trade for the SDGs	Indicator concepts (private and public non-concessional SDG finance, tax heavens)	Administrative data

Table summarizes SDG priorities requiring more or better data and outlines principal data issues and associated data collection methods.

Implications for future research and policy

The SDG Index provides a first comprehensive assessment of countries' starting points on the internationally agreed SDGs. In contrast to GDP per capita and more narrowly defined indices, it addresses the full spectrum of economic, social and environmental challenges that countries face in achieving the SDGs providing additional insights into countries' sustainable development needs. The SDG Dashboards show significant variation in starting points across countries, and they underscore that every country falls short on a number of SDG priorities. Both tools show that countries pursue different development strategies, and that many countries need to better balance economic, social, and environmental objectives. These questions require further scientific analyses in all major disciplines relating to the 17 SDGs.

The scope and coverage of the SDG Index is currently limited by the availability of data, and significant gaps exist, such as sustainable consumption or gender-based violence. Official statistics do not adequately cover the goals, so they will need to be complemented by robust, scientific data. Future research into improving the SDG Index will focus on adding more SDG metrics as data becomes available and relating national performance thresholds to be achieved by 2030 to planetary boundaries[5,6].

To better reflect regional priorities, the SDG Index and Dashboards can in the future be augmented with variables that are of particular relevance in a given region, such as malaria metrics in sub-Saharan Africa. Likewise, countries can apply SDG Indices at the sub-national level to compare starting points across states and provinces. A first prototype SDG Index has been launched for

Table 6 | Partial correlations coefficients with Cantril Ladder.

	(1)	(2)	(3)	(4)	(5)
Sustainable Development Goals Index	0.227** (0.014)	-	-	-	0.185* (0.049)
Global Competitiveness Index	-	0.167 (0.072)	-	-	0.075 (0.431)
Human Development Index	-	-	0.123 (0.188)	-	-0.078 (0.407)
Index for Economic Freedom	-	-	-	0.130 (0.164)	0.066 (0.483)
Log GDP per capita (PPP)	0.477*** (0.000)	0.556*** (0.000)	0.323*** (0.000)	0.738*** (0.000)	0.328*** (0.000)
Unemployment	-0.405*** (0.000)	-0.317*** (0.001)	-0.405* (0.000)	-0.391*** (0.000)	-0.335*** (0.000)
Observations	119	119	119	119	119

Partial correlations between SWB measured by the Cantril Ladder and the following explanatory variables: Sustainable Development Goals Index, Global Competitiveness Index, Human Development Index, Index of Economic Freedom, GDP per capita and unemployment. Significance of partial correlation coefficients is reported in parenthesis using the following convention: ***$p<0.001$, **$p<0.01$, *$p<0.05$; all p values are one-sided. Summary statistics and data sources for all variables are provided in Supplementary Table 11. PPP, purchasing power parity.

US cities[42], and similar indices can be designed for cities around the world.

Finally, more countries need to be included in the Index. For example, compact versions of the SDG Index can be developed for small island developing states that tend to lack data for key socioeconomic and environmental variables owing to their small population size and limited data collection capacities.

In view of current data limitations, the SDG Index and Dashboards do not provide a comprehensive measure of sustainable development. The probable addition of indicators in future editions of the SDG Index, combined with the fact that data for many variables is only updated infrequently and with different periodicities, limits the scope for calculating year-on-year changes in the SDG Index and Dashboards and for using them as monitoring tools (see Supplementary Section 4). When publishing updates to the SDG Index we will consider how progress towards the goals can be estimated using the Index and Dashboards to help inform official SDG monitoring processes.

Methods

Methods, including statements of data availability and any associated accession codes and references, are available in the online version of this paper.

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Author contributions

All authors contributed extensively to the design of the SDG Index and Dashboards, and the methodology in the paper. J.D.S. supervised the work. G.S.-T. led the writing and revisions of the manuscript, with input from all other authors. K.T. and D.D.-D. identified indicators, collected, checked and prepared data, wrote and ran code, and performed robustness tests, with input from all other authors at all stages. The initial concept for the SDG Index was developed by C.K.

Additional information

Supplementary information is available in the online version of the paper. Reprints and permissions information is available online at www.nature.com/reprints. Correspondence and requests for materials should be addressed to G.S.-T.

Competing financial interests

The authors declare no competing financial interests.

Methods

As described in Supplementary Section 1, the SDG Index and Dashboards include more than 230 official SDG indicators[47] — proposed by the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) — that met tests of data availability and usability in a global index. Where official SDG indicators did not meet the criteria for data selection or where indicator gaps remained, we considered official and other metrics published in the peer-reviewed literature, as well as major databases and reports on development and environmental indicators. We also consulted with a broad range of experts and conducted a public consultation on an earlier draft of the analysis that generated 56 submissions. Since one purpose of the SDG Index and Dashboards is to highlight missing data, we did not impute missing data except for four variables that lacked data for high- or low-income countries (Supplementary Section 1.3). Each of the 17 SDGs has at least 1 (SDGs 1 and 11) and a maximum of 11 indicators. The raw data for the SDG Index is available for download with this paper.

Data for each indicator was normalized on a linear scale of 0 to 100. A score of 0 was defined by performance at the 2.5 percentile to ensure extreme values did not skew the distribution[22]. A score of 100 denotes target achievement and "leaving no one behind"[1] (for example, zero extreme poverty, 100% school completion). Some SDG target thresholds are below levels achieved today in high-performing countries. For example, the official 2030 SDG Target for child mortality is 25 per 1000 live births, whereas the top-performing countries have rates of 2.3–3.9 per 1000. For such SDG indicators, the maximum score of 100 was set as an aspirational target surpassing the SDG Target (for example, 0 child mortality per 1000 live births). In cases where no quantitative SDG target or an aspirational target could be identified we used the average of the top-five-performing countries as the benchmark for top performance. In this way the SDG Index defined an optimum outcome across the 17 goals that countries, including advanced economies, should aim for by 2030.

We aggregated indicators arithmetically within each goal and then averaged across goals, applying the same weight to every goal according to equation 1:

$$I_i(N_i, N_{ij}, I_{ijk}) = \sum_{j=1}^{N_i} \frac{1}{N_i} \sum_{k=1}^{N_{ij}} \frac{1}{N_{ij}} I_{ijk}$$

Where I_i is the index score for country i, N_i the number of SDGs for which the country has data, N_{ij} the number of indicators for SDG j for which data is available for country i, and I_{ijk} denotes the score of indicator k under SDG j for country i. This weighting for the SDG Index is subjective, as is the case with all composite indices[22,37]. Our approach is consistent with the intention of UN member states who framed the SDGs as an "integrated and indivisible" agenda[1], whereby the goals have equal priority. Supplementary Section 2.3 discusses the motivation for and implications of alternative aggregation methodologies.

Our methodology differs in some aspects from the approach of the health-related SDG Index[23] produced by the Global Burden of Disease consortium. Its authors relied on extensive modelling and interpolation to generate data for 188 countries[48]. Meanwhile, we refrained from modelling data due to the heterogeneity of the data sources used for the SDG Index, the absence of robust time series for some survey-based and other metrics, and the limited geographical coverage of many indicators for important SDG priorities. Moreover, the SDG Index seeks to draw attention to data gaps, so we limited the imputation of missing data to measures of extreme deprivation, which were not collected in rich countries and which we could confidently set at zero in the high-income countries (Supplementary Section 1.3).

For the health goals and several other SDGs, both the health-related SDG Index and the SDG Index define the upper bounds according to the average performance of the top countries. But this approach of relying on 'best performers' could not be used for greenhouse gas emission reductions, sustainable energy use or other areas where no country currently meets sustainability thresholds. For such variables, absolute target values had to be defined (Supplementary Section 2.2). The OECD pilot assessment used a similar methodology to ours and applied absolute thresholds (ref. 49), whereas in ref. 36 OECD countries are scored based on their relative performance. To construct the SDG Dashboards, each indicator was assigned absolute performance thresholds (Supplementary Table 6). For each goal a country's SDG Dashboard rating was determined by the rating of the worst-performing indicator. In this way, the SDG Dashboard highlights major implementation challenges in a goal even if the country performs well on several indicators. For example, a country that scores well on nutrition and food security indicators may be rated red on SDG 2 if it experiences high rates of obesity or low nitrogen use efficiency.

Data Availability Statement. All data used for this study and results are available for download on Figshare (https://figshare.com/s/2a93a3dd3371157af033).

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Erratum: National baselines for the Sustainable Development Goals assessed in the SDG Index and Dashboards

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In the version of this Perspective originally published, we did not credit the United Nations for the image icons in Figure 1. This has been corrected online 31 July 2017.