SDG indicator metadata

(Harmonized metadata template - format version 1.1)

0. Indicator information (SDG_INDICATOR_INFO)

0.a. Goal (SDG_GOAL)

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

0.b. Target (SDG_TARGET)

Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix

0.c. Indicator (SDG_INDICATOR)

Indicator 7.2.1: Renewable energy share in the total final energy consumption

0.d. Series (SDG_SERIES_DESCR)

Not applicable

0.e. Metadata update (META_LAST_UPDATE)

2022-03-31

0.f. Related indicators (SDG_RELATED_INDICATORS)

Indicator 9.4.1: CO_2 emission per unit of value added

Indicator 13.2.2: Total greenhouse gas emissions per year

0.g. International organisations(s) responsible for global monitoring (SDG_CUSTODIAN_AGENCIES)

International Energy Agency (IEA)

United Nations Statistics Division (UNSD)

International Renewable Energy Agency (IRENA)

1. Data reporter (CONTACT)

1.a. Organisation (CONTACT_ORGANISATION)

International Energy Agency (IEA)
United Nations Statistics Division (UNSD)
International Renewable Energy Agency (IRENA)

2. Definition, concepts, and classifications (IND_DEF_CON_CLASS)

2.a. Definition and concepts (STAT_CONC_DEF)

Definition:
The renewable energy share in total final consumption is the percentage of final consumption of energy that is derived from renewable resources.

Concepts:

Renewable energy consumption includes consumption of energy derived from: hydro, wind, solar, solid biofuels, liquid biofuels, biogas, geothermal, marine and renewable waste. Total final energy consumption is calculated from balances as total final consumption minus non-energy use.

Comments regarding specific renewable energy sources:

- Solar energy includes solar PV and solar thermal.
- Liquid biofuels include biogasoline, biodiesels and other liquid biofuels.
- Solid biofuels include fuelwood, animal waste, vegetable waste, black liquor, bagasse and charcoal.
- Renewable waste energy covers energy from renewable municipal waste.

2.b. Unit of measure (UNIT_MEASURE)

Percent (%)

2.c. Classifications (CLASS_SYSTEM)

The “International Recommendations for Energy Statistics” (IRES), adopted by the UN Statistical Commission, is the globally recognized standard used to develop the energy statistics underlying the calculation of the indicator.

This standard is available at: unstats.un.org/unsd/energystats/methodology/ires.

3. Data source type and data collection method (SRC_TYPE_COLL_METHOD)

3.a. Data sources (SOURCE_TYPE)

Data on renewable energy consumption are available through national energy balances compiled based on data collected by the International Energy Agency (for around 150 countries) and the United Nations Statistics Division (UNSD) for all countries. The energy balances make it possible to trace all the different sources and uses of energy at the national level.

Some technical assistance may be needed to improve these statistics, particularly in the case of renewable energy sources. Specialized industry surveys (e.g. on bioenergy use) or household surveys (in combination with the measurement of other indicators) would be feasible approaches to filling in data gaps (e.g. for use of firewood, off-grid solar energy).

3.b. Data collection method (COLL_METHOD)

The IEA collects energy data at the national level according to harmonised international definitions and questionnaires, as described in the UN International Recommendations for Energy Statistics (unstats.un.org/unsd/energystats/methodology/ires/).

UNSD also collects energy statistics from countries according to the same harmonised methodology.

3.c. Data collection calendar (FREQ_COLL)

Data are collected on an annual basis.

3.d. Data release calendar (REL_CAL_POLICY)

The IEA World Energy Balances are published in February, April and July with progressively broader geographical coverage (publishing full information for two calendar years prior and selected information for one year prior). The UN Energy Statistics Database is made available towards the end of the calendar year with full geographical coverage (publishing information for two calendar years prior).

3.e. Data providers (DATA_SOURCE)

National administrations, as described in documentation on sources for IEA and UNSD:
http://wds.iea.org/wds/pdf/WORLDBAL_Documentation.pdf
unstats.un.org/unsd/energystats/data

3.f. Data compilers (COMPILING_ORG)

The International Energy Agency (IEA) and the United Nations Statistics Division (UNSD)

The IEA and UNSD are the primary compilers of energy statistics across countries and develop internationally comparable energy balances based on internationally agreed methodologies. Aggregates are based on analysis merging of IEA and UNSD data.

3.g. Institutional mandate (INST_MANDATE)

IEA as one of the custodian agencies responsible for monitoring progress towards the SDG 7.2 target, leverage on their national data efforts and add value by promoting coherent standards, definitions and methodologies for both raw data and the derived indicators with the ultimate goal of producing internationally comparable datasets.

The UNSD mission in the area of energy statistics is to strengthen national statistical systems in order to assist countries to produce high quality energy statistics and balances. The mission is realized through four workstreams: Data collection (since 1950); Development of methodological guidelines and standards in energy statistics (e.g., IRES, ESCM); Capacity building (to disseminate such methodology and to assist countries to strengthen their energy statistical systems); and International cooperation and coordination. UNSD was selected as one of the custodians of indicator 7.2.1 because it collects for all countries the underlying data necessary to calculate the indicator.

4. Other methodological considerations (OTHER_METHOD)

4.a. Rationale (RATIONALE)

The target “By 2030, increase substantially the share of renewable energy in the global energy mix” impacts all three dimensions of sustainable development. Renewable energy technologies represent a major element in strategies for greening economies everywhere in the world and for tackling the critical global problem of climate change. A number of definitions of renewable energy exist; what they have in common is highlighting as renewable all forms of energy that their consumption does not deplete their availability in the future. These include solar, wind, ocean, hydropower, geothermal sources, and bioenergy (in the case of bioenergy, which can be depleted, sources of bioenergy can be replaced within a short to medium-term frame). Importantly, this indicator focuses on the amount of renewable energy actually consumed rather than the capacity for renewable energy production, which cannot always be

fully utilized. By focusing on consumption by the end user, it avoids the distortions caused by the fact that conventional energy sources are subject to significant energy losses along the production chain.

4.b. Comment and limitations (REC_USE_LIM)

- A limitation with existing renewable energy statistics is that they are not able to distinguish whether renewable energy is being sustainably produced. For example, a substantial share of today's renewable energy consumption comes from the use of wood and charcoal by households in the developing world, which sometimes may be associated with unsustainable forestry practices. There are efforts underway to improve the ability to measure the sustainability of bio-energy, although this remains a significant challenge.
- Off-grid renewables data are limited and not sufficiently captured in national and international energy statistics.
- The method of allocation of renewable energy consumption from electricity and heat output assumes that the share of transmission and distribution losses are the same among all technologies. However, this is not always true; for example when renewables are usually located in more remote areas and may incur larger losses.
- Likewise, imports and exports of electricity and heat are assumed to follow the renewable share of electricity and heat generation, respectively. This is a simplification that in many cases will not affect the indicator too much, but that might do so in some cases, for example, when a country only generates electricity from fossil fuels but imports a great share of the electricity it uses from a neighboring country's hydroelectric power plant.
- Methodological challenges associated with defining and measuring renewable energy are more fully described in the Global Tracking Framework (IEA and World Bank, 2013) Chapter 4, Section 1, pages 194-200. Data for traditional use of solid biofuels are generally scarce globally, and developing capacity in tracking such energy use, including developing national-level surveys, is essential for sound global energy tracking.

4.c. Method of computation (DATA_COMP)

This indicator is based on the development of comprehensive energy statistics across supply and demand for all energy sources – statistics used to produce the energy balance. Internationally agreed methodologies for energy statistics are described in the "International Recommendations for Energy Statistics" (IRES), adopted by the UN Statistical Commission, available at: unstats.un.org/unsd/energystats/methodology/ires.

Once an energy balance is developed, the indicator can be calculated by dividing final energy consumption from all renewable sources by total final energy consumption. Renewable energy consumption is derived as the sum of direct final consumption of renewable sources plus the components of electricity and heat consumption estimated to be derived from renewable sources based on generation shares. The indicator is calculated based on the following formula:

$$TFEC_{RES} = \frac{TFEC_{RES} + \left(TFEC_{ELE} \times \frac{ELE_{RES}}{ELE_{TOTAL}}\right) + \left(TFEC_{HEAT} \times \frac{HEAT_{RES}}{HEAT_{TOTAL}}\right)}{TFEC_{TOTAL}}$$

Where:

$TFEC$: Total final energy consumption is the sum of final energy consumption in the transport, industry and other sectors (also equivalent to the total final consumption minus the non-energy use).

ELE: Gross electricity production
$HEAT$: Gross heat production
RES: Renewable energy sources which include hydropower, wind, solar photovoltaic, solar thermal, geothermal, tide/wave/ocean, renewable municipal waste, solid biofuels, liquid biofuels, and biogases.

The denominator is the total final energy consumption of all energy products, while the numerator includes the direct consumption of renewable energy sources plus the final consumption of gross electricity and heat that is estimated to have come from renewable sources. This estimation allocates the amount of electricity and heat consumption to renewable sources based on the share of renewables in gross production in order to perform the calculation at the final energy level. For instance, if total final consumption is 150 TJ for biogas energy, while total final consumption of electricity is 400 TJ and heat 100 TJ, and the share of biogas is 10 percent in electricity output and 5 percent in heat output, the total reported number for biogas consumption will be 195 TJ (150 TJ+400TJ*10%+100TJ*5%).

The Global Tracking Framework Report (IEA and World Bank, 2013) provides more details on the suggested methodology for defining and measuring renewable energy (Chapter 4, Section 1, page 201-202).

4.d. Validation (DATA_VALIDATION)

The IEA has several internal procedures in place for energy data validation. This includes energy balance checks, time series analysis and reconciling differences in statistical classifications and definitions. UNSD also has a number of internal validation procedures to ensure internal data consistency, for instance through energy balance checks, and trend consistency, e.g. by way of time series analysis.

4.e. Adjustments (ADJUSTMENT)

The country specific commodity balances underlying the IEA energy data are based on national energy data of heterogeneous nature converted and adapted to fit the IEA format and methodology. Considerable effort has been made to ensure that the data adhere to the IEA definitions based on the guidelines provided by IRES. Nevertheless, energy statistics at the national level are often collected using criteria and definitions which differ, sometimes considerably, from those of international organisations. This is especially true for non-OECD countries, which are submitting data to the IEA on a voluntary basis. The IEA has identified most of these differences and, where possible, adjusted the data to meet international definitions. For details on recognized country specific anomalies and the corresponding adjustments, please refer to country specific notes included in the IEA World energy balances documentation file available at: wds.iea.org/wds/pdf/WORLDBAL_Documentation.pdf

Likewise, UNSD also needs to adjust certain data to fit the international methodology set by IRES, thus ensuring data comparability across countries. Data from all countries are submitted voluntarily to UNSD, sometimes via non-standard formats or through sharing of national publications. The identification of such deviations from the standard is an ongoing task, and UNSD has started publishing some of this information in a supplement to the Energy Statistics Database named “Notes on sources”, available at: unstats.un.org/unsd/energystats/pubs/yearbook/, with the goal of increasing transparency and providing more and more information with time.

4.f. Treatment of missing values (i) at country level and (ii) at regional level (IMPUTATION)

- **At country level**

The IEA has attempted to provide all the elements of energy balances down to the level of final consumption, for over 150 countries. Providing all the elements of supply, as well as all inputs and outputs of the main transformation activities and final consumption has often required estimations. Estimations have been generally made after consultation with national statistical offices, energy companies, utilities and national energy experts.

Likewise, UNSD attempts to provide full energy balances for the 225 countries and areas it covers, including the 75 or so it covers for SDG reporting. This may require searching for national official publications, data from other international organizations and expert estimation based on reputable sources and other publicly available information. Generally speaking, data on the supply side is more widely available than transformation activities and final consumption.

- **At regional and global levels**

In addition to estimates at a country level, adjustments addressing differences in definitions alongside estimations for informal and/or confidential trade, production or consumption of energy products are sometimes required to complete major aggregates, when key statistics are missing. Such estimations and adjustments implemented by IEA have been generally made after consultation with national statistical offices, energy companies, utilities and national energy experts.

4.g. Regional aggregations (REG_AGG)

Aggregates are calculated, whether by region or global, using final energy consumption as weights.

4.h. Methods and guidance available to countries for the compilation of the data at the national level (DOC_METHOD)

The IEA data corresponding to OECD countries are derived based on information provided in the five fuel-specific annual IEA/Eurostat joint questionnaires completed by the national administrations. These questionnaires are available online at: iea.org/areas-of-work/data-and-statistics/questionnaires The IEA commodity balances for all other countries are based on national energy data of heterogeneous nature, converted and adapted to fit the IEA format and methodology based on IRES recommendations.

In addition to IRES, UNSD has published the *Energy Statistics Compilers Manual* (ESCM - unstats.un.org/unsd/energystats/methodology/escm/) as a practical companion to assist countries in the compilation of data according to the international methodology. UNSD sends countries its own questionnaire (unstats.un.org/unsd/energystats/questionnaire/), except to the countries which are mandated to submit the IEA/Eurostat joint questionnaires. In the latter case, UNSD obtains data from the IEA.

4.i. Quality management (QUALITY_MGMNT)

The IEA, in co-operation with the Statistical Office of the European Communities (Eurostat), has published an Energy Statistics Manual. This Manual helps the energy statisticians have a better grasp of definitions,

units and methodologies. Moreover, IEA has established a quality management framework based on the internationally recognized guidelines recommended by IRES to ensure quality of statistical products.

ESCM contains a full chapter on the Generic Statistical Business Process Model applied to energy statistics, helping countries manage energy data quality. Inside UNSD, processes are established to ensure the quality of its products, and such processes are reviewed periodically.

4.j Quality assurance (QUALITY_ASSURE)

The IEA follows the guidelines recommended by the IRES to ensure relevance, accuracy and reliability, timeliness and punctuality, accessibility and clarity as well as coherence and comparability of the data.

UNSD coordinated input from international organizations and countries to publish IRES and its practical companion, the ESCM. Each of both contains a chapter on quality assurance and metadata to help guide all countries ensure good energy data quality.

4.k Quality assessment (QUALITY_ASSMNT)

The IEA has an extensive data quality validation process through exchange with national data providers worldwide. It also convenes its Energy Statistics Development Group meeting to discuss energy statistics developments with its Members, and cooperates with partners worldwide to ensure coherence of data and methods.

UNSD assesses many quality aspects of the data by means of internal checks, exchanges with national data providers, and comparison with alternative sources.

5. Data availability and disaggregation (COVERAGE)

Data availability:
Between the various existing data sources, primarily the IEA World Energy Balances and the UN Energy Statistics Database, annual total and renewable energy consumption for every country and area can be collected. The Tracking SDG7: The Energy Progress Report (formerly *Sustainable Energy for All Global Tracking Framework*) is reporting this indicator at a global level between 1990 and 2030.

Time series:
2000 – present

Disaggregation:
Disaggregation of the data on consumption of renewable energy, e.g. by resource and end-use sector, could provide insights into other dimensions of the goal, such as affordability and reliability. For solar energy, it may also be of interest to disaggregate between on-grid and off-grid capacity.

6. Comparability / deviation from international standards (COMPARABILITY)

Sources of discrepancies:
The IEA World energy balances and the UN Energy Statistics Database, which provide the underlying data for calculating this indicator, are global databases obtained following harmonised definitions and

comparable methodologies across countries. However, they do not represent an official source for national submissions of the indicator 7.2.1 on renewable energy. Due to possible deviations from IRES in national methodologies, national indicators may differ from the internationally comparable ones. Difference may arise due to different sources of official energy data, dissimilarities in the underlying methodologies, adjustments and estimations.

7. References and Documentation (OTHER_DOC)

URL:
iea.org; unstats.un.org/unsd/energystats

References:
IEA Energy Balances and Statistics
http://www.iea.org/statistics/

UN Energy Statistics Database
unstats.un.org/unsd/energystats/data (description) and data.un.org/Explorer.aspx?d=EDATA (data). Downloadable though API (https://data.un.org/ws). Browse contents on https://data.un.org/SdmxBrowser/start.

IEA SDG 7 webpage: iea.org/reports/sdg7-data-and-projections

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