METADATA

GREEN GROWTH INDEX

Concept, Methods and Applications

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This is a supplementary document to the Report on the Green Growth Index – Concept, Methods and Applications (Acosta et al., 2019). It provides description on the indicators that were included in the indicator framework of the Green Growth Index*.

* Note: The SDG indicators are regularly updated. The SDG indicators identified here are based on the list as of August 2019.

Contents

01 Sustainable and efficient resource use

1.1 Ratio of total primary energy supply to GDP, or energy intensity level of primary energy

Unit:	Megajoules per constant 2011 purchasing power parity GDP	**Indicator category / code:**	Efficient and sustainable energy / EE1
Related SDG:	Target 7.3, indicator 7.3.1 (as of June 2019).		
Impact on green growth:	Negative	**Data availability:**	Time series 1990–2015
Data source:	World Bank, Sustainable Energy for All (SE4ALL) database from the SE4ALL Global Tracking Framework led jointly by the World Bank, the International Energy Agency, and the Energy Sector Management Assistance Program.		
Online source:	https://data.worldbank.org/indicator/EG.FEC.RNEW.ZS?view=chart		
Definition:	Energy intensity is the energy provided to the economy to create a unit of economic output. A low level of energy intensity means less energy is used for a unit of economic output (UNSTATS metadata).		
Relevance:	Energy is one of the most significant inputs for economic growth. Economic growth depends on the available cost-effective energy sources. Energy intensity and other energy consumption characteristics are relevant because the energy sector affects economic development. It is a very relevant indicator for green growth because it shows how energy is efficiently used in the economy (Reddy and Mehra, 2017).		
Limitation(s):	The structure of the economy, geography and other structural factors influence the share of total primary energy supply to the GDP in the country. As such, the indicator is not suited for measuring energy efficiency (UNSTATS metadata).		

1.2 Share of renewable to total final energy consumption

Unit:	Percentage	**Indicator category / code:**	Efficient and sustainable energy / EE2
Related SDG:	Target 7.2, indicator 7.2.1 (as of June 2019).		
Impact on green growth:	Positive	**Data availability:**	Time series, 1990–2015
Data source:	World Bank, Sustainable Energy for All (SE4ALL) database from the SE4ALL Global Tracking Framework led jointly by the World Bank, International Energy Agency, and the Energy Sector Management Assistance Program.		
Online source:	https://data.worldbank.org/indicator/EG.FEC.RNEW.ZS?view=chart		
Definition:	Renewable energy is the energy from the natural processes that can be replenished in a fast rate. Renewable energy includes heat and electricity from wind, hydropower, solar, ocean, geothermal, biofuels, and biomass. Renewable energy supports the shift from a less carbon-intensive to a more sustainable energy system (IEA, n.d.).		

1.2 Share of renewable to total final energy consumption *(continued)*

Relevance:	Increasing the share of renewable energy can help improve economic growth by helping address energy shortage in developing countries (Marinas et al., 2018). It is also identified as an important tool to address climate change (Nia and Niavand, 2017). It enables countries to protect the environment as renewable energy generates nearly zero emission of greenhouse gases and air pollutants (U□urlu and Gokcol, 2017).
Limitation(s):	The measurement of renewable energy takes into account energy generated from biomass and charcoal, which are not necessarily produced in a sustainable way. It also does not take into account off-grid renewables. Moreover, the indicator tends to underestimate the transport costs of renewable energy because heat and electricity are not differentiated in its calculations (UNSTATS metadata; IEA and WB, 2013).

1.3 Water use efficiency

Unit:	U.S. dollars per cubic meter	**Indicator category / code:**	Efficient and sustainable water use / EW1
Related SDG:	Target 6.4, indicator 6.4.1 (as of June 2019).		
Impact on green growth:	Positive	**Data availability:**	2015
Data source:	FAO (2018).		
Online source:	http://www.fao.org/3/CA1588EN/ca1588en.pdf		
Definition:	Water use efficiency is the total efficiency in the main sectors of the economy weighted according to the proportion of water withdrawn in every sector over the total amount of withdrawals. The indicator provides an indication on the extent that water resources could support the world's ecosystems of the current and future generations (FAO, 2018).		
Relevance:	There are different levels of water use and scarcity between countries because water resources and human population are unevenly distributed around the world (Mekonnen and Hoekstra, 2014). Water scarcity is getting worse, causing intense drought due to increasing intensity of climate change impacts. As such, water competition is increasing in different sectors of the economy, affecting economic growth. Consequently, the demand to increase water use efficiency is growing because the availability of water supply in many countries is limited and increasing the supply is costly (Mancosu et al., 2015).		
Limitation(s):	The indicator considers water for agriculture, mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply, construction, and all the service sectors. It does not consider, however, water use for energy or the quality of water distribution networks (UNSTATS metadata).		

1.4 Share of freshwater withdrawal to available freshwater resources (Level of water stress)

Unit:	Percentage	**Indicator category / code:**	Efficient and sustainable water use / EW1
Related SDG:	Target 6.4, indicator 6.4.2 (as of June 2019).		
Impact on green growth:	Positive	**Data availability:**	1998–2007, 2014
Data source:	Food and Agriculture Organization of the United Nations (FAO).		
Online source:	http://www.fao.org/nr/water/aquastat/data/query/results.html (average 1998–2002 and 2003–2007); https://data.worldbank.org/indicator/ER.H2O.FWST.ZS (2014).		
Definition:	It is the ratio between the total amount of freshwater withdrawn by the main sectors and the total resources of renewable freshwater. The indicator measures how sustainable withdrawal and supply of freshwater can reduce water scarcity and its impacts on society (FAO, n.d.).		

1.4 Share of freshwater withdrawal to available freshwater resources (Level of water stress) *(continued)*

Relevance:	Water stress affects more than 2 billion people across the world because water use is shifting from agriculture to industrial uses due to growing urban populations (Önder and Akay, 2016). Also, climate change and current natural conditions affect pressure over water resources. As such, the metrics of water stress has changed over the last three decades. They shifted from simple indicators to holistic threshold indicators, which characterize water sustainability and human environments (Damkjaer and Taylor, 2017).
Limitation(s):	The indicator does not fully reflect sustainable water management because it does not consider the quality of water distribution, behavioral patterns, or geographic and climatic particularities. It also does not consider the quality of water. Freshwater resources are particularly difficult to measure due to complexity of water resource cycle. Data availability and estimation remain a challenge (UNSTATS metadata).

1.5 Average soil organic carbon content

Unit:	Tons per hectare	**Indicator category / code:**	Sustainable land use / SL1
Related SDG:	While not in the list of SDGs, the indicator represents a key contribution to Sustainable Development Goal (SDG) indicator 15.3.1, which defines the area of degraded land (FAO and ITPS, 2018).		
Impact on green growth:	Positive	**Data availability:**	2018
Data source:	FAO.		
Online source:	http://54.229.242.119/GSOCmap/		
Definition:	Soil organic carbon composes most of soil organic matter. It affects processes related to food production and soil function. High soil organic carbon content improves food productivity by giving plants more nutrients and water. It also significantly contributes to climate change adaptation and mitigation (FAO and ITPS, 2018).		
Relevance:	Farming practices such as organic agriculture contribute to the conservation of organic carbon in the soil. It is also more energy-efficient than traditional farming. Low energy consumption in organic production results from low concentrate feeding, minimal amount of synthetic pesticides, and the absence of synthetic fertilizers. Thus, organic production has the potential to contribute to the sustainable development and growth of society (Cristache et al., 2018).		
Limitation(s):	Various methods exist to calculate soil carbon content. FAO uses quality control and uniformization methods. De Vos et al. (2007) showed that measurements using standard methods yield high uncertainty.		

1.6 Share of organic agriculture to total agricultural land area

Unit:	Percentage	**Indicator category / code:**	Sustainable land use / SL2
Related SDG:	Not in the list of SDG indicators but relevant to SDG 2 and 12 (Rahmann et al., 2017).		
Impact on green growth:	Positive	**Data availability:**	Time series, 2004—2016
Data source:	FAO.		
Online source:	https://landportal.org/voc/landvoc/theme/land-food-security		
Definition:	Organic agriculture is a production system that improves biodiversity, biological activity in soil, and biological cycles. Agricultural area includes permanent pastures, permanent crops, and arable land (FAO, 2003).		
Relevance:	Agricultural land is crucial, and there is also a limited resource for agricultural goods production. Thus, there is a need to use agricultural land efficiently to provide food security to a growing population (Pilvere et al., 2014). A shift from conventional to organic farming was one of the ways to address the issue. Organic farming integrates and effectively uses the landscape and ecosystem services. It contributes to long-term food security by conserving natural resources and promoting overall sustainability (Kukreja and Meredith, 2011).		
Limitation(s):	This indicator does not consider the debate around organic farming and transgenic crops, in particular with respect to consistency in defining and measuring sustainability (UNSTATS metadata).		

1.7 Total domestic material consumption (DMC) per unit of GDP

Unit:	DMC kg per constant 2005 GDP	**Indicator category / code:**	Material use efficiency / ME1
Related SDG:	Target 8.4, indicator 8.4.2; Target 12.2, indicator 12.2.2 (as of June 2019).		
Impact on green growth:	Negative	**Data availability:**	Time series, 1970–2015
Data source:	U.N. Environment: Secretariat of the International Resource Panel (resourcepanel@unep.org).		
Online source:	https://www.resourcepanel.org/global-material-flows-database		
Definition:	Domestic material consumption is the total amount of materials used in the economy at the national level. It is also the total amount of domestic materials handled within the economy, either added to the transport infrastructure or building materials. Moreover, it covers the physical aspect of the economic process. The indicator can be used to measure long-term waste equivalent (UNEP, 2016).		
Relevance:	At the national level, material efficiency is one of the crucial indicators for the success of sustainable resource management. As an economy grows, economic material efficiency increases (Fishman et al., 2014). The increase in material efficiency is crucial to separating resource depletion and its accompanied environmental stresses from the development of the economy (Zhang et al., 2018).		
Limitation(s):	Domestic material consumption is based on material flows from Japan and the European Union but is estimated for the rest of the world using various nonstandardized datasets comprising agriculture, forestry, fisheries, mining, and energy statistics. It does not consider the whole of material consumption (UNSTATS metadata).		

1.8 Total material footprint (MF) per capita

Unit:	MF tons per capita	**Indicator category / code:**	Material use efficiency / ME2
Related SDG:	Target 8.4, indicator 8.4.1; Target 12.2, indicator 12.2.1 (as of February 2018).		
Impact on green growth:	Negative	**Data availability:**	Time series, 1990–2015
Data source:	U.N. Environment: Secretariat of the International Resource Panel (resourcepanel@unep.org).		
Online source:	https://www.resourcepanel.org/global-material-flows-database		
Definition:	Material footprint attributes the universal material extraction to the final domestic demand. The total material footprint is the total amount of footprint for metal ores, nonmetal ores, fossil fuels, and biomass. It shows the needed amount of main materials for the final domestic demand. DMC and MF measure production and consumption, respectively, hence they can be combined to cover both aspects of material flows in the economy. MF includes traded goods (UNSTATS metadata).		
Relevance:	The demand for urban material resources are expected to increase due to future growth in urban population. As a country economically grows, it tends to reduce domestic materials through international trade. With that, the general mass of material consumption increases (Wiedmann et al., 2013).		
Limitation(s):	Similar to DMC, MF is based on material flows from Japan and the European Union, with estimates extrapolated for the rest of the countries in the world. MF is not based on apparent physical consumption and actual physical movement of materials within and among countries. It is based on the estimates from where raw materials are extracted and where a product or service is consumed (UNSTATS metadata, Wiedmann et al., 2013).		

02 Natural capital protection

2.1 PM2.5 air pollution, mean annual population-weighted exposure

Unit:	Micrograms per cubic meter	**Indicator category / code:**	Environmental quality / EQ1
Related SDG:	Target 11.6, indicator 11.6.2 (as of June 2019).		
Impact on green growth:	Negative	**Data availability:**	Time series, 1990–2016
Data source:	Brauer, M. et al. 2016, for the Global Burden of Disease Study 2016, World Health Organization.		
Online source:	https://data.worldbank.org/indicator/EN.ATM.PM25.MC.M3		
Definition:	The mean annual population-weighted exposure to PM2.5 measures the average exposure level of a population to the concentration of PM2.5, which penetrates deep into the human respiratory system and therefore severely damages human health. The exposure level is computed by weighting the mean annual PM2.5 concentration by urban and rural population (WB, 2019).		
Relevance:	According to the World Health Organization, PM has harmful effects on human health. PM2.5 is the most commonly used indicator for estimating the effects on mortality. In fact, it ranked as the fifth mortality risk factor in 2015 (Van der Gon et al., n.d.). Moreover, exposure to chronic PM2.5 over a period of one year or more causes around 95 percent of the 3 million deaths globally per year. Thus, prediction of exposure to it is a good indicator for the overall impacts of air pollution on health (Tessum et al., 2017).		
Limitation(s):	The indicator calculates air pollution using satellite data but using urban populations as denominator factor, which can be defined differently according to the country. Furthermore, consultations with countries can lead to adjustments and bias on the data. Data quality varies between high-, low-, and middle-income countries (UNSTATS metadata).		

2.2 Age-standardized disability-adjusted life years (DALY) rate as affected by unsafe water sources

Unit:	DALY lost per 100,000 persons	**Indicator category / code:**	Environmental quality / EQ2
Related SDG:	Target 3.9, indicator 3.9.2.		
Impact on green growth:	Negative	**Data availability:**	Time series, 2000–2017
Data source:	Institute for Health Metrics and Evaluation.		
Online source:	http://ghdx.healthdata.org/gbd-results-tool		
Definition:	The disability-adjusted life years (DALY) is the only indicator in health that measures diseases consisting of the total number of years of life lost and the number of years lived with disability (Kim et al., 2018).		

2.2 Age-standardized disability-adjusted life years (DALY) rate as affected by unsafe water sources *(continued)*

Relevance:	Clean water access is important for the environment, human development, and economic growth. More than 2 billion people across the globe, however, do not have access to safe water resources (EPI, 2018). Urban construction and economic development increase sewage discharges and harshly damages the reservoir environment. The need for safe water has increased because living standards have also improved (Qing et al., 2014). In developing countries, diarrheal disease caused by poor drinking water quality is one of the most common contributors to the disease burden as measured by disability-adjusted life years. Thus, safe water resources play an important role in maintaining human welfare and health (Hunter et al., 2010).
Limitation(s):	The data on deaths are not up-to-date in all countries as there are not always reliable registration systems, leading to discrepancies between countries and the need to complete the data using other sources (UNSTATS metadata).

2.3 Municipal solid waste (MSW) generation per capita

Unit:	Tons per year per capita	**Indicator category / code:**	Environmental Quality / EQ3
Related SDG:	Not in the list of SDG indicators, but contributes to knowledge on Target 11.6, Indicator 11.6.1.		
Impact on green growth:	Negative	**Data availability:**	2018
Data source:	World Bank What a Waste database.		
Online source:	https://datacatalog.worldbank.org/dataset/what-waste-global-database		
Definition:	Municipal solid waste is defined as the household waste and other waste generated in the same nature by industrial and agricultural areas, business or commercial establishments, and public spaces (UNSTATS metadata). The per capita municipal solid waste is an environmental indicator that measures the intensity of generating waste over time (Kawai & Tasaki, 2016).		
Relevance:	The overload amount of solid wastes from domestic activities of humans disposed in the municipality has caused numerous negative impacts to humans and ecosystem (Azodo and Ismaila, 2016). Also, economic growth, consumption patterns, and the degree of industrialization are related to the amount of solid wastes generated. Solid wastes are a by-product of urban growth. The growth of population in urban areas results in more municipal solid wastes. Additionally, if there is a lack of technology and efficient methods to dispose of wastes, air quality will deteriorate, thus adversely affecting human health (Tahir et al., 2015).		
Limitation(s):	In many developing countries, municipal solid waste collection and treatment is done through the informal sector. Data on adequate treatment of municipal waste is limited. Furthermore, even if data collection is done correctly, interpretation of what makes municipal waste treatment, for instance, recycling, composting, adequacy of collected data varies greatly from country to country. This leads to limitations in data unification (UNSTATS metadata).		

2.4 Ratio of carbon dioxide (CO_2) emissions to population, excluding AFOLU

Unit:	Metric tons per capita	**Indicator category / code:**	GHG emissions reduction / GE1
Related SDG:	Not in the list of SDG indicators but relevant to Goal 13 on Climate action.		
Impact on green growth:	Negative	**Data availability:**	Time series, 1960–2014
Data source:	Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States.		
Online source:	https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?view=chart		
Definition:	CO_2 is a greenhouse gas that is odorless, colorless, and nonpoisonous. It is formed through carbon combustion and respiration of living things (UNFCCC, n.d.). The indicator is based on emissions ensuing from burning fossil fuels and manufacturing cement, including those produced during the consumption of solid, liquid, and gas fuels and gas flaring (WB, 2019a).		

2.4 Ratio of carbon dioxide (CO_2) emissions to population, excluding AFOLU *(continued)*

Relevance:	In 2012, carbon dioxide accounts for around three-quarters of total greenhouse gas emissions (Ritchie and Roser, 2018). In China, the total carbon emissions in the cities relate closely to the country's GDP. But per unit area carbon emissions are strongly related with population density in cities (Wang et al., 2012). It is suggested that a more useful indicator for measuring impacts on climate is carbon emissions per capita (The Guardian, 2016).
Limitation(s):	Different calculation methods and energy sector disaggregation methodologies have caused some discrepancies on estimates of CO_2 emissions among countries due to. (UNSTATS metadata)

2.5 Ratio of non-CO_2 emissions (CH_4, N_2O) to population, excluding AFOLU

Unit:	Tons per capita	**Indicator category / code:**	GHG emissions reduction / GE2
Related SDG:	Not in the list of SDG indicators but relevant to Goal 13 on Climate action.		
Impact on green growth:	Negative	**Data availability:**	1990–2010
Data source:	FAOSTAT data for both GHG emissions and population.		
Online source:	https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions		
Definition:	Methane and nitrous oxide are also sources of greenhouse gas emissions, accounting for around 17 percent and 7 percent of emissions, respectively. In terms of sectors, agriculture and energy contribute about 90 percent of global methane emissions, while agriculture accounts for more than 60 percent of nitrous oxide emissions. Due to the importance of the latter type of emissions, nitrous oxide emissions were included as separate indicator (see GE3 below) (Ritchie and Roser, 2018).		
Relevance:	Non-CO_2 greenhouse gases also contribute to climate change. It is, however, not related to cumulative emissions but determined through annual emissions. Thus, it is important to account independently the additional warming from the non-CO_2 agents when CO_2 emissions compatible with temperature limit is estimated (Friedlingstein et al., 2014).		
Limitation(s):	The EDGAR database uses a bottom-up approach to determine GHG emissions from country statistics. This method is robust for countries with strong statistical data infrastructure but less so for countries with a weak data measurement and reporting body (Janssens-Maenhout, et al. 2017).		

2.6 Ratio of non-CO_2 emissions (CH_4, N_2O) agriculture to population

Unit:	Gigagrams per 1,000 persons	**Indicator category / code:**	GHG emissions reduction / GE3
Related SDG:	Not in the list of SDG indicators but relevant to Goal 13 on Climate action.		
Impact on green growth:	Negative	**Data availability:**	1961–2016
Data source:	FAO for emissions, WB for population.		
Online source:	http://www.fao.org/faostat/en/#data/GL; https://data.worldbank.org/indicator/SP.POP.TOTL		
Definition:	Greenhouse gas emitted from the agricultural sector include non-CO_2 gases, such as methane (CH_4) and nitrous oxide (N_2O). Livestock and crop production and management generate these gases (FAO, 2018a).		
Relevance:	Activities related to agriculture, forestry, and other land uses (AFOLU) generate greenhouse gases through removals by sinks. They comprise CO_2 and non-CO_2 emissions from forestry and other land uses and non-CO_2 from agriculture. AFOLU represents almost 25 percent of greenhouse gas emissions globally. Next to the energy sector, AFOLU is the second largest emitting sector. Action in AFOLU is important to many countries where the sector represents a huge part of their economy, is at risk of climate change, and can greatly benefit from climate funding for GHG reduction, food security, and rural development (Tubiello et al., 2014).		
Limitation(s):	The indicator for emissions from agriculture is constructed using the Tier 1 IPCC methodology. Using higher tier data modelling would reduce the uncertainty by 10 percent to 20 percent (Tubiello et al., 2013).		

2.7 Average proportion of terrestrial, freshwater, marine, and mountain key biodiversity areas (KBAs) covered by protected areas

Unit:	Percentage	**Indicator category / code:**	Biodiversity and ecosystem protection / BE1
Related SDG:	Target 14.5, indicator 14.5.1; Target 15.1, indicator 15.1.2; Target 15.4, indicator 15.4.1.		
Impact on green growth:	Positive	**Data availability:**	2000–2018
Data source:	BirdLife International, IUCN and UNEP-WCMC (2018).		
Online source:	https://unstats.un.org/sdgs/indicators/database/		
Definition:	The indicator is the proportion of main biodiversity areas, whether terrestrial, freshwater, marine, and mountain, covered by protected areas. These areas significantly affect biodiversity preservation globally. Protecting these key ecosystems improves biodiversity and sustains the use of natural resources (UNSTATS metadata).		
Relevance:	As humans encroach on the natural systems, adverse impacts on the terrestrial, freshwater, and marine ecosystems also increase. Establishing protected areas has become a major strategy to conserve biodiversity. Well-managed protected areas provide healthy ecosystems and benefits even to humans. These benefits include ecosystem services, such as food security, disaster risk reduction, and clean water (Bertzky et al., 2012). Moreover, integrating establishment of protected areas in land use plans can address issues relating to species loss and climate change adaptation (Lopoukhine et al., 2012).		
Limitation(s):	This indicator does not include how the effectiveness of establishing protected areas in protecting biodiversity and ecosystems, which depends on enforcement and appropriate management. Regarding key biodiversity areas, the list is not complete in all regions, and there are some omissions (UNSTATS metadata).		

2.8 Share of forest area to total land area

Unit:	Percentage	**Indicator category / code:**	Biodiversity and ecosystem protection / BE2
Related SDG:	Target 15.1, indicator 15.1.1.		
Impact on green growth:	Positive	**Data availability:**	1990–2016
Data source:	FAO, electronic files and web site http://www.fao.org/faostat/en/#data/EL.		
Online source:	https://data.worldbank.org/indicator/AG.LND.FRST.ZS;		
Definition:	Forest area is a land with trees with a minimum of five meters in situ. It does not include trees in agricultural areas, such as fruit plantations and agroforestry, and in gardens and parks (WB, 2019a). Forest area is important for human as it provides goods, such as nonwood and wood forest products, and services, such as carbon sequestration, coastal protection, soil preservation, water conservation, and biodiversity habitat (UNSTATS metadata).		
Relevance:	Forestry can help conserve natural resources and contribute to their sustainable growth through protecting water resources and enhancing biodiversity. The forestry sector can contribute to green growth through instituting policies on climate change. IT can help expand renewable energy and reduce greenhouse gas emissions. Generally, forests contribute to green building and infrastructure and acts as carbon sinks (United Nations, 2009).		
Limitation(s):	Forest surveys are conducted at irregular intervals from country to country. Remote sensing can be used but cannot detect long-term tree growth or low canopy cover density forests. The indicator is used to measure the extent of forest preserved and restored but only partially measures the extent of forests that are managed sustainably (UNSTATS metadata).		

2.9 Soil biodiversity, or the potential level of diversity living in soils

Unit:	Index	**Indicator category / code:**	Biodiversity and ecosystem protection / BE3
Related SDG:	Not in the list of SDG indicators but provides important contribution to SDG indicator 15.3.1.		
Impact on green growth:	Positive	**Data availability:**	2016
Data source:	Joint Research Centre, European Soil Data Centre (ESDAC).		
Online source:	https://esdac.jrc.ec.europa.eu/content/global-soil-biodiversity-maps-0		
Definition:	This indicator is based on the soil biodiversity map with an index showing the level of diversity living in soils. Data include the distribution of soil microbial diversity and soil fauna diversity (Serna-Chavez et al., 2013).		
Relevance:	Soil biodiversity reflects the diversity of living organisms in soils. These organisms interact with different animals and plants in the ecosystem. Moreover, these organisms contribute important services for sustainable ecosystem. They regulate organic matter dynamics, greenhouse gas emissions, and carbon sequestration in soils. Also, they enhance the efficiency of acquiring nutrients and plant health (El-Hage Scialabba, n.d.).		
Limitation(s):	This indicator uses measurements that uniformly made one meter underground. This is sometimes underneath the organic ground layer and in the sedimentary layer, meaning it does not account completely for soil biodiversity (Serna-Chavez et al., 2013).		

2.10 Red List Index

Unit:	Index	**Indicator category / code:**	Cultural and social value / CV1
Related SDG:	Target 15.5, indicator 15.5.1.		
Impact on green growth:	Positive; an upward trend means that the expected rate of species extinctions decreases.	**Data availability:**	1993–2016
Data source:	BirdLife International and IUCN (2018).		
Online source:	https://www.sdg.org/datasets/indicator-15-5-1-red-list-index/data		
Definition:	The Red List Index, which ranges from 0 to 1, measures the variation in the total extinction across species groups. It is based on the variation in the total number of species in every type of extinction risk based on the IUCN Red List of Threatened Species. A value of 1 means the species is of least concern for extinction; a value of 0 means the species is extinct. The index shows how far the species groups have moved toward extinction. Therefore, it can be used to compare species groups in terms of extinction risk level and the rate that such a risk changes (UNSTATS metadata).		
Relevance:	There is still a significant number of species threatened by extinction despite different conservation efforts. Contributing factors include habitat destruction, pollution, overexploitation, and introduction of exotic species. To boost conservation efforts, many countries have been using the IUCN Red List. The list is a commonly used system to assess the risk of and quantify threats to a species to go extinct (Kideghesho, 2009). Species that are highly valued are considered cultural indicators and critical when planning restoration and rehabilitation projects with local communities (Harmsworth et al., 2011).		
Limitation(s):	The Red List Index includes several sources of uncertainty. Species can be inadequately qualified as to their endangered status, and there can be inconsistency in assessing species. Some species are also too poorly known to be Included in the Red List's data (UNSTATS metadata).		

2.11 Tourism and recreation in coastal and marine areas

Unit:	Scores, 1–100	**Indicator category / code:**	Cultural and social value / CV2
Related SDG:	Not in the list of SDG indicators but contributes to SDG target 12.B, which is to develop and implement tools to monitor sustainable tourism.		
Impact on green growth:	Positive	**Data availability:**	2014–2017
Data source:	Ocean Health Index.		
Online source:	http://data.oceanhealthindex.org/home		
Definition:	Tourism in coastal and marine areas contributes to economic growth. The indicator on tourism and recreation represents the cultural experiences of visitors in coastal and marine attractions. This indicator only represents participation in coastal tourism. The Ocean Health Index measures the economic aspects of coastal and marine attractions in Coastal Livelihoods and Economies goal (OHI, 2019).		
Relevance:	Ecotourism promotes responsible tourism in natural areas, improves the well-being of local communities, and contributes to conserving the environment (Zambrano et al., 2010). Determining the symbolic species depends on the existence of that species, and that its value for a particular cultural area increases when it is rare and its habitat is inaccessible (Schirpke et al., 2018).		
Limitation(s):	The model used for this index is the study of participation rates in 19 marine-related activities per capita. Thus, a wide range of marine activities are not included (Halpern et al., 2014).		

2.12 Share of terrestrial and marine protected areas to total territorial areas

Unit:	Percentage	**Indicator category / code:**	Cultural and social Value / CV3
Related SDG:	Target 14.5, indicator 14.5.1, and contributes to Target 15.1.		
Impact on green growth:	Positive	**Data availability:**	2016, 2017
Data source:	World Database on Protected Areas (WDPA), whose compilation and management is carried out by the United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC) in collaboration with governments, non-governmental organizations, academia, and industry.		
Online source:	https://data.worldbank.org/indicator/ER.PTD.TOTL.ZS; https://www.protectedplanet.net/		
Definition:	Terrestrial protected areas are at least 1,000 hectares of completely or partially protected areas designated by the national government as nature reserves, national parks, wildlife sanctuaries, natural monuments, and protected landscapes. Protected areas also include scientific areas that cannot be publicly accessed and areas that are managed sustainably. Marine protected areas are subtidal or intertidal land, overlying water, and associated fauna and flora preserved by law. It also includes the cultural and historical characteristics of the area (WB, 2019a).		
Relevance:	Planning for tourism areas consider the environment and people in protected areas. A tourism planning and development strategy normally takes into account aspects such as adequate zoning, safeguarding guidelines, regulations, and proper management (Yamauchi and Lee, 1999).		
Limitation(s):	The indicator excludes sites protected under local or provincial law (WB, 2019a).		

03 Green economic opportunities

3.1 Adjusted net savings, taking account of natural resources and pollution damages

Unit:	Percentage of gross national income (GNI)	**Indicator category / code:**	Green Investment / GV1
Related SDG:	Not in the list of SDG indicators but contributes to Goal 12.		
Impact on green growth:	Positive	**Data availability:**	Time series, 1990–2017
Data source:	World Bank staff estimates based on sources and methods described in "The Changing Wealth of Nations 2018: Building a Sustainable Future" (Lange et al 2018).		
Online source:	https://data.worldbank.org/indicator/NY.ADJ.SVNG.GN.ZS?view=chart		
Definition:	Adjusted net savings are computed by adding net national savings and expenses in education and subtracting mineral depletion, energy depletion, net forest depletion, damages from particulate emissions, and carbon dioxide (WB, 2019c). It measures the sustainability of the economy based on the extended national accounts. Saving creates a surplus for investment, which helps countries escape a state of low-level subsistence (EU 2012).		
Relevance:	Natural capital is the most abundant asset is accessible in all countries. Environmental degradation for increasing economic growth is rational because the growth of economy depends on the natural resources available. In fact, natural capital is the largest part of wealth in low-income countries. In the adjusted net saving (ANS), the gross national saving minus capital depreciation and depletion of natural resources is used as a measure. ANS guides policymakers on the direction of the economy and actions for long-term growth. It indicates if the country is using more wealth than what it is adding (Lange et al., 2018).		
Limitation(s):	The methodology is different from that of national accounts: The unit prices used to calculate the value of natural resource depletion are regional and international, and not local. Concerning energy and mineral depletion, average.e cost is used instead of marginal cost to calculate unit resource rent. Finally, net forest depletion does not include all forest benefits but only timber benefits (WB, 2018).		

3.2 Share of export of environmental goods (OECD and APEC classifications) to total export

Unit:	Percentage	**Indicator category / code:**	Green trade / GT1
Related SDG:	Not in the list of SDG indicators but contributes to Goal 12, for example, Target 12.6 to encourage companies to adopt sustainable practices.		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000–2017
Data source:	Computed using UNCOMTRADE data and OECD and APEC classifications of environmental goods; based on the methods applied by U.N. Environment (Page 2017).		
Online source:	https://comtrade.un.org/data/		
Definition:	Green trade is the share of exports of environmental goods in total exports. These goods are environment-friendly in production, usage, and disposal. Thus, they reduce environmental pollution and hazards. This indicator measures how a country competes in creating and selling environmental goods. Also, it measures the result of policies and investments related to green trade (Page 2017).		
Relevance:	In Asia-Pacific, environmental goods present an essential trade opportunity for exports and imports. The region has a large share of exports, and their shares have been increasing. The main contributor to such growth was renewable energy. Environmental good exports from developing countries account for more than 75 percent of the region's total. These countries have also increased their environmental goods export share (Jacob & Moller, 2017).		
Limitation(s):	Environmental goods under harmonized customs codes can comprise products that have both environmental and nonenvironmental end uses (Moll de Alba & Todorov, 2018).		

3.3 Share of green manufacturing employment in total manufacturing employment

Unit:	Percentage	**Indicator category / code:**	Green employment / GJ
Related SDG:	Not in the list of SDG indicators but contributes to Goal 9, for example, Target 9.2.		
Impact on green growth:	Positive	**Data availability:**	2000–2015
Data source:	Moll de Alba and Todorov 2018, 2019 (in press).		
Online source:	https://www.inderscienceonline.com/doi/pdf/10.1504/WRSTSD.2018.093223		
Definition:	This indicator measures the impact of manufacturing on employment through its capability to absorb excess labor force from the traditional and agricultural sectors (UNSTATS metadata).		
Relevance:	The labor market will be restructured as there is transition toward green growth. It will create new green employment opportunities. There is, however, an issue as employment is relocated between industries due to structural changes caused by greener growth. Research shows that carbon-intensive industries emit almost 90 percent of CO2 but only generate a little more than 10 percent of employment. Thus, these industries with large environmental footprint should adapt. There should be adjustments in labor market employment for greener growth. Also, good policies on innovation and environment can create new markets (OECD, 2014).		
Limitation(s):	Analysis covered only limited data and a number of countries were excluded (Moll de Alba & Todorov, 2018).		

3.4 Share of patent publications in environmental technology to total patents

Unit:	Percentage	**Indicator category / code:**	Green innovation / GN1
Related SDG:	Not in the list of SDG indicators but contributes to Goal 12, for example, Target 12.A to support developing countries' scientific and technological capacity for sustainable consumption and production.		
Impact on green growth:	Positive	**Data availability:**	1980–2017
Data source:	World Intellectual Property Organization (WIPO) statistics database. Last updated: December 2018.		
Online source:	https://www3.wipo.int/ipstats/index.htm?tab=patent		
Definition:	Patents in environmental technology measure the innovative capability to produce goods and services that are environment-friendly. Green innovations ensue from policies on research and development and other private initiatives. Environment- friendly inventions contribute to the production of environmental goods and thus making new markets and employment (PAGE 2017).		
Relevance:	The dynamics in green technologies are increasing since 2007. This resulted in an increased share of patents in environmental technology (Walz et al., 2017). The patent grants are an indicator used to determine the innovative level in the field of environment. Ecoinventions patents are used in measuring invention and research activities and in studying the research direction in a given technological field. Ecoinnovations patents, meanwhile, are used in measuring innovations that reduce environmental risk and negative impacts (OECD, 2014).		
Limitation(s):	The criteria for a patent to be environmental technology are not extensive, and they include climate change mitigation; capture, storage, sequestration or disposal of greenhouse gases; and environmental and water-related adaptation technologies (OECD 2014).		

04 Social inclusion

4.1 Population with access to safely managed water and sanitation

Unit:	Percentage	**Indicator category / code:**	Access to basic services and resources / AB1
Related SDG:	Target 6.1, indicator 6.1.1; Target 6.2, 6.2.1.		
Impact on green growth:	Positive	**Data availability:**	2000–2015
Data source:	WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene (washdata.org).		
Online source:	https://data.worldbank.org/indicator/SH.H2O.SMDW.ZS; https://data.worldbank.org/indicator/SH.STA.SMSS.ZS		
Definition:	This indicator indicates the population that uses drinking water from safe sources that are accessible and available. Safe water sources include delivered water, protected springs, protected wells, piped water, and tubewells. Also, it indicates the population that has sanitation facilities not shared with others. Sanitation facilities include septic tanks, flush-to-piped sewer systems, and improved toilets with slabs (WB, 2019a).		
Relevance:	Access to safely managed water and sanitation is the foundation of socio-economic development, human dignity, well-being, and health (Anthonj et al., 2018). However, a number of people do not have this. In the past century, the use of water was more than twice the population rate. Even though there is no water shortage yet, 40 percent of the global population living around a river basin are experiencing water scarcity. Environmental degradation and water competition are some of the effects of water scarcity (Ako Ako et al., 2010). Moreover, clean water and sanitation inaccessibility causes children's death. Those who do not have access to clean water and sanitation also experience less opportunities in reaching their potential (Armah et al., 2018).		
Limitation(s):	Data on access to safely managed water and sanitation is not yet uniform, and national discrepancies exist. Faecal and chemical contamination is not considered in all cases (UNSTATS metadata). The indicators that were usually used in monitoring progress in response to water and sanitation issues are at the international level only. There have been many new and useful initiatives at the local level that contribute to the availability of clean water and sanitation (Osumanu et al., 2010), but these are not considered yet in measuring the indicator.		

4.2 Population with access to electricity and primary reliance on clean fuels and technology

Unit:	Percentage	**Indicator category / code:**	Access to basic services and resources / AB2
Related SDG:	Target 7.1, indicator 7.1.1 and indicator 7.1.2.		
Impact on green growth:	Positive	**Data availability:**	2000–2017

4.2 Population with access to electricity and primary reliance on clean fuels and technology *(continued)*

Data source:	World Bank, Sustainable Energy for All (SE4ALL) database from the SE4ALL Global Tracking Framework led jointly by the World Bank, International Energy Agency, and the Energy Sector Management Assistance Program; World Bank, Sustainable Energy for All (SE4ALL) database from WHO Global Household Energy database.
Online source:	https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS; https://data.worldbank.org/indicator/EG.CFT.ACCS.ZS
Definition:	Electricity access is the percentage of the population with access to electricity. The data are from national surveys, industries, and other international organizations. Clean fuel access is the percentage of the population that uses clean fuels for cooking, excluding kerosene (WB, 2019a). The use of solid fuels and kerosene in households contribute to mortality rates from respiratory-related diseases (WHO 2018). Fuels are categorized as clean based on their emission rate and specific recommendations. The population proportion is computed by dividing the number of people who use clean fuels for heating, cooking, and lighting by the total number of people who use any method for heating, cooking, and lighting (UNSTATS metadata).
Relevance:	Efforts to ensure access to affordable and clean energy have progressed due to recent initiatives in electrification and improvements in energy efficiency. There is, however, still a need to establish national policies on affordable energy. Some of the causes of global energy problems today are high fuel prices, poverty, and lack of access to clean fuels. Countries with severe climate and heating demand are greatly affected by these problems (Kerimray et al., 2017).
Limitation(s):	Data on household cooking, heating and lighting is not yet unified and universally measured. Concerning electricity, the availability of an electric outlet does not always imply the electric supply is reliable and constant (UNSTATS metadata).

4.3 Fixed Internet broadband and mobile cellular subscriptions per 100 people

Unit:	Number of subscriptions per 100 people	**Indicator category / code:**	Access to basic services and resources / AB3
Related SDG:	Target 17.6, indicator 17.6.2; Target 9.c, Indicator 9.c.1.		
Impact on green growth:	Positive	**Data availability:**	2000–2017
Data source:	International Telecommunication Union, World Telecommunication/ICT Development Report and database.		
Online source:	https://data.worldbank.org/indicator/IT.NET.BBND.P2; https://data.worldbank.org/indicator/IT.CEL.SETS.P2		
Definition:	Fixed internet broadband subscriptions refer to the subscriptions of people to high-speed public internet. It includes DSL, fiber, cable modem, and other wired broadband, wireless broadband, and satellite broadband. It does not include access to mobile networks. Mobile cellular subscriptions refer to the subscriptions to a public mobile service that has access to PSTN through cellular technology. It includes prepaid and postpaid subscriptions. It does not include subscriptions through USB modems, mobile data services, private mobile radio, and telepoint (WB, 2019a).		
Relevance:	There has been a difference among people when it comes to the access of digital information and communications technologies (ICT). This is observed in developed countries with different groups of socioeconomic status. The economic factors play an important role in the access of ICTs (Ronquillo and Currie, 2012). Mobile communications is important for people in rural areas with low income and literacy because of its mobility, flexibility, and low costs. In fact, the billion mobile subscribers are from rural poor (Index Mundi, n.d.). In terms of broadband subscriptions, there is an increasing trend in its use which contributes to economic growth and lives of users (Prieger, 2012).		
Limitation(s):	The indicator is easy to collect and trustworthy, due to the limited number of mobile and broadband operators. The highest source of uncertainty comes from population data (UNSTATS metadata).		

4.4 Proportion of seats held by women in national parliaments

Unit:	Percentage	**Indicator category / code:**	Gender balance / GB1
Related SDG:	Target 5.5, indicator 5.5.1.		
Impact on green growth:	Positive	**Data availability:**	1990 and 1997–2017
Data source:	Inter-Parliamentary Union (IPU) (ipu.org).		
Online source:	https://data.worldbank.org/indicator/SG.GEN.PARL.ZS?view=chart		

4.4 Proportion of seats held by women in national parliaments *(continued)*

Definition:	Participation of women in parliament is a major opportunity for them politically. It is linked to their empowerment. This indicator measures the extent of women's equal access to parliament (UNSTATS metadata).
Relevance:	Involvement of women in politics has good social and economic impacts. It is crucial in advancing gender equality and democracy in a country. Also, involvement of women in decision-making balances the dominance of men in politics. In a political sense, their involvement improves policies and inclusion of minority groups. In the economic sense, it promotes the role of women in development and their inclusion in the labor market (Asiedu et al., 2018).
Limitation(s):	The indicator does not consider results in by-elections and upper chambers of parliament. It also is not a complete measure of women's political power (UNSTATS metadata).

4.5 Ratio of female to male with account in financial institution (ratio female-male, % age 15+)

Unit:	Percentage	**Indicator category / code:**	Gender balance / GB2
Related SDG:	Target 8.10, indicator 8.10.2 and contribute to target 5.1.		
Impact on green growth:	Positive	**Data availability:**	2011, 2014, 2017
Data source:	World Bank Global Findex database.		
Online source:	https://globalfindex.worldbank.org/#data_sec_focus		
Definition:	Account in financial institution refers to the proportion of people age 15 and older who have access to financial or mobile money services, such as payments, insurance, savings, remittances, and credit irrespective of their age, education, address, and income (WB, 2019b). The indicator was computed using the ratio of female and male with accounts in financial organizations.		
Relevance:	Financial inclusion provides people with insurance and access to credit. Poor Low-income individuals rely on their own savings and earnings if they are excluded from financial systems. There is a wide gender gap when it comes to measuring financial inclusion through usage. Aside from income, gender has an impact on financial inclusion (Fanta and Mutsonziwa, 2016). People who have access to financial services can manage their lives and participate in businesses (UNSTATS metadata).		
Limitation(s):	The indicator is built using representative surveys of 140 countries, which are conducted every three years. This method implies uncertainties on the values (UNSTATS metadata; WB, 2019b).		

4.6 Getting paid, laws and regulations for equal gender pay

Unit:	Score, 0–100	**Indicator category / code:**	Gender balance / GB3
Related SDG:	Not in the list of SDG indicators but contributes to target 5.c and 10.2.		
Impact on green growth:	Positive	**Data availability:**	2009–2018
Data source:	World Bank Women, Business and the Law.		
Online source:	http://wbl.worldbank.org/en/reports		
Definition:	This indicator refers to the legal gender discrimination that influences employment and economic choices of women. It also covers the laws that require equal pay for labor of equal value (WB, 2019c).		
Relevance:	Similar to men, women have become better workforce members. There are also many social policies that support the employment of women. Gender pay gap, however, persists, partly due to the lack of political will to redistribute wage share. Gender quality will require more sharing of work and social support. Also, there is a need to change the behavior of employers and perspectives of countries that give opportunities for women (Rubery and Koukiadaki, 2016).		
Limitation(s):	This indicator does not consider the whole of the labor force (WB, 2019c).		

4.7 Inequality in income based on Atkinson

Unit:	Index	**Indicator category / code:**	Social equity / SE1
Related SDG:	Not in the list of SDG indicators but contributes to Target 1.1, indicator 1.1.1; Target 1.2, indicator 1.2.1; Target 10.1, indicator 10.1.1.		
Impact on green growth:	Positive	**Data availability:**	2010–2017
Data source:	UNDP Human Development Data (based on Atkinson, 1970).		
Online source:	http://hdr.undp.org/en/data#		
Definition:	Inequality in income based on Atkinson is one of the most used welfare-based indicators that measure inequality. It measures the percentage of total income to be waived by a society to achieve equal income shares among citizens. A high value means more acceptance for lesser income in order to achieve equal distribution of income (UNDESA 2015).		
Relevance:	The indicator measures income differences but cannot indicate the standard of living (Oregon Community Foundation, 2015). Studies show that measuring income inequality is a factor in determining the poverty level, economic growth rate, human rights, and the level of crime, violent conflict, and social unrest (McKay, 2002). The Atkinson Index is popularly used in measuring inequality. It shows the total income percentage that needs to be foregone to achieve equal income shares. This index also depends on the society's aversion to income inequality (Afonso et al., 2015).		
Limitation(s):	There are different methods for measuring income inequality, so it is important to understand their strengths and weaknesses (Tahsin, 2019). The Palma ratio is a recently recommended indicator for income inequality, but data remain limited.		

4.8 Ratio of urban to rural, access to safely managed water and sanitation, and access to electricity

Unit:	Percentage	**Indicator category / code:**	Social equity / SE2
Related SDG:	Target 6.1, indicator 6.1.1; Target 6.2, 6.2.1; and Target 7.1, indicator 7.1.1.		
Impact on green growth:	Positive	**Data availability:**	2000–2016
Data source:	Computation of the indicator used data on access to safely managed water and sanitation as well as access to electricity.		
Online source:	See above sources for the indicators on access to safely managed water and sanitation as well as access to electricity		
Definition:	It is calculated based on the portion of population who has access to basic services, such as safe water, sanitation, and electricity.		
Relevance:	There is a big difference between the population in rural and urban areas when it comes to access to basic services. According to research, eight out of 10 people without safe water sources are in rural areas. Services such as sanitation, water, hygiene, and electricity are essential for improved living. However, poor people particularly in rural areas have low access to these basic services (United Nations, 2011).		
Limitation(s):	This indicator has the same issues concerning water and sanitation as AB1. Concerning energy, it has the same issue as AB2.		

4.9 Share of youth not in education, employment or training, aged 15-24 years

Unit:	Percentage	**Indicator category / code:**	Social equity / SE3
Related SDG:	Target 8.6, indicator 8.6.1.		
Impact on green growth:	Positive	**Data availability:**	1990–2018
Data source:	International Labour Organization, ILOSTAT database. Data retrieved in April 2019.		
Online source:	https://data.worldbank.org/indicator/SL.UEM.NEET.ZS		

4.9 Share of youth not in education, employment or training, aged 15-24 years *(continued)*

Definition:	The number of youths aged 15-24 who are not in education, employment, or training is an indicator that measures the involvement of youth in the labor market and does not cover youth that are unemployed. It also includes youth workers who are outside the labor market because of their disability or involvement in household chores or other tasks (UNSTATS metadata).
Relevance:	Increasing human capital through employment, education, and training is one of the contributing factors for economic growth. The level of educational attainment is an important factor for employability. The youths who finished secondary education will less likely experience difficulty in searching for work (OECD, 2014). The youths who did not finish education nor attended training are the vulnerable ones in the labor market (Eurostat, 2019).
Limitation(s):	The age coverage defining youth is different from country to country — some use 15 to 24; others 15 to 29 — so the data are not uniform (WB, 2019a).

4.10 Proportion of population above statutory pensionable age receiving a pension

Unit:	Percentage	**Indicator category / code:**	Social protection / SP1
Related SDG:	Target 1.3, indicator 1.3.1.		
Impact on green growth:	Positive	**Data availability:**	Various years to represent 2015
Data source:	International Labour Organization (ILO).		
Online source:	http://www.social-protection.org/gimi/gess/RessourceDownload.action?ressource.ressourceId=54610		
Definition:	The proportion of population above statutory pensionable age receiving a pension is an indicator that measures the number of people who are covered by a social protection system. Access to social protection is a human right. This indicator also reflects the degree of security of the living condition of people. Social protection system benefits people covering disability, unemployed persons, child and maternity benefits, injured workers, and older persons (UNSTATS metadata).		
Relevance:	According to the International Labour Organization, old-age income security pension schemes are still relevant. Many countries are giving pensions in periodic cash forms under one scheme. Usually, it is through a combination of noncontributory and contributory schemes. Globally, those who receive pension comprise the 68 percent of people with above retirement age, either covered by noncontributory or contributory schemes (ILO, 2017).		
Limitation(s):	Countries provide statistics, which do not imply that pension is sufficient for the persons above pensionable age to live well. Furthermore, pensionable age varies from country to country (UNSTATS metadata).		

4.11 Health care Access and Quality Index

Unit:	Index	**Indicator category / code:**	Social protection / SP2
Related SDG:	Not in the list of SDG indicators but contributes to Target 3.8, Indicator 3.8.1.		
Impact on green growth:	Positive	**Data availability:**	1990–2015
Data source:	Institute for Health Metrics and Evaluation, based on Global Burden of Disease Study 2015 (GBD 2015).		
Online source:	http://ghdx.healthdata.org/record/global-burden-disease-study-2015-gbd-2015-healthcare-access-and-quality-index-based-amenable		
Definition:	Universal health coverage is facilitated when everyone has access to quality health care. Health systems aims to provide access to quality health care to improve the health conditions of people and prevent early death (GBD 2018).		
Relevance:	Even though there has been debate on the contribution of health care and health initiatives to population health, research shows that access to quality health care improves health outcomes, helping to reduce incidence of infectious diseases, cancers, maternal disorders, and noncommunicable diseases. Thus, assessment of mortality from these health concerns can give an important perspective on the quality of health care. Such an assessment on access to quality healthcare can contribute to population health improvement (Barber et al., 2017).		

4.11 Health care Access and Quality Index *(continued)*

Limitation(s):	The indicator will need to incorporate improvements in measuring health care access and quality into more comprehensive assessments of health system performance, such as expanding estimation to subnational locations (GBD 2018).

4.12 Proportion of urban population living in slums

Unit:	Percentage	**Indicator category / code:**	Social protection / SP3
Related SDG:	Target 11.1, indicator 11.1.1.		
Impact on green growth:	Negative	**Data availability:**	1991–2018
Data source:	United Nations Human Settlements Programme (UN-HABITAT).		
Online source:	https://data.worldbank.org/indicator/SL.EMP.WORK.ZS		
Definition:	The proportion of urban population living in slums is an indicator that measures the number of people in urban areas who do not have good housing condition. It also measures the capability of people to meet the basic need for a shelter. It reflects people living in homes that lack basic services, such as resilient housing, tenure security, safe water, improved sanitation, and electricity. These are indices for poverty (UN Habitat, 2003).		
Relevance:	As urban population grows so are informal settlers in the urban areas. The urban population living in slums has been increasing since the 20th century. Urban people living without basic services is a serious issue. Countries have been addressing this issue because it can cause further concerns, such as epidemics, political instability, mass migration, and national insecurity (Hermanson, 2016).		
Limitation(s):	Potential limitations include the lack of universally agreed definitions and characteristics for deteriorated housing conditions, underestimation of deteriorated housing units due to a lack of appropriate measurement tools, complex links between security land and property tenure, and the lack of data consistency globally due to limited capacity for collecting, managing, updating, and monitoring data in some countries (UNSTATS metadata).		

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