METADATA REPORT

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Jeongdong Building 19F
21-15 Jeongdong-gil
Jung-gu, Seoul 04518
Republic of Korea

Author:

Mr. Ruben Salem Sabado Jr.
Policy and Data Analyst, Consultant
Global Green Growth Performance Measurement
Global Green Growth Institute (GGGI)

Dr. Lilibeth A. Acosta
Deputy Director and Program Manager
Global Green Growth Performance Measurement
Directorate of Green Growth Implementation (DGGI)
Global Green Growth Institute (GGGI)

Contributors:

Mr. Innocent Nzimenyera
AI and Data Analyst
Global Green Growth Performance Measurement
Directorate of Green Growth Implementation (DGGI)
Global Green Growth Institute (GGGI)

Mr. Ribeus Munezero Mihigo
AI and Data Analyst, Consultant
Global Green Growth Performance Measurement

Global Green Growth Institute (GGGI)

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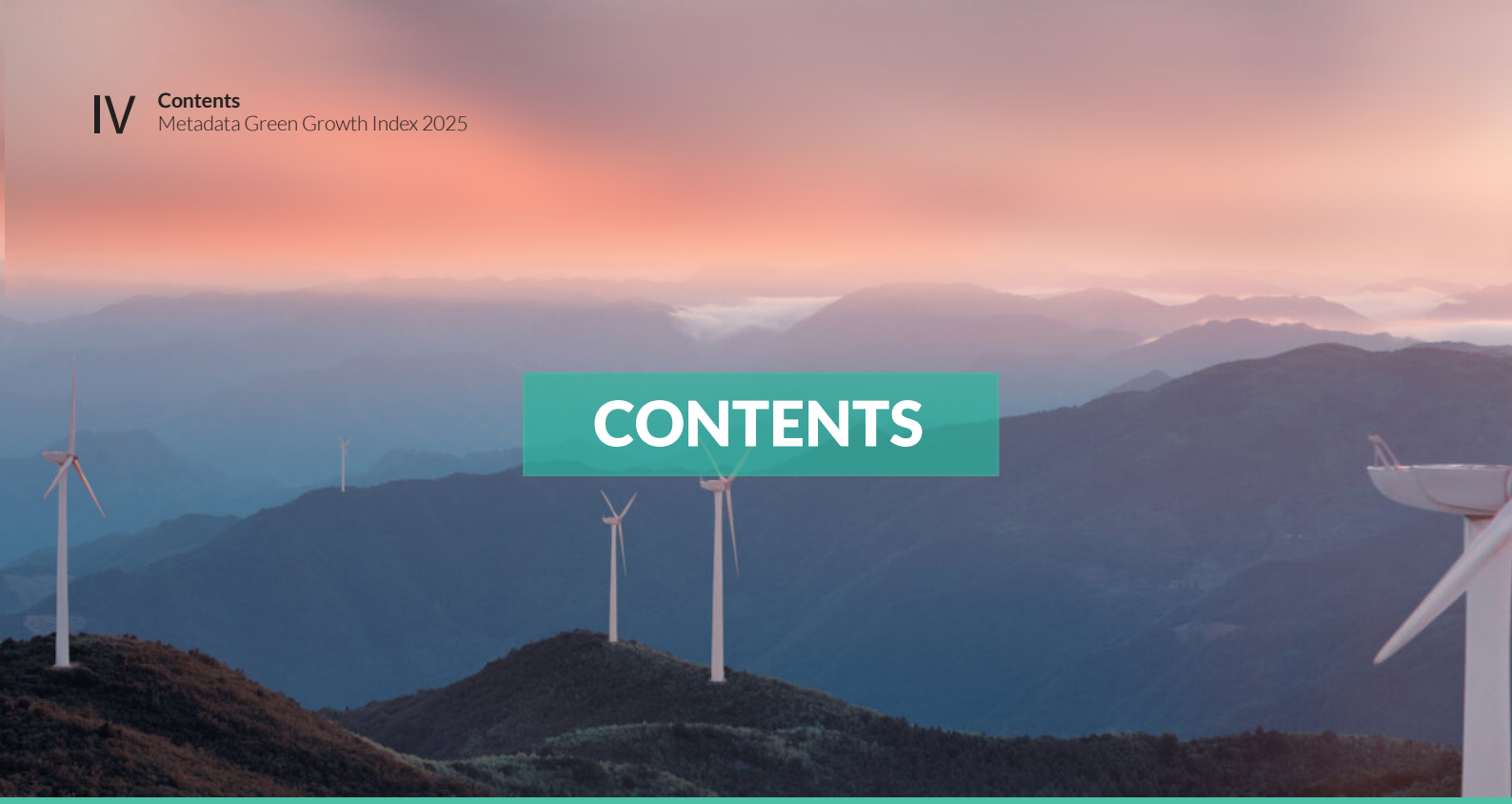
* Note: This is a supplementary document to the Report on the Green Growth Index 2.0 – Measuring Performance, Potential, and Pathways (Acosta et al., 2025). It provides a description of the indicators included in the Green Growth Index indicator framework*. The indicators are annually reviewed and updated to replace proxy variables. The indicators presented in this report are for the 2025 Edition of the Global Green Growth Index.



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 2017 purchasing power parity GDP	**Indicator category/code:**	Efficient and sustainable energy / EE1
Related SDG:	Target 7.3, indicator 7.3.1		
Impact on green growth:	Negative	**Data availability:**	Time series, 2000-2024
Data source:	Energy Balances, UNSTATS		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	Energy intensity refers to the amount of energy required to produce a unit of economic output. A low level of energy intensity means less energy is used for a unit of economic output [1.]		
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 highly relevant indicator for green growth because it demonstrates how energy is utilized efficiently within the economy [2].		
Limitations(s):	The structure of the economy, geography, and other structural factors influence the share of total primary energy supply in the country's gross domestic product (GDP). Thus, the indicator is not suited for measuring energy efficiency [3]		

1.2 Share of renewables in total final energy consumption			
Unit:	Percentage	**Indicator category/code:**	Efficient and sustainable energy / EE2
Related SDG:	Target 7.2, indicator 7.2.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	Energy Balances, UNSTATS		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	Renewable energy is the energy from natural processes that can be replenished at a fast rate. It includes heat and electricity from wind, hydropower, solar, ocean, geothermal, biofuels, and biomass. It supports the shift from a less carbon-intensive to a more sustainable energy system [4].		
Relevance:	Increasing the share of renewable energy can help improve economic growth by helping address energy shortages in developing countries [5]. It is also recognized as an important tool for addressing climate change[6] . It enables countries to protect the environment as renewable energy generates nearly zero emissions of greenhouse gases (GHG) and air pollutants [7] .		
Limitations(s):	The measurement of renewable energy encompasses energy generated from biomass and charcoal, which are not necessarily produced sustainably. It also does not consider off-grid renewable energy sources. Moreover, the indicator tends to underestimate the transport costs of renewable energy because heat and electricity are not differentiated in its calculations [8, 9],		

1.3 Efficiency in sustainable transport			
Unit:	Score	**Indicator category/code:**	Efficient and sustainable energy / EE3
Related SDG:	Not in the list of Sustainable Development Goals (SDGs) but contributes to Target 7.3; Target 9.1, 9.4; Target 12.c, 12.3; Target 17.14 [10]		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	World Bank		
Online source:	https://lpi.worldbank.org/		
Definition:	The indicator refers to the Logistics Performance Index (LPI), which the Sustainable Mobility for All (Sum4All) uses to represent an efficiency indicator in the Sustainable Mobility Index [11]. LPI is computed using principal component analysis (PCA). It has six dimensions: customs, infrastructure, ease of arranging shipments, quality of logistics services, timeliness, and tracking and tracing. The data used came from a worldwide survey of logistics professionals. Higher LPI scores were interpreted as having good logistics performance [12].		
Relevance:	Tracking logistics performance has been an important indicator of a country's progress in the fields of services, climate resilience, trade, and sustainability. LPI has been recognized by policymakers, companies, academia, and international organizations (such as the EU, ASEAN, and APEC) as a logistics performance indicator at the country level [13,14], . According to Sum4All, an efficient and sustainable transport system provides people with a more consistent, reliable, convenient, and cost-effective means of transportation without experiencing any problems in the system [15]. Additionally, a recent study revealed a positive and significant relationship between LPI and a reduction in CO2 emissions [16].		
Limitations(s):	Due to a lack of data for a better indicator, LPI will be used as a "proxy variable" for efficient transport. In addition, LPI scores, due to the nature of the data collected through surveys, could introduce potential biases/ subjectivity [17]. Thus, other important economic factors (e.g., transportation investments, economic growth rate, GDP) would not have a direct effect on the LPI scores [18].		

1.4 Water use efficiency			
Unit:	U.S. dollar per cubic meter	**Indicator category/code:**	Efficient and sustainable water use / EW1
Related SDG:	Target 6.4, indicator 6.4.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	Food and Agriculture Organization of United Nations (FAO)		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	Water use efficiency is the total efficiency in the main sectors of the economy, weighted according to the proportion of water withdrawn in each sector over the total amount of water withdrawn. The indicator provides an indication of the extent to which water resources can support the world's ecosystems for current and future generations [19].		
Relevance:	There are significant differences in water use and scarcity between countries due to the uneven distribution of water resources and human populations worldwide [20]. Water scarcity is worsening, leading to increasingly intense droughts due to the intensification of climate change impacts. As such, water competition is increasing in different sectors of the economy, affecting economic growth. Consequently, the demand to improve water use efficiency is growing because the availability of water supply in many countries is limited, and increasing the supply is costly [21].		
Limitations(s):	The indicator encompasses water use for agriculture, mining and quarrying, manufacturing, electricity, gas, steam, and air conditioning supply, construction, and all service sectors. It does not, however, consider water use for energy or the quality of water distribution networks [22].		

1.5 Share of freshwater withdrawal to available freshwater resources (Level of water stress)			
Unit:	Percentage	**Indicator category/code:**	Efficient and sustainable water use / EW2
Related SDG:	Target 6.4, indicator 6.4.2		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	FAO		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	It is the ratio between the total amount of freshwater withdrawn by the main sectors and the total renewable freshwater resources. The indicator measures how sustainable withdrawal and supply of freshwater can reduce water scarcity and its impacts on society [23].		
Relevance:	Water stress affects more than 2 billion people worldwide, as water use is shifting from agricultural to industrial uses due to growing urban populations and demand for processed products [24]. Also, climate change and current natural conditions affect pressure on water resources. As such, the metrics of water stress have changed over the last three decades. They shifted from simple indicators to holistic threshold indicators, which characterize water sustainability and human environments [25].		
Limitations(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 take into account the quality of the water. Freshwater resources are challenging to measure due to the complexity of the water resource cycle. Data availability and estimation remain a challenge [26].		

1.6 Sustainable fisheries as a proportion of GDP			
Unit:	Percentage	**Indicator category/code:**	Efficient and sustainable water use / EW3
Related SDG:	Target 14.7, indicator 14.7.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	Official country-reported data (UNSD and OECD national accounts) FAO Yearbook of Fishery Statistics and Review of the State of World Marine Fishery Resources		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	The indicator is computed as the value added of sustainable marine capture fisheries as a proportion of GDP. It is used to represent the sustainable utilization of marine resources through fisheries, where sustainably captured fish stocks can support the industries and communities that depend on them, without affecting their reproduction and long-term sustainability [27].		
Relevance:	Sustainable fishing is important since it contributes to the conservation and sustainable use of water resources, including oceans, seas, and marine life [28]. The fisheries sector's contribution to GDP is a standard method used to measure economic performance. However, there is difficulty in measuring it due to the general absence of comprehension or consensus, leading to underutilization or misuse of fisheries GDP measures [29].		
Limitations(s):	The data on marine capture/fish stock is only available for a few countries, which implies that there might be discrepancies in the actual level of exploitation of a fish stock [30].		

1. 7 Soil nutrient budget			
Unit:	Nitrogen kilogram per hectare	**Indicator category/code:**	Sustainable land use / SL1
Related SDG:	Not in the list of SDG indicators, but contributes to Targets 12 and 15		
Impact on green growth:	Negative	**Data availability:**	Time series, 1961-2024
Data source:	FAO		
Online source:	http://fenix.fao.org/faostat/internal/en/#data/ESB		
Definition:	The soil nutrient budget per unit area is an indicator of nutrient flows in a country's soil for a given year [31]. It is computed as the sum of inputs, including synthetic fertilizers (SF), manure applied to soils (MAS), nitrogen deposition (ND), and biological fixation (BF), minus outputs, such as crop removal (CR) [32].		
Relevance:	Nutrient Balance is often used as a method to assess nutrient use efficiency across countries, i.e., how efficiently agricultural inputs are utilized in relation to crop output [33]. Farm inputs are needed to ensure crop productivity; however, excessive use of these inputs incurs additional cost to farmers as well as poses further threats to the environment in the form of ammonia and GHG emissions [34]. On the other hand, under-utilizing farm inputs would lower the potential yield from crops [35].		
Limitations(s):	Based on the methods, the soil nutrient budget does not account for differences in baseline soil nutrient properties or nutrient retention/mining across countries over time. Additionally, the losses from emissions and leaching into water resources were not taken into account [36].		

1. 8 Share of organic agriculture in the 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 [37]		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	FAO		
Online source:	https://www.fao.org/faostat/en/#data/EL		
Definition:	Organic agriculture is a production system that enhances biodiversity, stimulates biological activity in the soil, and promotes biological cycles. Agricultural area includes permanent pastures, permanent crops, and arable land [38].		
Relevance:	Agricultural land is crucial and a limited resource for producing agricultural goods. Thus, there is a need to utilize agricultural land efficiently to ensure food security for a growing population [39]. A shift from conventional to organic farming is one way 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 [40].		
Limitations(s):	This indicator does not consider the debate surrounding organic farming and transgenic crops, particularly with respect to consistency in defining and measuring sustainability [41].		

1.9 Share of the ruminant livestock population in the agricultural area			
Unit:	Percentage	**Indicator category/code:**	Sustainable land use / SL3
Related SDG:	Not in the list of SDGs but contributes to Target 13.2, indicator 13.2.2		
Impact on green growth:	Negative	**Data availability:**	Time Series, 1961-2024
Data source:	FAO		
Online source:	http://www.fao.org/faostat/en/#data/EK		
Definition:	It is calculated as a percentage of the ruminant livestock population in relation to the agricultural land area.		
Relevance:	The livestock sector emits considerable amounts of human-induced GHG emissions, mainly from ruminants like cattle, which represent 62% of the sector's emissions [42]. Adoption of better practices and technologies for cattle raising and manure management could reduce the GHG emissions of the livestock sector by as much as 30% [43]. Additionally, overgrazing results in the loss of vegetative cover, nutrient loss, damaged soil structure, and erosion [44,45], . Livestock per agricultural area measures livestock production intensity, which is a contributing factor to higher emissions and poor soil quality.		
Limitations(s):	During the Green Growth Index international consultations on October 6, 2025, while this is a relevant indicator, international experts suggested combining it with other indicators, such as methane emissions per livestock. This will be discussed and considered in the following review process of the Green Growth Index.		

1.10 Total domestic material consumption (DMC) per unit of GDP			
Unit:	Kilograms per GDP	**Indicator category/code:**	Material use efficiency / ME1
Related SDG:	Target 8.4, indicator 8.4.2; Target 12.2, indicator 12.2.2		
Impact on green growth:	Negative	**Data availability:**	Time series, 1970-2024
Data source:	Organisation for Economic Co-operation and Development (OECD) for DMC and World Bank for GDP		
Online source:	https://www.oecd-ilibrary.org/environment/material-consumption/indicator/english_84971620-en; https://data.worldbank.org/		
Definition:	Domestic material consumption refers to the total amount of materials used within the national economy. 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 [46].		
Relevance:	At the national level, material efficiency is a crucial indicator of the success of sustainable resource management. As an economy grows, economic material efficiency increases [47]. The increase in material efficiency is crucial for separating resource depletion and its accompanying environmental stresses from economic development [48].		
Limitations(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 non-standardized datasets that comprise agriculture, forestry, fisheries, mining, and energy statistics. It does not consider the whole of material consumption [49].		

1.11 Total material footprint (MF) per capita population			
Unit:	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		
Impact on green growth:	Negative	**Data availability:**	Time series, 1990-2024
Data source:	U.N. Environment: Secretariat of the International Resource Panel		
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, non-metal ores, fossil fuels, and biomass. It shows the needed amount of primary materials for the final domestic demand. MF also includes traded goods. DMC measures production, and MF measures consumption, respectively. Hence, they can be combined to cover both aspects of material flows in the economy [50].		
Relevance:	The demand for urban material resources is expected to increase due to future growth in the urban population. As a country economically grows, it tends to reduce domestic materials through international trade. Consequently, the overall mass of material consumption increases [51].		
Limitations(s):	Like DMC, MF is based on material flows from Japan and the European Union, with estimates extrapolated for the rest of 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 [52, 53]		

1.12 Share of food loss to production and food waste to food consumption			
Unit:	Percentage	**Indicator category/code:**	Material use efficiency / ME3
Related SDG:	Target 12.3, indicator 12.3.1(a) and 12.3.1(b)		
Impact on green growth:	Negative	**Data availability:**	Time series, 2000-2024
Data source:	FAO		
Online source:	http://www.fao.org/faostat/en/#data/SCL		
Definition:	Food loss refers to the human-edible crop and livestock commodities that are lost during storage, transportation, and processing, including imported food commodities [54]. Food waste measures food discarded and not used for its intended purpose, such as consumption, and ends up as municipal solid waste [55].		
Relevance:	Reducing food waste and loss is crucial for lowering production costs, enhancing food system efficiencies, and improving food security, nutrition, and environmental sustainability [56] Additionally, it reduces GHG emissions, alleviates pressure on water and land resources, and improves productivity and economic growth [57] .		
Limitations(s):	For food loss, it only measures quantitative losses, but not qualitative and economic losses, which are not measurable but are equally important. Data availability remains a challenge. For food waste, due to its methodology, comparing at a regional level is possible if each country's random error is relatively high. However, comparing countries against one another is only possible if the difference in their estimates exceeds the combined amount of error [58].		

02 Natural capital protection

2.1 PM2.5 air pollution, mean annual population-weighted exposure			
Unit:	Micrograms per m^3	**Indicator category/code:**	Environmental quality / EQ1
Related SDG:	Target 11.6, indicator 11.6.2		
Impact on green growth:	Negative	**Data availability:**	Time series, 1990-2024
Data source:	Brauer, M. et al. 2017, for the Global Burden of Disease Study 2017.		
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 [59].		
Relevance:	According to the World Health Organization (WHO), particulate matter has harmful effects on human health. PM2.5 is the most commonly used indicator for estimating the impact on mortality. In fact, it ranked as the fifth mortality risk factor in 2015 [60]. 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 [61].		
Limitations(s):	The indicator calculates air pollution using satellite data, but using urban populations as the denominator factor, which can be defined differently according to the country. Furthermore, consultations with countries can lead to adjustments and bias in the data. Data quality also varies between high-, low-, and middle-income countries [62].		

2.2 DALY rate due to unsafe water sources (DALY lost per 100,000 persons)			
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, 1990-2024
Data source:	Institute for Health Metrics and Evaluation		
Online source:	http://ghdx.healthdata.org/gbd-results-tool		
Definition:	The disability-adjusted life years (DALYs) are the only indicator in health that measures diseases, encompassing the total number of years of life lost and the number of years lived with disability [63].		
Relevance:	Access to clean water is crucial for the environment, human development, and economic growth. However, approximately 785 million people worldwide lack access to basic, safe water resources [64]. Urban construction and economic development increase sewage discharges, which can severely damage the reservoir environment. The need for safe water has increased because living standards have also improved[65]. 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 [66].		

2.2 DALY rate due to unsafe water sources (DALY lost per 100,000 persons)	
Limitations(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 necessitating the completion of data using other sources [67].

2.3 Municipal solid waste (MSW) collected per urban population			
Unit:	Tons per urban population	**Indicator category/code:**	Environmental quality / EQ3
Related SDG:	Target 11.6, Indicator 11.6.1.		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	United Nations Human Settlements Programme (UN-Habitat),		
United Nations Statistics Division (UNSD), World Bank for urban population	http://ghdx.healthdata.org/gbd-results-tool		
Online source:	https://unstats.un.org/sdgs/dataportal/database		
Definition:	Municipal solid waste (MSW) 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. Total MSW collected refers to the amount of municipal waste collected by or on behalf of municipalities, as well as municipal waste collected by the private sector. It includes mixed waste and fractions collected separately for recovery operations (through door-to-door collection and/or through voluntary deposits) [68].		
Relevance:	The excessive amount of solid waste from human domestic activities disposed of in the municipality has caused numerous negative impacts on humans and the ecosystem [69]. Low levels of MSW collection pose severe threats to public health and local ecosystems (e.g., marine plastic pollution) [70]. Additionally, if there is a lack of technology and efficient methods for disposing of waste, air quality will deteriorate, thus adversely affecting human health [71].		
Limitations(s):	In many developing countries, municipal solid waste collection and treatment are done through the informal sector. Data on adequate treatment of municipal waste is limited. Furthermore, even if data collection is done correctly, the interpretation of what constitutes municipal waste treatment, such as recycling and composting, and the adequacy of the collected data vary significantly from country to country. This leads to limitations in data unification [72].		

2.4 Ratio of CO2 emissions to population, including AFOLU			
Unit:	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, 1990-2024
Data source:	Climate Analysis Indicators Tool (CAIT) and Potsdam Institute for Climate Impact Research for emissions (PIK), World Bank for population		
Online source:	https://www.climatewatchdata.org/ghg-emissions?end_year=2018&start_year=1990 and https://data.worldbank.org/		
Definition:	CO2 is a greenhouse gas that is odorless, colorless, and nonpoisonous. It is formed through carbon combustion and respiration of living things [73] . The indicator is based on emissions from the burning of fossil fuels and the manufacturing of cement, including those produced during the consumption of solid, liquid, and gaseous fuels, as well as gas flaring [74]		
Relevance:	In recent years, global CO_2 concentrations exceeded 400 ppm [75]. In China, the total carbon emissions in cities are closely related to the country's GDP. But per unit area carbon emissions are strongly related to population density in cities [76]. It is suggested that a more useful indicator for measuring climate impacts is carbon emissions per capita [77].		
Limitations(s):	Different calculation methods and energy sector disaggregation methodologies have led to some discrepancies in estimates of CO2 emissions among countries [78].		

2.5 Ratio of non-CO2 emissions (CH4, N2O and F-gas) excluding AFOLU to population			
Unit:	CO2eq 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:**	Time series, 1990-2024
Data source:	CAIT for emissions, World Bank for population		
Online source:	https://www.climatewatchdata.org/ghg-emissions?end_year=2018&start_year=1990 and https://data.worldbank.org/		
Definition:	Methane and nitrous oxide are also significant sources of GHG emissions, accounting for approximately 17.3 percent and 6.2 percent of total emissions, respectively. In terms of sectors, agriculture and fugitive emissions (e.g., unintentional gas leaks from fracking, traditional oil and gas extraction, and transportation) account for approximately 70 percent of global methane emissions. In comparison, agriculture accounts for more than 75 percent of nitrous oxide emissions. Due to the importance of the latter type of emissions, nitrous oxide emissions were included as a separate indicator (see GE3 below) [79].		
Relevance:	Non-CO2 greenhouse gases also contribute to climate change. It is, however, not related to cumulative emissions but determined through annual emissions. Thus, it is essential to account for the additional warming from non-CO2 agents independently when estimating CO2 emissions compatible with a temperature limit [80].		
Limitations(s):	Uncertainty in global emissions of CH4, N2O, and the F-gases has been estimated at 20%, 60%, and 20%, respectively [81].		

2.6 Ratio of non-CO2 emissions (CH4, N2O, and F-gas) in Agriculture and LUCF to population			
Unit:	CO2eq tons per capita	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:	Time series, 1990-2024
Data source:	CAIT for emissions, World Bank for population		
Online source:	https://www.climatewatchdata.org/ghg-emissions?end_year=2018&start_year=1990 and https://data.worldbank.org/		
Definition:	Greenhouse gases emitted from the agricultural sector include non-CO2 gases, such as methane (CH4) and nitrous oxide (N2O). Livestock and crop production and management generate these gases [82].		
Relevance:	Activities related to agriculture, forestry, and other land uses (AFOLU) generate greenhouse gases through removals by sinks. They comprise CO2 and non-CO2 emissions from forestry and other land uses, as well as non-CO2 emissions from agriculture. AFOLU accounts for nearly 25 percent of global GHG emissions. Next to the energy sector, AFOLU is the second-largest emitting sector. Action in AFOLU is crucial for many countries, where the sector accounts for a significant portion of their economy, is vulnerable to climate change, and can significantly benefit from climate funding for GHG reduction, food security, and rural development [83].		
Limitations(s):	Uncertainty in global emissions of CH4, N2O, and the F-gases has been estimated at 20%, 60%, and 20%, respectively [84].		

2.7 Average proportion of Key Biodiversity Areas 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:**	Time series, 2000-2024
Data source:	BirdLife International, International Union for Conservation of Nature (IUCN), and UNEP-WCMC		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	The indicator represents the proportion of main biodiversity areas, including terrestrial, freshwater, marine, and mountain areas, that are covered by protected areas. These areas have a significant impact on biodiversity preservation globally. Protecting these key ecosystems improves biodiversity and sustains the use of natural resources [85].		
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 crucial strategy for conserving 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 [86]. Moreover, integrating the establishment of protected areas in land use plans can address issues relating to species loss and climate change adaptation [87].		
Limitations(s):	The indicator does not account for the effectiveness of establishing protected areas in protecting biodiversity and ecosystems, which depends on enforcement and effective management. Regarding key biodiversity areas, the list is not complete in all regions, and there are also some omissions [88].		

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:**	Time series, 1990-2024
Data source:	FAO, electronic files and website https://www.fao.org/faostat/en/#data/EL		
Online source:	https://data.worldbank.org/indicator/AG.LND.FRST.ZS		
Definition:	A forest area is land with trees that are at least five meters in height. It does not include trees in agricultural areas, such as fruit plantations and agroforestry systems, and in gardens and parks [89]. Forest areas are important for humans as they provide goods such as non-wood and wood forest products, and services such as carbon sequestration, coastal protection, soil preservation, water conservation, and biodiversity habitat[90].		
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 by instituting policies that address climate change. It can help expand renewable energy and reduce GHG emissions. Generally, forests contribute to green building and infrastructure, acting as carbon sinks [91].		
Limitations(s):	Forest surveys are conducted at irregular intervals from country to country. Remote sensing can be used, but it cannot detect long-term tree growth or low canopy cover density forests. The indicator is used to measure the extent of forests that are preserved and restored, but it only partially measures the extent of forests that are managed sustainably [92].		

2.9 Above-ground biomass stock in the forest			
Unit:	Tons per hectare	**Indicator category/code:**	Biodiversity and ecosystem protection / BE3
Related SDG:	Target 15.2, indicator 15.2.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	FAO: Global Forest Resources Assessment (FRA)		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	Above-ground biomass is defined as "all biomass of living vegetation, both woody and herbaceous, above the soil, including stems, stumps, branches, bark, seeds, and foliage" [93]. It measures the gains in forest growth through biomass stock and reduction through wood removals, fire, wind, pests, diseases, and natural losses. A reduced biomass stock per hectare over a long period may suggest either unsustainable forest management and degradation or unforeseen losses due to fire, wind, pests, or diseases [94]. This indicator is also used as a sub-indicator for Target 15.2, specifically indicator 15.2.1, to track progress towards sustainable forest management.		
Relevance:	This indicator is important since forests serve as a major carbon pool. Additionally, it is given the most significant importance in carbon inventory and many mitigation projects related to forest lands, agroforestry, and shelterbelts. Lastly, it is a crucial carbon pool for afforestation and reforestation CDM projects of the Kyoto Protocol [95].		
Limitations(s):	The indicator does not fully reflect sustainable forest management, as it does not encompass all aspects, such as economic and social considerations. Additionally, due to limited data availability, only countries with complete time series data can have trends over time [96].		

2.10 Red List Index			
Unit:	Score	**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 indicates that the expected rate of species extinctions is decreasing.	**Data availability:**	Time series, 1993-2024
Data source:	BirdLife International and IUCN (2021)		
Online source:	https://unstats.un.org/sdgs/unsdg		
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 across different types of extinction risk, as categorized in the IUCN Red List of Threatened Species. A value of 1 means the species is of least concern for extinction, and 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 at which such a risk would change [97].		
Relevance:	Despite various conservation efforts, a significant number of species remain threatened by extinction. Contributing factors include habitat destruction, pollution, overexploitation, and the 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' extinction [98]. Highly valued species are considered cultural indicators and critical when planning restoration and rehabilitation projects with local communities [99].		
Limitations(s):	The Red List Index includes several sources of uncertainty. Species can be inadequately classified in terms of their endangered status, and inconsistencies may arise in assessing species. Some species are also too poorly known to be included in the Red List's data [100].		

2.11 Tourism and recreation in coastal and marine areas			
Unit:	Score, 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:**	Time series, 2000-2024
Data source:	Ocean Health Index (OHI)		
Online source:	https://oceanhealthindex.org/		
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 OHI measures the economic aspects of coastal and marine attractions in the Coastal Livelihoods and Economies goal [101].		
Relevance:	Ecotourism promotes responsible tourism in natural areas, enhances the well-being of local communities, and contributes to environmental conservation [102]. Determining the symbolic species depends on the existence of that species and its value in a particular cultural area, increasing when it is rare, and its habitat is inaccessible [103].		
Limitations(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 [104].		

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:**	Time series, 2000-2024
Data source:	World Database on Protected Areas (WDPA), where the compilation and management are 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 are not publicly accessible and those that are managed sustainably. Marine protected areas encompass subtidal and intertidal land, overlying water, and associated fauna and flora, which are preserved by law. It also includes the cultural and historical characteristics of the area [105].		
Relevance:	Planning for tourism areas takes into account the environment and the people in protected areas. A tourism planning and development strategy typically considers aspects such as adequate zoning, safeguarding guidelines, regulations, and proper management [106].		
Limitations(s):	The indicator excludes sites protected under local or provincial law [107].		

03 Green economic opportunities

3.1 Public Investments in Renewable Energy			
Unit:	Percent of GDP	**Indicator category/code:**	Green investment / GV1
Related SDG:	Not in the list of SDG indicators but contributes to Goal 7, for example, Target 7.b to expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	IRENA for Investment data and World Bank for GDP		
Online source:	https://pxweb.irena.org/pxweb/en/IRENASTAT/IRENASTAT__Finance/PUBFIN_2025_H2_PX.px/ https://data.worldbank.org/indicator/NY.GDP.MKTP.CD		
Definition:	This indicator refers to the amount of public funding allocated to renewable energy sources. Specifically, On-grid solar photovoltaic, Off-grid solar photovoltaic, Solar thermal energy, Concentrated solar power, Onshore wind energy, Offshore wind energy, Renewable hydropower, pumped storage, Marine energy, Other primary solid biofuels n.e.s., Renewable municipal waste, Biodiesel, Liquid biofuels, Biogasoline, Biogas, Geothermal energy, Multiple renewables [108]		
Relevance:	Scaled up renewable energy investment, on the foundation of sound enabling policy frameworks, is critical to accelerate the global energy transformation and reap its many benefits, while achieving climate and development targets. Public finance, including climate finance, plays an important role in bridging the financing gap and attracting further investment from the private sector to renewables .		
Limitations(s):	Important to capture private sector investment, Foreign Direct Investment when data becomes available		

3.2 Environmental Protection Expenditures			
Unit:	Percent of GDP	**Indicator category/code:**	Green investment / GV2
Related SDG:	Not in the list of SDG indicators but contributes to Goal 17, for example, Target 17.7 to promote the development, transfer, dissemination and diffusion of environmentally sound technologies		
Impact on green growth:	Positive	**Data availability:**	Time series, 1995-2024
Data source:	IMF		
Online source:	https://climatedata.imf.org/datasets/d22a6decd9b147fd9040f793082b219b_0/explore		
Definition:	Government expenditures on a specified set of activities including pollution abatement, protection of biodiversity landscape, waste and wastewater management, within the framework of the Classification of Functions of Government [109] .		
Relevance:	Environmental protection expenditures (EPEs) reflect the current priorities of governments in addressing sustainability and climate change. Higher levels of EPEs are seen as effective in reducing GHG emissions [110].		
Limitations(s):	Important to capture private sector investment, Foreign Direct Investment when data becomes available		

3.3 Total amount of funding to promote environmentally sound technologies			
Unit:	Ratio	**Indicator category/code:**	Green investment / GV3
Related SDG:	Target 17.7, indicator 17.7.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	United Nations Comtrade database (COMTRADE		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	Environmentally Sound Technologies (ESTs) are technologies that have the potential for significantly improved environmental performance relative to other technologies. ESTs protect the environment, are less polluting, sustainably use resources, recycle more of their wastes and products, and handle all residual wastes in a more environmentally acceptable way than the technologies for which they are substitutes. ESTs are not just individual technologies. They can also be defined as comprehensive systems that encompass knowledge, procedures, goods, services, and equipment, as well as organizational and managerial processes for promoting environmental sustainability [111].		
Relevance:	The total amount of funding to promote environmentally sound technologies (ESTs) as a share of GDP reflects a country's commitment to investing in innovation and technologies that reduce environmental impacts while supporting economic growth. Financing ESTs accelerates the transition toward cleaner production, resource efficiency, and low-carbon development by encouraging industries and institutions to adopt sustainable practices. This indicator is highly relevant to green growth because it measures the integration of environmental sustainability into technological and industrial advancement. Increased funding for ESTs also helps foster technical skills and capacity development needed to support green jobs, enabling a workforce that can drive sustainable innovation and implement environmentally responsible solutions across sectors [112].		
Limitations(s):	There are challenges when compiling this indicator, particularly in terms of defining ESTs across countries [113].		

3.4 Share of export of environmental goods (OECD and APEC classifications) to total export			
Unit:	Percentage	**Indicator category/code:**	Green trade / GT1
Related SDG:	Not included in the list of SDG indicators, but it contributes to Goal 12, specifically Target 12.6, which encourages companies to adopt sustainable practices.		
Impact on green growth:	Positive	**Data availability:**	Time series, 1998-2024
Data source:	United Nations Comtrade database (COMTRADE), World Economic Outlook (WEO), and International Monetary Fund (IMF)		
Online source:	https://climatedata.imf.org/datasets/8636ce866c8a404b8d9baeaffa2c6cb3_0/explore?showTable=true		
Definition:	Environmental goods include both goods connected to environmental protection—such as goods related to pollution management and resource management—and adapted goods—which are goods that have been specifically modified to be more "environmentally friendly" or "cleaner" [114].		
Relevance:	In the Asia-Pacific region, environmental goods present a significant trade opportunity for both exports and imports. The region has a substantial share of exports, and its share has been increasing. The main contributor to such growth was renewable energy. Environmental goods exports from developing countries account for more than 75 percent of the region's total exports. These countries have also increased their share of environmental goods exports [115].		
Limitations(s):	Environmental goods under harmonized customs codes can comprise products that have both environmental and nonenvironmental end uses [116].		

3.5 CO2 emissions embedded in trade			
Unit:	Percentage	**Indicator category/code:**	Green trade / GT2
Related SDG:	Not in the list of SDG indicators but contributes to Goal 9, for example, Target 9.4 to upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes		
Impact on green growth:	Negative	**Data availability:**	Time series, 1990-2024
Data source:	Global Carbon Budget with major processing by Our World in Data		
Online source:	https://ourworldindata.org/grapher/share-co2-embedded-in-trade		
Definition:	Annual net carbon dioxide (CO^2) emissions embedded in trade are measured as a percentage of production-based emissions of CO^2. Net CO^2 emissions embedded in trade refer to the net amount of CO^2 imported or exported via traded goods with an economy. A positive value denotes a country or region is a net importer of CO^2 emissions; a negative value indicates a country is a net exporter.		
Relevance:	CO^2 emissions embedded in trade measure the balance between emissions generated domestically to produce exported goods and those associated with imported goods consumed within a country. This indicator is relevant to green growth because it highlights how trade patterns affect a nation's overall carbon footprint and its role in the global transition to low-carbon economies. A positive balance indicates reliance on carbon-intensive imports, while a negative balance suggests that a country's exports contribute to emissions abroad.		
Limitations(s):	However, this indicator serves only as a proxy variable for the carbon intensity of trade, as it reflects the net transfer of emissions rather than the actual environmental performance or greenness of traded goods. A more suitable replacement would be the percentage of Trade in Low Carbon Technology Products as a share of total goods exported, which would directly measure a country's participation in and contribution to the expansion of low-carbon industries and the global clean technology market.		

3.6 Water virtual trade flows			
Unit:	Tonnes squared per year	**Indicator category/code:**	Green trade / GT3
Related SDG:	Not in the list of SDG indicators but contributes to Goal 6, for example, Target 6.4 to substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity		
Impact on green growth:	Negative	**Data availability:**	Time series, 1961-2024
Data source:	Water footprint data from the Water Footprint Assessment tool, Production data from the FAO		
Online source:	https://www.waterfootprintassessmenttool.org/countries/~AFG/scope_ https://www.fao.org/faostat/en/#data/TCL		
Definition:	The water footprint measures the amount of water used to produce goods and services for domestic use or foreign exports. The total water footprint for crops includes annual green, blue, and grey water footprints per country. Virtual water flows are calculated by multiplying the total water footprint (in tons) by the volume of agricultural exports (in tons) per commodity, and then taking the ratio to the total agricultural land area (in hectares). The indicator measures the amount of water used for exporting agricultural commodities.		
Relevance:	Water virtual trade flows measure the amount of water embodied in exported agricultural products, highlighting the link between trade, resource use, and environmental sustainability. This indicator is highly relevant to green growth as it helps assess how agricultural exports contribute to the depletion or efficient use of a country's water resources, particularly in water-scarce regions. Understanding virtual water flows supports more sustainable production and trade policies by encouraging the export of less water-intensive crops and promoting efficient irrigation and water management practices. Integrating this information into trade and agricultural planning enables countries to balance economic benefits from exports with the sustainable use of freshwater resources, ensuring long-term environmental and economic resilience.		
Limitations(s):	Constant values for the water footprint for several countries and years covered		

3.7 Share of green employment in total manufacturing employment			
Unit:	Percentage	**Indicator category/code:**	Green employment / GJ1
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:**	Time series, 2000-2024
Data source:	Moll de Alba and Todorov 2018, 2019.		
Online source:	Not available online, data computed and shared by the author		
Definition:	This indicator measures the impact of manufacturing on employment through its capability to absorb excess labor force from the traditional and agricultural sectors [117].		
Relevance:	The labor market will undergo restructuring as the economy transitions 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 nearly 90 percent of CO2 but generate only slightly more than 10 percent of employment. Thus, these industries with a significant environmental footprint should adapt. There should be adjustments in the labor market employment for greener growth. Additionally, effective policies on innovation and the environment can create new markets [118].		
Limitations(s):	The analysis covered only limited data, and a number of countries were excluded [119].		

3.8 Renewable Energy Employment to total renewable energy			
Unit:	Number of Jobs per toe of primary energy supply	**Indicator category/code:**	Green employment / GJ2
Related SDG:	Not in the list of SDG indicators but contributes to Goal 8, for example, Target 8.5. to achieve full and productive employment and decent work for all women and men		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	IRENA for RE employment, IEA for renewable energy		
Online source:	https://www.irena.org/Data/View-data-by-topic/Benefits/Renewable-Energy-Employment-by-Country- https://www.iea.org/data-and-statistics/data-explorers#indicator-chart		
Definition:	This indicator refers to the ratio between the total number of people employed in the RE sector and the total renewable energy supply.		
Relevance:	Employment opportunities are a key consideration in planning for a low-carbon economy. It is considered a tangible benefit when transitioning to a low-carbon economy. The increase in employment not only reduces emissions but also contributes towards socio-economic development [120].		
Limitations(s):	This indicator does not capture the quality of RE jobs		

3.9 Employment in water and waste collection, treatment, and disposal activities, and materials recovery			
Unit:	Percent of Industrial Employment	**Indicator category/code:**	Green employment / GJ3
Related SDG:	Not in the list of SDG indicators but contributes to Goal 8, for example, Target 8.5. to achieve full and productive employment and decent work for all women and men		
Impact on green growth:	Positive	**Data availability:**	Time series, 1993-2024
Data source:	ILO		
Online source:	https://ilostat.ilo.org/data/		
Definition:	The employed comprise all persons of working age who, during a specified brief period, were in one of the following categories: a) paid employment (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work). Data disaggregated by economic activity are provided according to the latest version of the International Standard Industrial Classification of All Economic Activities (ISIC) available for that year.		
Relevance:	Employment in water and waste collection, treatment, disposal, and materials recovery as a percent of total industrial employment measures the extent to which a country's labor market is shifting toward environmentally sustainable activities within the industrial sector. Jobs in these areas contribute directly to pollution reduction, resource efficiency, and the circular economy by supporting cleaner production, recycling, and safe waste management. This indicator is highly relevant to green growth as it links job creation with environmental protection, demonstrating how the transition to a low-carbon and resource-efficient economy can generate decent and sustainable employment. Expanding green jobs in water and waste management also strengthens public health, conserves natural resources, and enhances the long-term resilience of industrial systems.		
Limitations(s):	Jobs in this sector could still be considered low-quality jobs, especially for developing countries		

3.10 Share of patent publications in environmental technology of total patents			
Unit:	Percent	**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:**	Time series, 1990–2024
Data source:	OECD, STI Micro-data Lab: Intellectual Property Database		
Online source:	https://data-explorer.oecd.org/		
Definition:	Patents in environmental technology measure the innovative capability to produce environmentally friendly goods and services. Green innovations emerge from policies on research and development, as well as other private initiatives. Environmentally friendly inventions contribute to the production of environmental goods, thereby creating new markets and employment opportunities [121].		
Relevance:	The dynamics of green technologies have been increasing since 2007. This resulted in an increased share of patents in environmental technology [122]. The patent grants are indicators used to determine the innovative level in the field of the environment. Eco-invention patents are used to measure invention and research activities, as well as to study the research direction in a given technological field. Eco innovations patents, meanwhile, are used in measuring innovations that reduce environmental risk and negative impacts [123],[124].		
Limitations(s):	The criteria for a patent to be considered an environmental technology are not extensive, and they include climate change mitigation, the capture, storage, sequestration, or disposal of greenhouse gases, as well as environmental and water-related adaptation technologies [125],[126]		

3.11 University-industry collaboration in Research & Development			
Unit:	Score	**Indicator category/code:**	Green Innovation / GN2
Related SDG:	Not in the list of SDG indicators but contributes to Goal 9, for example, Target 9.5 to enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000–2024
Data source:	World Bank		
Online source:	https://prosperitydata360.worldbank.org		
Definition:	This indicator assesses the extent to which businesses and universities collaborate on research and development (R&D). [1 = do not collaborate at all; 7 = collaborate extensively] . [120]		
Relevance:	Both industry and academia stand to benefit from long-term cooperation. Companies will gain greater access to cutting-edge research and scientific talent at a time when corporate R&D budgets are increasingly under pressure. Universities will gain access to financial support and research partners at a time when government funding is shrinking. Most importantly, society will benefit from a stream of previously unimaginable advances in life sciences, biomedical engineering, communications, environmental sciences, and artificial intelligence [128].		
Limitations(s):	Could be limited in terms of sectoral coverage and potential subjectivity in scoring methodology		

3.12 Installed renewable energy-generating capacity			
Unit:	Watts per capita	**Indicator category/code:**	Green Innovation / GN3
Related SDG:	Target 7.b, indicator 7.b.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000–2024
Data source:	International Renewable Energy Agency (IRENA)		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	The indicator is defined as the installed capacity of power plants that generate electricity from renewable energy sources divided by the total population of a country. Capacity is defined as the net maximum electrical capacity installed at the end of the year, and renewable energy sources are defined as per the IRENA Statute [129].		
Relevance:	The installation of energy infrastructure from renewable sources reduces GHG emissions. There is no readily available mechanism to collect, aggregate, and measure the contribution of this disparate group of products to the delivery of modern and sustainable energy services. However, one major part of the energy supply chain that can be readily measured is the infrastructure used to produce electricity [130].		
Limitations(s):	This indicator only captures electricity capacity, meaning that the modernization of technologies used to produce heat or provide energy for transportation was not accounted for [131].		

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, indicator SDG 6.2.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene (washdata.org); Global Health Observatory (GHO)		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	The indicator shows the population that uses drinking water from safe, accessible, and available sources. Safe water sources include delivered water, protected springs, protected wells, piped water, and tubewells. Additionally, it indicates the population that has access to sanitation facilities not shared with others. Sanitation facilities include septic tanks, flush-to-piped sewer systems, and improved toilets with slabs [132].		
Relevance:	Access to safely managed water and sanitation is the foundation of socio-economic development, human dignity, well-being, and health [133]. However, many people do not have this. In the past century, the use of water has been more than twice the population growth rate. Although there is no water shortage yet, 40 percent of the global population living near a river basin is experiencing water scarcity. Environmental degradation and water competition are some of the effects of water scarcity [134]. Moreover, the inaccessibility of clean water and sanitation causes children's deaths. Those who lack access to clean water and sanitation also face fewer opportunities to reach their full potential [135].		
Limitations(s):	Data on access to safely managed water and sanitation are not yet uniform, and national discrepancies exist. Fecal and chemical contamination is not considered in all cases [136]. The indicators typically used for monitoring progress in response to water and sanitation issues are limited to the international level. Numerous new and useful initiatives at the local level have contributed to the availability of clean water and sanitation [137]. Still, these have not yet been considered in measuring the indicator.		

4.2 Prevalence of undernourishment

Unit:	Percentage	**Indicator category/code:**	Access to basic services and resources / AB2
Related SDG:	Target 2.1, indicator 2.1.1		
Impact on green growth:	Negative	**Data availability:**	Time series, 2000-2024
Data source:	FAO		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	The prevalence of undernourishment (PoU) measures the percentage of the population that lacks sufficient food to meet the required dietary energy needs for a normal, active, and healthy life. Additionally, undernourishment is defined as a condition of inadequate food intake [138].		

4.2 Prevalence of undernourishment

Relevance:	In 2020, 768 million people were undernourished globally, with 418 million residing in Asia and more than one-third, or 282 million, living in Africa [139]. Prevalence of undernourishment and undernutrition in children can lead to stunting, wasting (being dangerously thin for one's height), and being underweight [140].
Limitations(s):	The precision of the PoU estimates is low due to the probabilistic nature of the inference and the model parameters' margins of uncertainty. The PoU's theoretical Margin of Error cannot be calculated, but in many cases, it would likely exceed plus or minus 2.5%. Thus, FAO only publishes country-level estimates larger than 2.5% which is the lowest score that can be obtained in the indicator [141]. It cannot be disaggregated by age, sex, etc. to identify populations that are most vulnerable to undernourishment within countries[142]. Lastly, it only indicates the number of people who are undernourished, but not the severity of their undernourishment [143]

4.3 Proportion of population with primary reliance on clean fuels and technology

Unit:	Percent	**Indicator category/code:**	Access to basic services and resources / AB3
Related SDG:	Target 7.1, indicator SDG 7.1.1, indicator 7.1.2		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	World Bank for access to electricity, WHO for access to clean cooking fuels		
Online source:	https://unstats.un.org/sdgs/unsdg		
	This indicator assesses the extent to which businesses and universities collaborate on research and development (R&D). [1 = do not collaborate at all; 7 = collaborate extensively] .		
Definition:	Electricity access refers to 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 [144]. The use of solid fuels and kerosene in households contributes to mortality rates from respiratory-related diseases [145]. 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 [146].		
Relevance:	Efforts to ensure access to affordable and clean energy have progressed due to recent initiatives in electrification and improvements in energy efficiency. However, there is still a need to establish national policies on affordable energy. Some of the primary causes of global energy problems today include high fuel prices, poverty, and a lack of access to clean energy sources. Countries with severe climates and high heating demands are significantly affected by these problems [147].		
Limitations(s):	Data on household cooking, heating, and lighting are not yet unified and universally measured. Concerning electricity, the availability of an electric outlet does not always imply that the electric supply is reliable and constant [148].It also does not include information about affordability, reliability, and the quality of service, which are also indicators of accessibility [149]		

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:**	Time series, 2000-2024
	International Renewable Energy Agency (IRENA)		
Data source:	Inter-Parliamentary Union (IPU)		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	Participation of women in parliament is a major opportunity for them politically. It is linked to their empowerment. The indicator measures the extent of women's equal access to parliament [150].		
Relevance:	Involvement of women in politics has good social and economic impacts. It is crucial in advancing gender equality and democracy in a country. Additionally, the participation of women in decision-making helps balance 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 [151].		
Limitations(s):	The indicator does not consider results in by-elections and upper chambers of parliament. It is also not a complete measure of women's political power [152].		

4.5 Gender ratio of accounts at a financial institution or mobile-money-service provider			
Unit:	Ratio	**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:	Negative	**Data availability:**	Time series, 2000-2024
Data source:	World Bank Global Findex database		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	An account in a financial institution refers to the proportion of people aged 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 [153]. The indicator was computed by taking the higher value between the male-female or female-male ratio of the indicator. Given that the target is equality, countries are penalized if there are imbalances (i.e., higher ratio values) in access to financial institutions between males and females.		
Relevance:	Financial inclusion enables people to access insurance and credit. Low-income individuals often rely on their own savings and earnings when 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[154]. People who have access to financial services can manage their lives and participate in businesses[155].		
Limitations(s):	The indicator is built using representative surveys of 140 countries, which are conducted every three years. This method implies uncertainties on the values [156]		

4.6 Getting paid, laws, and regulations for equal gender pay			
Unit:	Score	**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:**	Time series, 1971-2024
Data source:	World Bank Women, Business and the Law		
Online source:	https://wbl.worldbank.org/en/reports		
Definition:	The indicator refers to the legal gender discrimination that influences the employment and economic choices of women. It also covers the laws that require equal pay for labor of equal value [157].		
Relevance:	Similar to men, women have become better workforce members. Many social policies support the employment of women. The gender pay gap, however, persists partly due to a lack of political will to redistribute the wage share. Gender equality will require a greater sharing of work and social support. Additionally, there is a need to change the behavior of employers and the perspectives of countries that offer opportunities for women [158]		
Limitations(s):	This indicator does not encompass the entire labor force . [159]		

4.7 Inequality in income-based Palma ratio			
Unit:	Ratio	**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:	Negative	**Data availability:**	Time series, 1963-2024
Data source:	World Bank		
Online source:	https://data.worldbank.org/indicator		
Definition:	The Palma ratio is a measure of income concentration. It is computed as the share of national income received by the 10% of people with the highest disposable income divided by the share of all income received by the 40% of people with the lowest disposable income [160],[161] . Higher scores would indicate higher levels of inequality. For example, a value of 3.0 in the Palma ratio suggests that the richest 10% earn three times more than the poorest 40%.		
Relevance:	Studies show that measuring income inequality is a factor in determining poverty levels, economic growth rates, human rights, and the levels of crime, violent conflict, and social unrest [162],[163] .It was also observed that growth rates are generally better for countries that have lower initial income inequality [164]. The Palma ratio is also used in policy debates because it is easier to interpret and explain to both policymakers and stakeholders compared to other measures of inequality [165]		
Limitations(s):	As with all measures of inequality, the indicator measures income differences but cannot indicate the standard of living [166]. In addition, the Palma ratio only utilizes the top 10% and 40% of the income distribution data as a measure of concentration [167]		

4.8 Population with access to basic services by urban/rural, i.e., electricity			
Unit:	Ratio	**Indicator category/code:**	Social Equity / SE2
Related SDG:	Target 7.1, indicator 7.1.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	The computation of the indicator utilized data on access to electricity.		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	It is calculated based on the portion of the population that has access to electricity.		
Relevance:	There is a big difference between the population in rural and urban areas when it comes to access to basic services. Services like electricity are essential for a better quality of life. However, people in poverty, particularly those in rural areas, have limited access to these basic services [168].		
Limitations(s):	The indicator has the same issues concerning electricity as AB1.		

4.9 Share of youth (aged 15-24 years) not in education, employment, or training			
Unit:	Percentage	**Indicator category/code:**	Social Equity / SE3
Related SDG:	Target 8.6, indicator 8.6.1.		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	LFS - EU Labour Force Survey		
Online source:	https://unstats.un.org/sdgs/unsdg		
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 who 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 [169].		
Relevance:	Increasing human capital through employment, education, and training is a key contributing factor to economic growth. The level of educational attainment is a crucial factor in employability. Youths who have finished secondary education are less likely to experience difficulty in finding work [170]. Youths who did not complete their education or attend training are the most vulnerable in the labor market [171].		
Limitations(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 [172].		

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:**	Time series, 1996-2024
Data source:	International Labour Organization (ILO)		
Online source:	https://unstats.un.org/sdgs/unsdg		
Definition:	The proportion of the population above the 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 level of security in people's living conditions. The social protection system benefits people covering disability, unemployed persons, child and maternity benefits, injured workers, and older persons [173].		
Relevance:	According to the ILO, old-age income security pension schemes are still relevant. Many countries offer pensions in periodic cash forms under a single scheme. Typically, it is achieved through a combination of non-contributory and contributory schemes. Globally, those who receive pensions comprise 68 percent of people above retirement age, either covered by non-contributory or contributory schemes [174].		
Limitations(s):	Countries provide statistics, which do not imply that the pension is sufficient for persons above pensionable age to live well. Furthermore, pensionable age varies from country to country [175].		

4.11 Universal health coverage (UHC) service coverage index			
Unit:	Score	**Indicator category/code:**	Social protection / SP2
Related SDG:	Target 3.8, indicator 3.8.1		
Impact on green growth:	Positive	**Data availability:**	Time series, 2000-2024
Data source:	WHO		
Online source:	https://unstats.un.org/sdgs/indicators/database/		
Definition:	The indicator encompasses and measures various essential services based on tracer interventions, including reproductive, maternal, newborn, and child health, infectious diseases, non-communicable diseases, and service capacity and access. It is scaled from 0 to 100 using 14 tracer indicators from the four tracer interventions [176].		
Relevance:	The indicator ensures that all receive healthcare, including health promotion, prevention, rehabilitation, palliative care, and treatment, while protecting them from financial consequences. Additionally, good health enables people to earn an income and escape poverty, and has a positive impact on long-term economic development [177].		
Limitations(s):	It only covers health services and interventions that are needed for universal health coverage that have a currently existing database and available data for every country [178].		

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:**	Time series, 1999-2024
Data source:	United Nations Human Settlements Programme (UN-HABITAT)		
Online source:	https://unstats.un.org/sdgs/unsdg		
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 [179].		
Relevance:	As urban population grows, so are the 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 [180].		
Limitations(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 [181].		

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