Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.
Target 7.a: By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
Indicator 7.a.1: International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems.

Institutional information

Organization(s):
Organisation for Economic Co-operation and Development (OECD) and International Renewable Energy Agency (IRENA)

Concepts and definitions

Definition:
The flows are covered through two complementary sources.

OECD: The flows covered by the OECD are defined as all official loans, grants and equity investments received by countries on the DAC List of ODA Recipients from foreign governments and multilateral agencies, for the purpose of clean energy research and development and renewable energy production, including in hybrid systems extracted from the OECD/DAC Creditor Reporting System (CRS) with the following sector codes:

- 23210 Energy generation, renewable sources – multiple technologies - Renewable energy generation programmes that cannot be attributed to one single technology (codes 23220 through 23280 below). Fuelwood/charcoal production should be included under forestry 31261.
- 23220 Hydro-electric power plants - Including energy generating river barges.
- 23230 Solar energy - Including photo-voltaic cells, solar thermal applications and solar heating.
- 23240 Wind energy - Wind energy for water lifting and electric power generation.
- 23250 Marine energy - Including ocean thermal energy conversion, tidal and wave power.
- 23260 Geothermal energy - Use of geothermal energy for generating electric power or directly as heat for agriculture, etc.
- 23270- Biofuel-fired power plants Use of solids and liquids produced from biomass for direct power generation. Also includes biogases from anaerobic fermentation (e.g. landfill gas, sewage sludge gas, fermentation of energy crops and manure) and thermal processes (also known as syngas); waste fired power plants making use of biodegradable municipal waste (household waste and waste from companies and public services that resembles household waste, collected at installations specifically designed for their disposal with recovery of combustible liquids, gases or heat). See code 23360 for non-renewable waste-fired power plants.

Research and development of energy efficiency technologies and measures is captured under CRS sector code 23182 on Energy research. The above flows also include technical assistance provided to support production, research and development as defined above.

IRENA: The flows covered by IRENA are defined as all additional loans, grants and equity investments received by developing countries (defined as countries in developing regions, as listed in the UN M49 composition of regions) from all foreign governments, multilateral agencies and additional development finance institutions (including export credits, where available) for the purpose of clean energy research and development and renewable energy production, including in hybrid systems. These additional flows cover the same technologies and other activities (research and development, technical assistance, etc.) as listed above and exclude all flows extracted from the OECD/DAC CRS.

Rationale:
Total ODA and OOF flows to developing countries quantify the public financial effort (excluding export credits) that donors provide to developing countries for renewable energies. The additional flows (from the IRENA database) capture the flows to non-ODA Recipients in developing regions, flows from countries and institutions not currently reporting to the DAC and certain other types of flows, such as export credits.

Energy access is a major development constraint in many developing countries and, while starting from a relatively low base, energy demand is expected to grow very rapidly in many of these countries in the future. This presents an opportunity for developing countries to utilize clean and renewable technologies to meet their future energy needs if they can gain access to the appropriate technologies and expertise. This indicator provides a suitable measure of the international support given to developing countries to access these technologies.

Concepts:
The definition and classification of renewable technologies complies with the UN Standard International Energy Product Classification (SIEC). Definitions of other concepts are given above.

Comments and limitations:
Data in the Creditor Reporting System are available from 1973. However, the data coverage is considered complete since 1995 for commitments at an activity level and 2002 for disbursements. At present, flows to clean energy research and development are only partially covered by the database and a few other areas (e.g. off-grid electricity supply, investments in improved cookstove projects) may be covered only partially.

The IRENA database currently only covers financial institutions that have invested a total of USD 400 million or more in renewable energy. The process of continuous improvement of the database includes verifying the data against data produced by the multilateral development banks for climate finance reporting and by comparing the data with other independent reporting by international development finance agencies.

Methodology

Computation Method:
The OECD flows are calculated by taking the total official flows (ODA and OOF) from DAC member countries, multilateral organisations and other providers of development assistance to the sectors listed above. The IRENA (additional) flows are calculated by taking the total public investment flows from IRENA's Public Renewable Energy Investment Database and excluding: domestic financial flows;

international flows to countries outside developing regions; and flows reported by OECD (as described above). The flows are measured in current United States Dollars (USD).

Disaggregation:
Data in the CRS contain markers which reflect whether a policy objective is attained through the activity. Measuring gender equality is included in the CRS. Data from the CRS are reported at the project level and can be disaggregated by type of flow (ODA or OOF), by donor, recipient country, type of finance, type of aid (project, agriculture sub-sector, etc.).

Data in IRENA are stored by country (source and recipient) at the project-level, allowing disaggregation of the data in several dimensions. For example, financial flows can be divided by technologies (i.e. bioenergy, geothermal energy, hydropower, ocean energy, solar energy, and wind energy) and sub-technologies (e.g. onshore and offshore wind), by geography (both at the country and regional level), by financial instrument and by type of recipient.

Treatment of missing values:

- At country level

Not applicable - there is no imputation of missing values.

- At regional and global levels

Not applicable - there is no imputation of missing values to obtain regional or global totals.

Regional aggregates:
Regional and global totals are calculated by summing all available data from countries.

Sources of discrepancies:
Neither OECD nor IRENA make estimates of these figures. The data all come from national sources reported to OECD or, in the case of IRENA, from officially published statistics.

Methods and guidance available to countries for the compilation of the data at the national level:
Not applicable.

Quality assurance:
OECD/DAC data are reported by donors according to the same standards and methodologies (see here: http://www.oecd.org/dac/stats/methodology.htm). IRENA data are compiled from national sources following the United Nations Fundamental Principles of Official Statistics: https://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx.

Consultation/validation process with countries for adjustments and estimates
For OECD, see: http://www.oecd.org/dac/stats/methodology.htm

Data Sources

Description:

The OECD/DAC has been collecting data on official and private resource flows from 1960 at an aggregate level and 1973 at an activity level through the Creditor Reporting System (CRS data are considered complete from 1995 for commitments at an activity level and 2002 for disbursements). Data are reported on an annual calendar year basis by statistical reporters in national administrations (aid agencies, Ministries of Foreign Affairs or Finance, etc.

IRENA's data on financial flows from public sources in support of renewable energy are available in IRENA's Public Renewable Energy Investment Database. IRENA collects this data from a wide range of publicly available sources, including the databases and annual reports of all of the main development finance institutions and 20 other bilateral and multilateral agencies investing in renewable energy. The database is updated annually and (at end-2016) covers public renewable energy investment flowing to 29 developed countries and 104 developing countries, for the period 2009-2015. As new publicly-funded financial institutions start investing in renewable energy, the IRENA database will expand to include these new investors over time.

Collection process:
See above.

Data Availability

Description:
The CRS contains flows to all DAC recipient countries. Global and regional figures are based on the sum of ODA and OOF flows to the renewable energy projects.
IRENA currently includes data about renewable energy projects in 29 developed countries and 104 developing countries (133 countries overall).

Time series:
OECD: annual data from 1960 onwards (see above). IRENA: annual data from 2009 onwards.

Calendar

Data collection:
Data for a year is collected during the following year.

Data release:
OECD DAC data is updated four time a year, with complete and detailed data published at year-end (covering the previous year). IRENA investment data is available at year-end (covering the previous year).

Data providers

See above.

Data compilers

Organisation for Economic Co-operation and Development (OECD) and International Renewable Energy Agency (IRENA).

References

CRS: See all links here: http://www.oecd.org/dac/stats/methodology.htm
IRENA Renewable Energy Finance Flows:
http://resourceirena.irena.org/gateway/dashboard/?topic=6&subTopic=8

Related indicators

Not applicable.

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
Target 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services
Indicator 7.1.1: Proportion of population with access to electricity

Institutional information

Organization(s):

World Bank (WB)

Concepts and definitions

Definition:

Proportion of population with access to electricity is the percentage of population with access to electricity.

Rationale:

Access to electricity addresses major critical issues in all the dimensions of sustainable development. The target has a wide range of social and economic impacts, including facilitating development of household-based income generating activities and lightening the burden of household tasks.

Concepts:

Please see method of computation for more details.

Comments and limitations:

While the existing global household survey evidence base provides a good starting point for tracking household energy access, it also presents a number of limitations that will need to be addressed over time. In many parts of the world, the presence of an electricity connection in the household does not necessarily guarantee that the energy supplied is adequate in quality and reliability or affordable in cost and it would be desirable to have fuller information about these critical attributes of the service, which have been highlighted in SDG7.

Substantial progress has already been made toward developing and piloting a new methodology known as the Multi-Tier Framework for Measuring Energy Access (World Bank) which is able to capture these broader dimensions of service quality and would make it possible to go beyond a simple yes/no measure of energy access to a more refined approach that recognizes different levels of energy access, and also takes into account the affordability and reliability of energy access explicitly referenced in the language of SDG7. The methodology for the Multi-Tier Framework for Measuring Energy Access has already been published based on a broad consultative exercise and represents a consensus view across numerous international agencies working in the field. A first Global Energy Access Survey using this methodology has already been launched and is underway expecting to yield results by early 2017. Discussions are also progressing with the World Bank's Household Survey Technical Working Group regarding the mainstreaming of this methodology into the standardized household questionnaire design that will be applied every three years in all low income countries between 2015 and 2030 as part of the broader SDG monitoring exercise.

The adoption of this methodology will allow – over time – the more refined measurement of energy access, making it possible to report more disaggregated information regarding the type of electricity supply (grid or off-grid), the capacity of electricity supply provided (in Watts), the duration of service (daily hours and evening hours), the reliability of service (in terms of number and length of unplanned service interruptions), the quality of service (in terms of voltage fluctuations), as well as affordability and legality of service.

Another advantage of this approach is that they can be applied not only to measuring energy access at the household level, but also its availability to support enterprises and deliver critical community services, such as health and education.

Methodological challenges associated with the measurement of energy access are more fully described the Global Tracking Framework (2013) (Chapter 2, Section 1, page 75-82), and in the ESMAP (2015) Report “Beyond Connections: Energy Access Redefined” both of which are referenced below.

Methodology

Computation Method:

Given the low frequency and the regional distribution of some surveys, a number of countries have gaps in available data. To develop the historical evolution and starting point of electrification rates, a simple modelling approach was adopted to fill in the missing data points - around 1990, 2000, 2010 and 2012. This modelling approach allowed the estimation of electrification rates for 212 countries over these time periods. The SE4ALL Global Tracking Framework Report (2013) referenced below provides more details on the suggested methodology for tracking access to energy (Chapter 2, Section 1, page 82-87).

Disaggregation:

Disaggregation of access to electricity by rural or urban place of residence is possible for all countries.

Treatment of missing values:

- At country level

  Given the low frequency and the regional distribution of some surveys, a number of countries have gaps in available data. To develop the historical evolution and starting point of electrification rates, a simple modeling approach was adopted to fill in the missing data points - around 1990, around 2000, and around 2010. Therefore, a country can have a continuum of zero to three data points. There are 42 countries with zero data point and the weighted regional average was used as an estimate for electrification in each of the data periods. 170 countries have between one and three data points and missing data are estimated by using a model with region, country, and time variables. The model keeps the original observation if data is available for any of the time periods. This modeling approach allowed the estimation of electrification rates for 212 countries over these three time periods (Indicated as "Estimate").

- At regional and global levels

  NA

Regional aggregates:

Global coverage is available through the World Bank Global Electrification Database 2015 and the database SE4ALL Global Tracking Framework (World Bank) referenced below.

Data Sources

Description:

Data for access to electricity are collected entirely from household surveys (and occasionally censuses), tapping into a wide number of different household survey types including: Demographic and Health Surveys (DHS) and Living Standards Measurement Surveys (LSMS), Multi-Indicator Cluster Surveys (MICS), the World Health Survey (WHS), other nationally developed and implemented surveys, including those by various government agencies (for example, ministries of energy and utilities).

The World Bank is the agency that has taken responsibility for compiling a metadatabase of statistics on electricity access harvested from the full global body of household surveys. The World Bank Electrification Database covers more than 180 countries for the period 1990-2012 and is updated regularly.

For more information on compiling access to energy data see Global Tracking Framework report (2013) (Chapter 2, Annex 2, page 127-129).

Data Availability

Data was collected on these indicators for the period 1990-2012 for more than 180 countries worldwide.

Calendar

Data release:

Ongoing

Data providers

NA

Data compilers

World Bank

References

URL:

www.worldbank.org

References:

Global Tracking Framework Report (2013)

http://trackingenergy4all.worldbank.org

Global Tracking Framework Report (2015)

http://trackingenergy4all.worldbank.org/

Global Tracking Framework database (2015)

http://data.worldbank.org/data-catalog/sustainable-energy-for-all

Multi-Tier Framework for Measuring Energy Access

https://www.esmap.org/node/55526

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
Target 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services
Indicator 7.1.2: Proportion of population with primary reliance on clean fuels and technology

Institutional information

Organization(s):

World Health Organization (WHO)

Concepts and definitions

Definition:

Proportion of population with primary reliance on clean fuels and technology is calculated as the number of people using clean fuels and technologies for cooking, heating and lighting divided by total population reporting that any cooking, heating or lighting, expressed as percentage. “Clean” is defined by the emission rate targets and specific fuel recommendations (i.e. against unprocessed coal and kerosene) included in the normative guidance WHO guidelines for indoor air quality: household fuel combustion.

Rationale:

Cooking, lighting and heating represent a large share of household energy use across the low- and middle-income countries. For cooking and heating, households typically rely on solid fuels (such as wood, charcoal, biomass) or kerosene paired with inefficient technologies (e.g. open fires, stoves, space heaters or lamps). It is well known that reliance on such inefficient energy for cooking, heating and lighting is associated with high levels of household (indoor) air pollution. The use of inefficient fuels for cooking alone is estimated to cause over 4 million deaths annually, mainly among women and children. This is more than TB, HIV and malaria combined. These adverse health impacts can be avoided by adopting clean fuels and technologies for all main household energy end-or in some circumstances by adopting advanced combustion cook stoves (i.e. those which achieve the emission rates targets provided by the WHO guidelines) and adopting strict protocols for their safe use. Given the importance of clean and safe household energy use as a human development issue, universal access to energy among the technical practitioner community is currently taken to mean access to both electricity and clean fuels and technologies for cooking, heating and lighting. For this reason, clean cooking forms part of the universal access objective under the UN Secretary General’s Sustainable Energy for All initiative.

Concepts:

Current global data collection focuses on the primary fuel used for cooking, categorized as solid or non-solid fuels, where solid fuels are considered polluting and non-modern, while non-solid fuels are considered clean. This single measure captures a good part of the lack of access to clean cooking fuels, but fails to collect data on type of device or technology is used for cooking, and also fails to capture other polluting forms of energy use in the home such as those used for lighting and heating.

New evidence-based normative guidance from the WHO (i.e. WHO Guidelines for indoor air quality guidelines: household fuel combustion), highlights the importance of addressing both fuel and the technology for adequately protecting public health. These guidelines provide technical recommendations in the form of emissions targets for as to what fuels and technology (stove, lamp, and so on) combinations in the home are clean. These guidelines also recommend against the use of unprocessed coal and discourage the use kerosene (a non-solid but highly polluting fuel) in the home. They also recommend that all major household energy end uses (e.g. cooking, space heating, lighting) use efficient fuels and technology combinations to ensure health benefits.

For this reason, the technical recommendations in the WHO guidelines, access to modern cooking solution in the home will be defined as "access to clean fuels and technologies" rather than "access to non-solid fuels." This shift will help ensure that health and other "nexus" benefits are better counted, and thus realized.

Comments and limitations:

The indicator uses the type of primary fuels and technologies used for cooking, heating, and lighting as a practical surrogate for estimating human exposure to household (indoor) air pollution and its related disease burden, as it is not currently possible to obtain nationally representative samples of indoor concentrations of criteria pollutants, such as fine particulate matter and carbon monoxide. However epidemiological studies provide a science-based evidence for establishing those estimates using these surrogates.
The indicator is based on the main type of fuel and technology used for cooking as cooking occupies the largest share of overall household energy needs. However, many households use more than one type of fuel and stove for cooking and, depending on climatic and geographical conditions, heating with polluting fuels can also be a contributor to household (indoor) air pollution levels. In addition, lighting with kerosene, a very polluting and hazardous fuel is also often used, and in some countries is the main fuel used for cooking.

While the existing global household survey evidence base provides a good starting point for tracking household energy access for cooking fuel, it also presents a number of limitations that will need to be addressed over time. Currently there is a limited amount of available data capturing the type of fuel and devices used in the home for heating and lighting. Accordingly WHO in cooperation with World Bank, and the Global Alliance for Clean Cook stoves, is leading a survey enhancement process with representatives from country statistical offices and national household surveying agencies (e.g. Demographic and Health Survey, Multiple Indicator Cluster Survey, Living Standards Measurement Survey) to better gather efficiently and harmoniously information on the fuels and technologies for cooking, heating and lighting. This process is currently in the piloting phase with expected rollout of the final household surveys questions (~6 questions in total) expected in the coming year. These few questions will replace and slightly expand the current set of questions commonly used on national multipurpose surveys to assess household energy.

Substantial progress has already been made toward developing and piloting a new methodology known as the Multi-Tier Framework for Measuring Energy Access (World Bank) which is able to capture the affordability and reliability of energy access explicitly referenced in the language of SDG7 and harnesses the normative guidance in the WHO guidelines to benchmark tiers of energy access. The methodology for the Multi-Tier Framework for Measuring Energy Access has already been published based on a broad

consultative exercise and represents a consensus view across numerous international agencies working in the field. A first Global Energy Access Survey using this methodology has already been launched and is underway expecting to yield results by early 2017.

Methodology

Computation Method:

The indicator is modelled with household survey data compiled by WHO. The information on cooking fuel use and cooking practices comes from about 800 nationally representative survey and censuses. Survey sources include Demographic and Health Surveys (DHS) and Living Standards Measurement Surveys (LSMS), Multi-Indicator Cluster Surveys (MICS), the World Health Survey (WHS), and other nationally developed and implemented surveys.

Estimates of primary cooking energy for the total, urban and rural population for a given year are obtained separately using a multilevel model. The model only accounts for regions, countries and time as a spline function, and estimates are restricted to values ranging from zero to one. More details on the model are published elsewhere (Bonjour et al, 2013).

Estimates for countries with no available surveys were obtained as follows:

When survey data is available for a country, the regional population- weighted mean is used to derive aggregate estimates at a regional or global level, however no country point estimate is given for that country is reported

Countries classified as high-income with a Gross National Income (GNI) of more than US$ 12,746.- per capita are assumed to have made a complete transition to using clean fuels and technologies as the primary domestic energy source for cooking and the primary reliance on polluting (unclean) fuels and technologies use is reported to be less than 5% and assumed as zero for regional and global estimates.

For estimating the fraction of the population relying on clean fuels and technologies for heating and lighting, the same methodology using survey data to derive country estimates for a particular year will be used using the same above mentioned assumptions.

Disaggregation:

Disaggregated estimates for different end-uses (i.e. cooking, heating and lighting; with expected improvements in household surveys, this will be possible for heating and lighting for all countries.

Disaggregation of access to clean fuel and technologies for cooking by rural or urban place of residence is possible for all countries.

Gender disaggregation by main user (i.e. cook) of cooking energy will be available with expected improvements in household surveys

Gender disaggregation of head of household for cooking, lighting and heating is available

Gender equality

Energy is a service provided at the household, rather than individual level.

Nonetheless, it is used differentially by men and women and has different impacts on their health and well-being. What will be possible, in principle, is to report energy access disaggregated by the main user of cooking energy.

In addition, WHO's Household energy database includes country data from thirty countries on the time spent by children collecting fuelwood and water disaggregated by sex. With the improvements in data collection via the below mentioned survey harmonization process, data will be available reporting time spent exclusively on fuel collection rather than in combination with water collection.

Treatment of missing values:

- At country level

  No reporting for low- and middle-income countries with no data.

  High income countries with no data are assumed to have transitioned to clean fuels and technologies, and are therefore assumed to have >95% of their population using clean fuels and technologies.

- At regional and global levels

  For low- and middle-income countries with no data, population-weighted regional averages estimates are used to derive the regional and global estimates.

  High income countries with no data are assumed to have transitioned to clean fuels and technologies, and are therefore assumed to have >95% of their population using clean fuels and technologies.

Regional aggregates:

Regional and global estimates are population-weighted; i.e. the country estimates (e.g. 56%) is multiplied by its population, this figure is summed (by region or for all countries) and divided by the sum of the population of the countries included.

Sources of discrepancies:

There may be discrepancies between internationally reported and nationally reported figures. The reasons are the following:

- Modelled estimates versus survey data point.

- Use of different definitions of polluting (or previously solid) fuels (wood only or wood and any other biomass, e.g. dung residues; kerosene included or not as polluting fuels).

- Use of different total population estimate

- Estimates are expressed as percentage of population using polluting (or solid) fuels (as per SDG indicator) as compared to percentage of household using polluting (or solid) fuels (as assessed by surveys such as DHS or MICS).

- In the estimates presented here, values above 95% polluting fuel use are reported as “>95%”, and values below 5% as “<5

Data Sources

Primary household fuels and technologies, particularly for cooking, is routinely collected at the national levels in most countries using censuses and surveys. Household surveys used include: United States Agency for International Development (USAID)-supported Demographic and Health Surveys (DHS); United Nations Children’s Fund (UNICEF)-supported Multiple Indicator Cluster Surveys (MICS); WHO-supported World Health Surveys (WHS); and other reliable and nationally representative country surveys.

The World Health Organization is the agency that has taken responsibility for compiling a database of statistics on access to clean and polluting fuels and technologies harvested from the full global body of household surveys for cooking, heating and lighting. Currently, the WHO Database covers cooking energy for 157 countries and one territory for the period 1970-2015 and is updated regularly and publicly available. For lighting, the WHO database includes data for 76 countries for the period 1963-2014. For heating, the WHO database includes data for 16 countries for the period 1986 – 2012.

Presently WHO is working with national surveying agencies, country statistical offices and other stakeholders (e.g. researchers) to enhance multipurpose household survey instruments to gather data on the fuels and technologies used for heating and lighting.

Data Availability

Description:

For cooking fuels, coverage of 157 countries is available through the WHO Global Household Energy Database.

For lighting fuels, the WHO database includes data for 76 countries.

For heating fuels, the WHO database includes data for 16 countries.

Time series:

From 1980 to 2014

Calendar

Data collection:

Summer/Fall 2016.

Data release:

1-May-2017

Data providers

Name:
National Statistical Offices

Description:

National Statistical Offices or any national providers of household surveys and censuses.

Data compilers

WHO, Public health, Social and Environmental Determinants of health Department (PHE).

References

URL:

www.who.int/gho/phe

References:

Global Tracking Framework report (2013)
http://trackingenergy4all.worldbank.org/

Global Tracking Framework Report (2015)
http://trackingenergy4all.worldbank.org/

Global Tracking Framework database (2015)
http://data.worldbank.org/data-catalog/sustainable-energy-for-all

Multi-Tier Framework for Measuring Energy Access,
https://www.esmap.org/node/55526

WHO Guidelines for indoor air quality: Household Fuel Combustion, WHO (2014)
http://www.who.int/indoorair/guidelines/hhfc/en/

Bonjour S, Adair-Rohani H, Wolf J, Bruce NG, Mehta S, Prüss-Ustün A, Lahiff M, Rehfuess EA, Mishra V, Smith KR. Solid Fuel Use for Household Cooking: Country and Regional Estimates for 1980-2010. Environ Health Perspect (2013): .doi:10.1289/ehp.1205987.)

Population using solid fuels meta-data, WHO
http://apps.who.int/gho/indicatorregistry/App_Main/view_indicator.aspx?iid=318

Related indicators

3.9.1:
Mortality rate attributed to household and ambient air pollution

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix
Indicator 7.2.1: Renewable energy share in the total final energy consumption

Institutional information

Organization(s):

International Energy Agency (IEA)

United Nations Statistics Division (UNSD)

United Nations' inter-agency mechanism on energy (UN Energy)

SE4ALL Global Tracking Framework Consortium (SE4ALL Global Tracking Framework Consortium)

Concepts and definitions

Definition:

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

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 resources, 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.

Concepts:

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

Comments with regard to specific renewable energy resources:

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

Comments and limitations:

- 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 is limited and not sufficiently captured in the 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 between all technologies. However, this is not always true because renewables are usually located in more remote areas from consumption centers and may incur larger losses.
- Likewise, imports and exports of electricity and heat are assumed to follow the share of renewability 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 the Global Tracking Framework (2013) Chapter 4, Section 1, page 194-200.

Methodology

Computation Method:

It is calculated by dividing consumption of energy from all renewable sources by total final energy consumption. Renewable energy consumption is derived from three tables of the IEA world energy statistics and balances: total final consumption, electricity output and heat output. All volumes reported in the total final consumption table are taken as reported. Since volumes for electricity and heat in the final consumption table are not broken down by technology, electricity and heat output tables are used instead to break down final consumption of electricity and heat by technology. The allocation by technology is done by deriving the share of technology in electricity and heat output tables and multiplying that share by final energy consumption of electricity and heat, respectively. For instance, if total final consumption table reports 150 TJ for biogas energy, while total final consumption of electricity is 400 TJ and heat 100 TJ, and the share of biogas in total electricity output is 10 percent and 5 percent in heat, the total reported number for biogas consumption will be 195 TJ (150 TJ+400TJ*10%+100TJ*5%). The Global Tracking Framework Report (2013) provides more details on the suggested methodology for defining and measuring renewable energy (Chapter 4, Section 1, page 201-202)

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 grid and off-grid capacity.

Regional aggregates:

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

Data Sources

Data on renewable energy consumption are available through national Energy Balances produced by the International Energy Agency and the United Nations Statistics Division (UNSD) for more than 180 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).

Data Availability

Description:

Between the various existing data sources, primarily the IEA Energy Balances and the UN Energy Statistics Database, annual total and renewable energy consumption for every country and area can be collected. The Sustainable Energy for All Global Tracking Framework is reporting this indicator at a global level between 2010 and 2030.

Time series:

1990-present

Calendar

Data collection:

Data is collected on an annual basis.

Data release:

The IEA Energy Balances are updated early Fall (publishing information for the previous calendar year). The UN energy balances are updated early Spring (publishing information for two calendar years back). (The IEA Energy Balances are updated early Fall (publishing information for the previous calendar year). The UN energy balances are updated early Spring (publishing information for two calendar years back).)

Data providers

National statistical offices

Data compilers

Name:

The IEA and UNSD

Description:

The IEA and UNSD are the primary compilers of national energy balances data. The SE4ALL Global Tracking Framework Consortium combines information from the IEA Energy Balances and the UN Statistics Database in order to calculate this indicator at a global level

References

URL:

worldbank.org; iea.org; unstats.un.org

References:

Global Tracking Framework report (2013)
http://trackingenergy4all.worldbank.org/

Global Tracking Framework Report (2015)
http://trackingenergy4all.worldbank.org/

Global Tracking Framework database (2015)
http://data.worldbank.org/data-catalog/sustainable-energy-for-all

UN Energy Statistics Database
http://unstats.un.org/unsd/energy/edbase.htm

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

IRENA Renewable Energy Database
http://resourceirena.irena.org/gateway/dashboard"

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
Target 7.3: By 2030, double the global rate of improvement in energy efficiency
Indicator 7.3.1: Energy intensity measured in terms of primary energy and GDP

Institutional information

Organization(s):

International Energy Agency (IEA)

United Nations Statistics Division (UNSD)

United Nations' Inter-agency Mechanism on Energy (UN Energy)

SE4ALL Global Tracking Framework Consortium (SE4ALL Global Tracking Framework Consortium)

Concepts and definitions

Definition:
Energy intensity is defined as the energy supplied to the economy pet unit value of economic output.

Rationale:

Energy intensity is an indication of how much energy is used to produce one unit of economic output. It is a proxy of the efficiency with which an economy is able to use energy to produce economic output. A lower ratio indicates that less energy is used to produce one unit of output.

Concepts:

Total energy supply, as defined by the International Recommendations for Energy Statistics (IRES), as made up of production plus net imports minus international marine and aviation bunkers plus-stock changes. Gross Domestic Product (GDP) is the measure of economic output. For international comparison purposes, GDP is measured in constant terms at purchasing power parity

Comments and limitations:

Energy intensity is only an imperfect proxy for energy efficiency. It can be affected by a number of factors, such as climate, structure of the economy, nature of economic activities etc. that are not necessarily linked to pure efficiency.

Methodology

Computation Method:

Energy intensity is obtained by dividing total energy supply over GDP.

Disaggregation:

Disaggregation of energy intensity, e.g. by sector, could provide further insights into progress towards energy efficiency. At present it is only feasible to calculate such sector disaggregations for the following sectors – industry, residential, transport, agriculture, households – as reported in the SE4ALL Global Tracking Framework. It would be desirable, over time, to develop more refined sectoral level energy intensity indicators that make it possible to look at energy intensity by industry (e.g. cement, steel) or by type of vehicle (e.g. cars, trucks), for example. Doing so will not be possible without statistical collaboration with the relevant energy consuming sectors.

Decomposition analysis of energy intensity trends seeks to filter out factors that affect energy demand, such as economy wide scale and structure shifts, from more narrowly defined energy intensity shifts. The methodology applies decomposition analysis to isolate a more refined measure of energy intensity, one that sifts out the temporal shift of relative sector weights. This analysis is also reported in the SE4ALL Global Tracking Framework.

Regional aggregates:

Aggregates are calculated, whether by region or global, using total energy supply as weights.

Data Sources

Total energy supply is typically calculated in the making of national energy balances. Energy balances are available for larger economies from the International Energy Agency (IEA) and for all countries in the world from the United Nations Statistics Division (UNSD).

Data Availability

Description:

IEA and UN energy balances combined provide total energy supply data for all countries on an annual basis. GDP data is available for all countries on an annual basis.

Time series:

1990-present

Calendar

Data collection:

Data is collected on an annual basis.

Data release:

The IEA Energy Balances are updated early Fall (publishing information for two calendar years prior). The UN energy balances are made available towards the end of the calendar year (publishing information for two calendar years prior) (The IEA Energy Balances are updated early Fall (publishing information for two calendar years prior). The UN energy balances are made available towards the end of the calendar year (publishing information for two calendar years prior)

Data providers

National statistical offices

Data compilers

Name:

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

Description:

The IEA and UNSD are the primary compilers of national energy balances data. The SE4ALL Global Tracking Framework Consortium combines information from the IEA Energy Balances and the UN Statistics Database.

References

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IEA Energy Balances and Statistics
http://www.iea.org/statistics/topics/energybalances/"