WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

The Global Energy Architecture Performance Index 2017: Methodological Addendum

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1. Context

Since 2011, the World Economic Forum has been working on the New Energy Architecture (NEA) initiative in collaboration with Accenture to better understand the changes underway in the global energy system, and how to enable the transition to a more affordable, sustainable and secure energy architecture. A core part of this work has been the development of the Energy Architecture Performance Index (EAPI).

A core principle behind the EAPI is to provide open access to the methodology, metadata and sources used in a transparent manner (as far as this is possible from a data confidentiality perspective). The aim of this document is to provide further detail on the methodology behind the EAPI for all relevant stakeholders to access, to deepen their understanding of the index.

2. Definition and framework

The Forum's global indexes are tools that inform and support policy-making, decision-making and communication efforts on a wide range of issues. Like every global index produced by the Forum, **the EAPI is a composite indicator**, as defined by the Organisation for Economic Cooperation and Development (OECD) and the Joint Research Centre of the European Commission in their *Handbook on Constructing Composite Indicators*.[1]

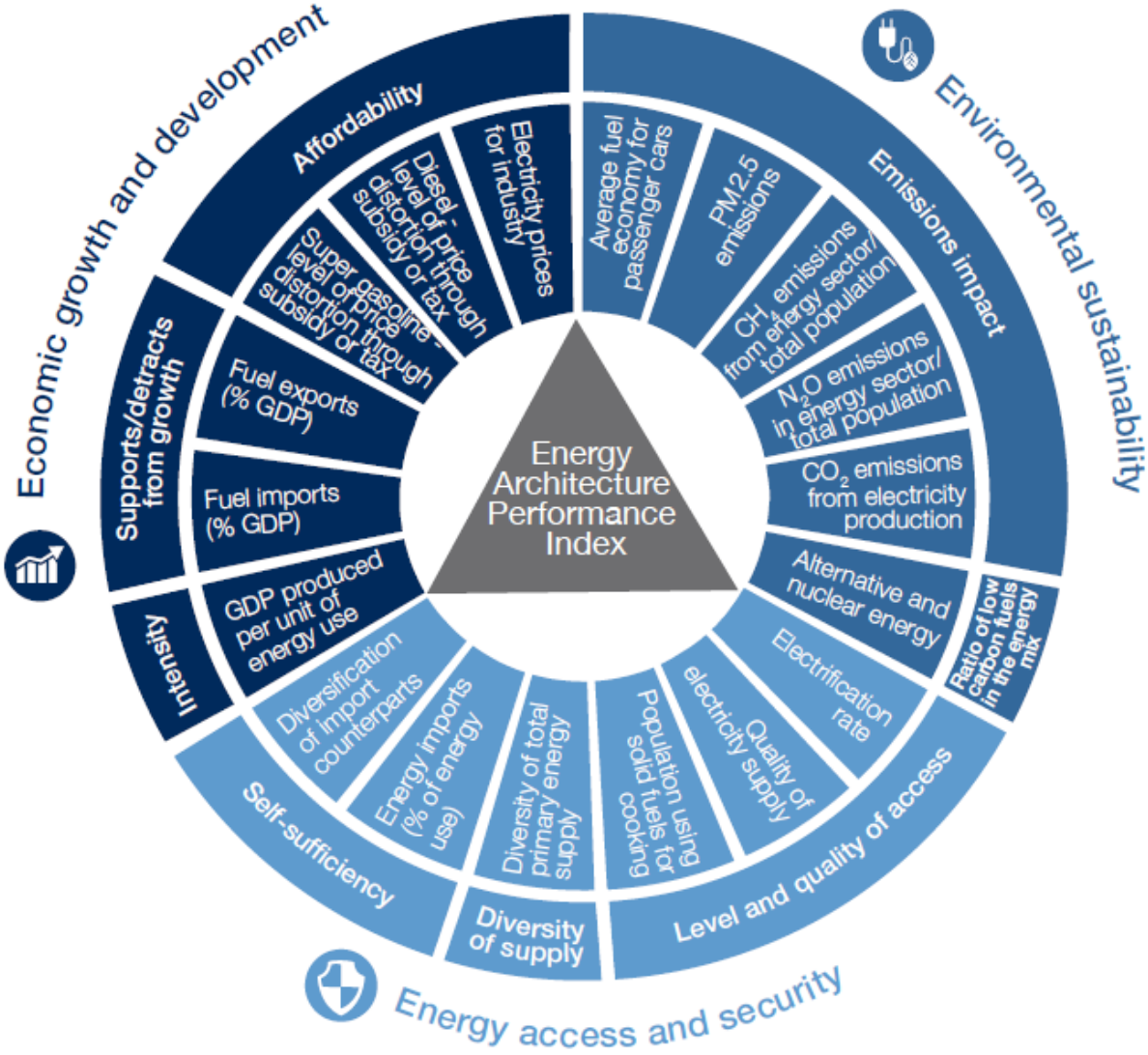
A composite indicator, or index, is a compilation of individual indicators into a single indicator on the basis of an underlying framework. Composite indicators are used to measure and compare the performance of countries and other geographic entities (e.g. regions) on a specific concept.

The EAPI measures and compares the energy system performance of different countries based on 18 indicators across three sub-indices (or "baskets"), corresponding to the three imperatives of the energy triangle (Figure 1):

1. **Economic growth and development:** this sub-index measures the extent to which a country's energy architecture adds or detracts from economic growth and development *(six indicators)*.
2. **Environmental sustainability:** this sub-index measures the environmental impact of energy supply and consumption within a country's energy architecture *(six indicators)*.
3. **Energy access and security:** this sub-index measures the extent to which a country's energy supply is secure, accessible and diversified *(six indicators)*.

[1] OECD (2008) *Handbook on Constructing Composite Indicators, Methodology and User Guide*.

Figure 1 – The Energy Architecture Performance Index



3. Indicators: selection criteria and profiles

The EAPI tracks output-oriented indicators to measure the energy system performance of different countries. The distinction between "input" and "output" indicators is critical. Input indicators measure human or financial resources specifically deployed for a particular energy project or programme, whereas output indicators measure the quantity of energy-related goods or services produced and the efficiency of energy production.

All 18 EAPI indicators were selected against the following key principles:

- **Use of only output data** – measuring either output-oriented observational data (with a specific, definable relationship to the sub-index in question) or a best available proxy, rather than estimates.
- **Reliability** – utilizing reliable source data from renowned institutions.
- **Reusability** – sourcing data from the same providers on an annual basis, thus facilitating updates of the data.
- **Quality** – selecting data that represents the best measure available, given constraints.
- **Completeness** – using data of adequate global and temporal coverage: data has been consistently treated and checked for periodicity to ensure the EAPI's future sustainability.

Table 1 provides details for each of the selected indicators, including the energy system objective it contributes to (either positively or negatively), what it measures and the weight attributed to individual indicators within each basket (or sub-index).

It should be noted that the current set of indicators the EAPI measures is by no means definitive, as the methodology could evolve to include and exclude certain components.

4. Aggregation of individual indicators: overview

The computation of a composite indicator like the EAPI involves multiple levels of aggregation. The overall EAPI score (i.e. the most aggregated level) for an individual country is the result of an aggregation of values from the three sub-indices, which themselves consist of an aggregation of underlying values from across each of their six indicators.

A set of normalization methods are applied to individual indicators in order to aggregate them – these include min-max, standardization and percentile rankings. To ensure the index produces policy-relevant insights and rankings, any targets used are derived from accepted policy documentation or expert judgements.

When an indicator is missing data for a particular year, the latest available data point is used to avoid extrapolation. A country is included in the final list of countries if it has no more than three missing data points in total, with no more than one missing data point across each of the three sides of the energy triangle.

Of course, reality and the statistics that represent it cannot be assumed to converge in perfect harmony, and the statistical results of the analysis need to be set in context in order to generate a better understanding of real-world situations.

Table 1 – Indicator profiles

Energy system objective	Measure (of)	Indicator name	Indicator weight
Economic growth and development	Intensity	Energy intensity (GDP per unit of energy use (PPP US$ per kg of oil equivalent))	0.25
	Supports/detracts from growth	Cost of energy imports (% GDP)	0.125
		Value of energy exports (% GDP)	0.125
	Affordability	Degree of artificial distortion to gasoline pricing (index)	0.125
		Degree of artificial distortion to diesel pricing (index)	0.125
		Electricity prices for industry (US$ per kilowatt-hour)	0.25
Environmental sustainability	Ratio of low-carbon fuel sources in the energy mix	Alternative and nuclear energy (% of total energy use, incl. biomass)	0.2
	Emissions impact	CO_2 emissions from electricity production, total/kWh	0.2
		Methane emissions in energy sector (thousand metric tonnes of CO_2 equivalent)/total population	0.1
		Nitrous oxide emissions in energy sector (thousand metric tonnes of CO_2 equivalent)/total population	0.1
		PM2.5, country level (micrograms per cubic metre)	0.2
		Average fuel economy for passenger cars (l/100 km)	0.2
Energy access and security	Level and quality of access	Electrification rate (% of population)	0.2
		Quality of electricity supply (1-7)	0.2
		Percentage of population using solid fuels for cooking (%)	0.2
	Diversity of supply	Diversity of total primary energy supply (Herfindahl index)	0.2 / 0.1[2]
	Self-sufficiency	Import dependence (energy imports, net % energy use)	0.2
		Diversification of import counterparts (Herfindahl index)	0 / 0.1[3]

[2] For the indicator on diversity of total primary energy supply, net exporters are given a weighting of 0.2 (since they are not scored for the indicator on diversification of import counterparts), whereas net importers are given a weighting of 0.125 to form a mini-index for diversity of supply.
[3] The indicator on diversification of import counterparts only applies to net importers: for these countries, a weighting of 0.125 is used (for net exporters, a weighting of 0 is used).

5. Weighting: approach and rationale

Within the overall aggregated EAPI score, each of the scores across each of the three baskets receives equal priority and weighting. This reflects the fundamental principles that the imperatives of the energy triangle are of mutual importance and are interlinked. To bring greater balance to the energy triangle and enable an effective transition to a new energy architecture, it is important that policy-makers look to the long term, providing a more stable policy environment based on an in-depth understanding of the trade-offs they are making. Where possible, decision-makers should aim to take actions that result in positive net benefits for all three of the energy triangle's imperatives.

Within each sub-index, each indicator is allocated an equal weight (Table 1), with the exception of the following indicators:

- **Economic growth and development:** the super gasoline and diesel indicators combine to form a mini-index within the economic growth and development basket; this mini-index is allocated equal weighting with the other indicators. Within the same basket, the indicators for fuel imports and exports as a share of GDP are also combined to form a mini-index, which is also allocated equal weighting with the other indicators.
- **Environmental sustainability:** the nitrous oxide emissions and methane emissions indicators are combined to form a mini-index within the environmental sustainability basket; this mini-index is allocated equal weighting with the other indicators.
- **Energy security and access:** the score for the energy imports indicator (for countries that are net importers) is combined with the score for the diversification of import counterparts indicator to form a mini-index, which is allocated equal weighting with the other indicators.

Indicators that correlate closely, or do not apply to certain countries, or run orthogonally to each other, are diluted to prevent double-counting of scores.

6. Methodology reviews

2017 Methodology review

Minor adjustments were made to the methodology:

- **Normalization**: Minor adjustments have been made in normalization scores.
- **Extreme values removed**: For example, the electricity price for Italy has been removed following reviews of PX-Web databases of ENEL, the Italian electricity company.

2016 Methodology review

As part of 2016 updates to the EAPI, minor adjustments were made to reflect issues such as discontinuation of data and improvements to the model. The key adjustments were:

- **PM10 replaced by PM2.5**: The model was altered to include PM2.5 instead of PM10 as a result of improvement to the methodology, since PM2.5 is a more serious health concern than PM10. Smaller particles6 can travel more deeply into a person's lungs and cause more harmful effects.
- **Fuel prices distortion**: The distortion formula was adjusted to be based on a fixed range around the optimal price, thereby excluding outliers that were previously included in the data set. As a consequence, countries that offer highly subsidized fuels or highly taxed fuels are "penalized" more.
- **Change in data source for "Population using solid fuels":** Data was sourced from the World Bank, the Sustainable Energy for All (SE4ALL) database from the World Health

Organization, and the Global Household Energy database (instead of the UN Statistics Division of The Millennium Development Goals Database). However, the differences were limited (± 5%).

- **Normalization:** Minor adjustments were made in normalization scores.
- **Extreme values removed:** The electricity price for Italy and N2O emissions for Finland were removed following reviews of PX-Web databases of ENEL, the Italian electricity company, and of Statistics Finland.

2014/2015 Methodology review

As part of the 2014/2015 updates to the EAPI, the model was been recalibrated, and the normalization approach for PM10 and weightings for some of the indicators were revised. This recalibration represented an improvement to the EAPI model and did not affect the key messages from the previous year's report. Due to the recalibration, comparisons with previous editions of the EAPI were not presented in the 2015 Global Energy Architecture Performance Report.

2013/2014 Methodology review

Following the launch of the EAPI 2013, a review process was initiated in 2013/2014 to identify areas for improvement within the index methodology and identify new, pertinent data sets. Interviews with members of the Expert Panel and other relevant stakeholders highlighted the following areas:

- **Adjustment to the indicator for monitoring CO_2 emissions.** In the first edition of the EAPI, the CO_2 emissions indicator used total CO_2 emissions from electricity and heat production to derive a per capita measure. Using a per capita denominator for emissions, however, could distort a country's emissions data by basing it on population size. The new indicator for CO_2 emissions calculates a score based on the total CO_2 emissions from electricity generation per kWh produced. This alternative indicator reflects a country's power-generating mix and contribution to GHG emissions, and supports the debate on the climate implications of a transition to cleaner and more efficient sources of power.

- **Inclusion of a new indicator monitoring methane emissions.** According to the IEA analysis "Redrawing the Energy-Climate Map", the energy sector was responsible for 3.1 gigatons (Gt) of carbon dioxide-equivalent methane emissions, making it the second-largest contributing sector. Energy-sector methane emissions are primarily due to inefficiencies in the upstream practices of flaring and venting. Policies and industry regulation to lower methane emissions could significantly contribute to reaching the climate goal of limiting temperature increase to 2°C through 2020.

- **Inclusion of a new indicator to monitor diversity in counterparts.** A country's energy security can be defined by its supply of natural resources. However, some importing countries have been more or less able to establish themselves within the global or regional energy trade market, affecting the security of their energy supply. Their security may be comparatively at risk depending on the number of trade partners they rely on and how their energy demands are spread among the partners. Using the Herfidhal index methodology, the model assigns a score based on the number of trade partners of each importing country, and the spread of import quantities across these partners.

No changes were made to the overall aggregation methodology for the index.

7. EAPI 2017 - Indicator Metadata

EAPI Indicator	Rationale	Latest data	Sources	Time series	Full description	URL	Technical notes
GDP per unit of energy use *(PPP $ per kg of oil equivalent)*	Provides an indication of the efficiency of energy use, and whether there is an opportunity to improve energy availability by reducing energy intensity.	2014	World Bank and International Energy Agency	1980 - 2011/ 2014	Energy use per PPP GDP is the kilogram of oil equivalent of energy use per constant PPP GDP. • **Energy use** refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport. • **PPP GDP** is gross domestic product converted to 2005 constant international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as a dollar has in the United States.	http://data.worldbank.org/indicator/EG.GDP.PUSE.KO.PP.KD	No specific target for energy intensity. The Kyoto Protocol sets targets for total greenhouse gas emissions for Annex I (developed) countries. European Council for an Energy Efficient Economy recommends 20% reductions by 2020 in energy intensity across many Eurozone countries, but not universally. *Low threshold - lowest performance* *High threshold - excludes 2.5 percentile*
Fuel imports *(% GDP, adjusted for LCU)*	Provides an indication of the extent to which the energy sector has a negative impact on growth. Import bill is calculated based on the import of fuels (mineral fuels, lubricants and related materials) as classified under the Standard International Trade Classification, Revision 3, Eurostat.	2014	World Trade Organisation and World Bank	1980 - 2014	Fuel imports, US$ at current prices. • **Fuel imports** include mineral fuels, lubricants and related materials as classified under the Standard International Trade Classification, Revision 3, Eurostat. • **GDP** is the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports, calculated using today's dollar value.	http://data.worldbank.org/indicator/NY.GDP.MKTP.CD http://stat.wto.org/StatisticalProgram/WSDBStatProgramTechNotes.aspx?Language=E#Def_Meth_Com	No data available for target setting. The low performance distribution threshold is based on the lowest performance value for 2014. The target value excludes 2.5 percentile.
Fuel exports *(% GDP)*	Provides an indication of the extent to which the energy sector has a positive impact on growth. Export bill is calculated based on the export of fuels (mineral fuels, lubricants and related materials) as classified under the Standard International Trade Classification, Revision 3, Eurostat.	2014	World Trade Organisation and World Bank	1980 - 2014	Fuel exports, US$ at current prices. • **Fuel exports** include mineral fuels, lubricants and related materials as classified under the Standard International Trade Classification, Revision 3, Eurostat. • **GDP** is the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports, calculated using today's dollar value.	http://data.worldbank.org/indicator/NY.GDP.MKTP.CD http://stat.wto.org/StatisticalProgram/WSDBStatProgramTechNotes.aspx?Language=E#Def_Meth_Com	No data available for target setting. The low performance distribution threshold is based on the lowest performance value for 2014. The target value excludes 2.5 percentile. *The inclusion of this indicator was frequently debated by the team, given the well-understood effects of indirect deindustrialization, the symptoms of which include the decline in productivity of national manufacturing sectors due to the currency strengthening effect of natural resource endowment and exploitation, and the following shift of labour resources away from the non-tradable goods sectors. However, given the EAPI's strict focus on country energy architecture and, within this basket, the contribution of energy to GDP, it was felt that on an overall global basis, revenues from fossil fuel endowments contributed to country GDP, especially when successful boom minimization structures (e.g. investment into sovereign wealth funds, stabilizing the powerful revenue stream) were used to reduce the risk of Dutch disease and drive competitiveness through investment in education and infrastructure programmes.*

EAPI Indicator	Rationale	Latest data	Sources	Time series	Full description	URL	Technical notes
Super gasoline - level of price distortion through subsidy or tax (Index 0 -1)	Fuel subsidies are a burden on country economies and encourage wasteful fuel use. Aligning fossil fuel pricing with world market price would clearly foster greater economic and energy efficiency, reducing the burden on country finances. Fossil fuel taxation is powerful a revenue tool for, most notably, the transport sector. But too high taxation burdens the consumer and drives inflation as costs rise for transporting goods around a country, and revenue generated from taxation may be elastic over the long-term as consumers adjust their consumption in light of higher prices. We therefore propose that a high tax rate (within the 4th quartile) is the optimal pricing mechanism for driving economic growth, on a global basis and excluding consideration of other externalities associated to fossil fuel consumption.	2014	GIZ (Gesellschaft für Internationale Zusammenarbeit), the German development agency	2004 - 2014	Price per litre of super gasoline in US cents. All prices relate to November 2012 data. Prices reflect Brent crude price of $110 per barrel (reference day 16 to 18 November 2012). All pricing data related to GIZ database. Score derived from the level of a country's deviation from a threshold price, set as the threshold point between high taxation and very high taxation per fossil fuel per year. These boundaries are defined by GIZ in its International Fuel Prices report. A very high subsidy equates with a retail price of gasoline and diesel below price of crude oil on world market. A subsidy is indicated by a price of gasoline and diesel above the price of crude oil on the world market and below the price level of the United States. Cost-covering retail prices incl. industry margin, VAT and incl. approx. $0.10. This fuel price without other specific fuel taxes may be considered as the international minimum benchmark for a non-subsidized fuel. Taxation is indicated by a price of gasoline and diesel above price level of the United States and below price level of Spain/Luxembourg (in November 2012fuel prices were the lowest in EU15). Prices in EU countries are subject to VAT, specific fuel taxes as well as other country-specific duties and taxes. Very high taxation is indicated by a retail price of gasoline and diesel above the price level of Spain/Luxembourg. At these levels, countries are effectively using taxes to generate revenues and to encourage energy efficiency in the transport sector.	*n/a – provided by GIZ*	The low performance distribution threshold is based on the lowest performance value for 2014: 0. The target value is 1.
Diesel-level of price distortion through subsidy or tax (Index 0 -1)	*As above*	2014	GIZ (Gesellschaft für Internationale Zusammenarbeit), the German development agency	2004 - 2014	Price per litre of diesel in US cents. All prices relate to Nov. 2012 data. Prices reflect Brent crude price of $110 per barrel. All pricing data related to GIZ database. Score derived from level of a country's deviation from a threshold price, set as the median point in the very high taxation boundary per fossil fuel, per year. For more information regarding thresholds and median point calculations, see above.	*n/a – provided by GIZ*	The low performance distribution threshold is based on the lowest performance value for 2014: 0. The target value is 1.
Electricity prices for industry (US $ per kilowatt hour)	Energy consumption is strongly correlated to GDP, and lower energy prices are key drivers of economic growth, with electrical generation and other energy efficiencies good proxies for the Solow residual, describing technological progress. We therefore utilise this data as an indicator of low energy prices having a positive impact on growth. Subsidy data is unavailable across this data point, meaning that electricity prices must be assumed to be the product of a liberal energy market pricing mechanism at an aggregate level though, in reality, a larger portion of some countries' bills may be determined by political or regulatory decisions warranting subsidy, and a smaller share depending on the actual supply and demand.	2015	Energy Information Administration, Monthly Energy Review, May 2010, Table 9.9. Other Countries -- International Energy Agency, Energy Prices & Taxes - Quarterly Statistics, Fourth Quarter 2009, Part II, Section D, Table 22, and Part III, Section B, Table 19, 2008 and IEA 2013 *(OECD countries only)*	2001 - 2015	Energy end-use prices including taxes, converted using exchange rates. Price includes state and local taxes, energy or demand charges, customer service charges, environmental surcharges, franchise fees, fuel adjustments, and other miscellaneous charges applied to end-use customers during normal billing operations. Prices do not include deferred charges, credits or other adjustments, such as fuel or revenue from purchased power, from previous reporting periods. *NA = Not available* *Nota: The Paris-based International Energy Agency (IEA) maintains annual and quarterly time series of this price data that begin with the year 1978 and that also include the most recent quarterly prices. Information on purchasing this data online from the IEA is available at: http://data.iea.org/ieastore/default.asp.*	http://www.eia.gov/countries/prices/electricity_industry.cfm Other data provided by IEA	No specific targets available. The low performance distribution threshold is based on the lowest performance value. The target value is based on the highest performance value.
Alternative and nuclear energy (% of total energy use, incl. biomass)	Alternative and nuclear energy production reduces reliance on fossil fuels, which produce greenhouse gases and pollute the atmosphere. Inclusion of this indicator supposes that nuclear energy is also environmentally preferable to fossil fuel usage given the higher volume of negative environmental externalities associated with fossil fuel mining, power production and	2014	International Energy Agency	1980 - 2014	Alternative energy includes hydropower and nuclear, geothermal, biomass and solar power, among others.	n/a – provided by IEA	The low performance distribution threshold is based on the lowest performance value for 2014. The target value is based on expert opinion, stipulating that an energy system 100% reliant on alternative and nuclear energy represents the ideal.

EAPI Indicator	Rationale	Latest data	Sources	Time series	Full description	URL	Technical notes
	emissions.						
CO_2 emissions from electricity production (total / kWh)	Carbon dioxide emissions from electricity and energy production contribute to climate change and ensuing environmental degradation.	2013	International Energy Agency	2000 - 2013	"CO_2 emissions from electricity and heat production" is the sum of three IEA categories of CO_2 emissions: (1) Main Activity Producer Electricity and Heat which contains the sum of emissions from main activity producer electricity generation, combined heat and power generation and heat plants. Main activity producers (formerly known as public utilities) are defined as those undertakings whose primary activity is to supply the public. They may be publicly or privately owned. This corresponds to IPCC Source/Sink Category 1 A 1 a. For the CO_2 emissions from fuel combustion (summary) file, emissions from own on-site use of fuel in power plants (EPOWERPLT) are also included. (2) Unallocated Autoproducers – this contains the emissions from the generation of electricity and/or heat by autoproducers. Autoproducers are defined as undertakings that generate electricity and/or heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned. In the 1996 IPCC Guidelines, these emissions would normally be distributed between industry, transport and "other" sectors. (3) Other Energy Industries contains emissions from fuel combusted in petroleum refineries, for the manufacture of solid fuels, coal mining, oil and gas extraction and other energy-producing industries. This corresponds to the IPCC Source/Sink Categories 1 A 1 b and 1 A 1 c. According to the 1996 IPCC Guidelines, emissions from coke inputs to blast furnaces can either be counted here or in the Industrial Processes source/sink category. Within detailed sectoral calculations, certain non-energy processes can be distinguished. In the reduction of iron in a blast furnace through the combustion of coke, the primary purpose of the coke oxidation is to produce pig iron and the emissions can be considered as an industrial process.	http://www.iea.org/publications/freepublications/publication/co2emissionsfromfuelcombustionhighlights2013.pdf	The target value of 0 represents the ideal state of CO_2 emissions from electricity. The low performance distribution excludes 2.5 percentile.
Nitrous-oxide emissions in energy sector (thousand metric tons of CO_2 equivalent / Total population)	Nitrous oxide is both an ozone-depleting compound and greenhouse gas, and is now the largest ozone-depleting substance emitted through human activities. It is one of a group of highly reactive nitrogen oxides (NOx). NO2 forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO2 is linked with a number of adverse effects on the respiratory system.	2012	International Energy Agency, World Bank	1990 - 2012	Energy processes produce nitrous-oxide emissions through the combustion of fossil fuels and biofuels.	http://data.worldbank.org/indicator/EN.ATM.NOXE.EI.ZS	No universal targets applicable. The low performance distribution threshold is based on the lowest performance value for 20132 The target value is 0% of total emissions.
Methane emissions from energy sector (thousand metric tons of CO_2 equivalent)/ total population)	The energy sector contributes to 40% of global methane emissions.	2012	International Energy Agency, World Bank	1990-2012	Methane emissions from energy processes are emissions from the production, handling, transmission, and combustion of fossil fuels and biofuels.	http://data.worldbank.org/indicator/EN.ATM.METH.EG.KT.CE	No universal targets applicable. The low performance distribution threshold is based on the lowest performance value for 2012. The target value is 0% of total emissions.

EAPI Indicator	Rationale	Latest data	Sources	Time series	Full description	URL	Technical notes
PM2.5, country level (micrograms per cubic meter)	Suspended particulates contribute to acute lower respiratory infections and other diseases such as cancer. Finer particulates lodge deep in lung tissue, causing greater damage than coarser particulates. Annual average concentrations of greater than 2.5 micro---grams per cubic meter are known to be injurious to human health.	2013	World Bank*	1990 - 2013	Population-weighted exposure to ambient PM2.5 pollution is defined as the average level of exposure of a nation's population to concentrations of suspended particles measuring less than 2.5 microns in aerodynamic diameter, which are capable of penetrating deep into the respiratory tract and causing severe health damage. Exposure is calculated by weighting mean annual concentrations of PM2.5 by population in both urban and rural areas.	http://data.worldbank.org/indicator/EN.ATM.PM25.MC.M3	The target value of 60 is based on the 60 µg/m^3 annual mean stipulated by the World Health Organisation's recommendations.
Average fuel economy for passenger cars (l/100km)	The transport sector is one of the most important areas requiring attention in improving environmental sustainability. Over 50% of oil use around the world is for transport, and nearly all the recent and future expected growth in that use comes from increased transport activity (IEA). Fuel efficiency directly affects emissions causing pollution by affecting the amount of fuel used, Measuring the average litres of gasoline equivalent used per hundred km driven indicates the efficiency of a country's transport system. Passenger cars in this instance stand as proxy for the transport sector.	2013/14	International Energy Agency	1990 – 2013/14	Measure of the average litres of gasoline equivalent used per hundred kilometres driven, indicating the efficiency of a country's transport system. Passenger cars in this instance need to stand as proxy for the entire transport sector, given the paucity of global data across this indicator for both light-duty and heavy-duty vehicle fleets.	n/a – provided by IEA	In its 2007 review of the EU CO_2 and cars strategy, the European Commission announced that the EU objective of 120 g CO_2/km (5.2 l/100 km or 45.6 mpg) by 2012 must be met. A resolution was formally adopted to enforce mandatory fuel efficiency standards of 120 g/km (5.2 l/100 km or 45.6 mpg), with carmakers achieving 130 g/km (5.6 l/100 km or 42 mpg) through technical improvements and the remaining 10 g/km coming from complementary measures (e.g. efficient tyres and air-conditioners, tyre pressure monitoring systems, gear shift indicators, improvements in light-duty vehicles, and increased use of biofuels). Thus, the target value of 5.2 l/100 km represents the EU target. The low performance distribution threshold is based on the lowest performance values from the 2013 data range.
Electrification rate (%)	Over the last few years, there has been international focus on the issue of access to energy. High global energy and food prices have shown the impact on both the global economy and the world's poor. In addition to the UN General Assembly adopting 'Sustainable Energy for All' as an annual theme, the UN Advisory Group on Energy and Climate Change has called for the adoption of a goal of universal access to modern energy services by 2030.	2012	World Bank Global Electrification Database 2012	2000 - 2012	Data for access to electricity are collected among different sources: mostly data from nationally representative household surveys (including national censuses) were used. Survey sources include 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, and various government agencies (for example, ministries of energy and utilities). 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, 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 modelling approach allowed the estimation of electrification rates for 212 countries over these three time periods (Indicated as "Estimate"). Notation "Assumption" refers to the assumption of universal access in countries classified as developed by the United Nations.	http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=sustainable-energy-for-all	United Nations Secretary-General Ban Ki-moon's Advisory Group on Energy and Climate Change stipulated a target to achieve universal access to modern energy services by 2030. The EAPI has therefore set a target of 100% for this indicator. The target value represents the ideal state of country-level electrification rates. The low performance distribution threshold is based on the lowest performance values from the 202 data range.

EAPI Indicator	Rationale	Latest data	Sources	Time series	Full description	URL	Technical notes
Quality of electricity supply (1-7)	Survey response to: "*How would you assess the quality of the electricity supply in your country (lack of interruptions and lack of voltage fluctuations)?*" [1 = insufficient and suffers frequent interruptions; 7 = sufficient and reliable]	2015/16	World Economic Forum, Global Competitiveness Index	2005 - 2015/16	Survey response to: *"How would you assess the quality of the electricity supply in your country (lack of interruptions and lack of voltage fluctuations)?*" [1 = insufficient and suffers frequent interruptions; 7 = sufficient and reliable]	www.weforum.org/issues/global-competitiveness	No specific targets available due to qualitative nature of data range. The low performance distribution threshold is based on the lowest performance value for 2015/16. A weighted average is used for data from the years 2015 and 2016. The target value is based on the highest performance value for 2015/16.
Percentage of population using solid fuels for cooking (%)	The number of people who use traditional biomass, such as wood and manure, is projected to rise from 2.7 billion today, to 2.8 billion in 2030. According to estimates from the World Health Organization (WHO) and IEA it is estimated that household air pollution from the use of these traditional sources of biomass in stoves with inadequate ventilation would lead to over 1.5 million premature deaths per year in 2030. Combatting this problem will mean universal access to clean cooking facilities for 2.8 billion people with additional cumulative investment of some USD 56 billion required in the next 20 years, or USD 2.6 billion every year (IEA).	2012	Millennium Development Goals Database Source: United Nations Statistics Division The Millennium Development Goals Database presents official data for more than 60 indicators to measure progress towards the Millennium Development Goals.	1990 - 2012	Solid fuel information is either extrapolated (single year data point), averaged (two or more years that are spaced four or fewer years apart) or a linear regression is performed when solid fuel use information is available for two or more years that are spaced at least five years apart. All countries with a gross national income (GNI) per capita above $10,500 and for which no survey data is available are assumed to have made a complete transition to using non-solid fuels as the primary source of domestic energy for cooking and heating.	http://mdgs.un.org/unsd/mdg/	This indicator correlates highly with GDP levels. For literature relating to targets, the EAPI focused its analysis on developing country policy targets to reflect the status quo. The Forum of Energy Ministers of Africa has committed to providing access to modern cooking energy to 50% of the rural poor. In 2005, the Economic Community of West African States (ECOWAS) committed to providing modern cooking energy to 100% of the rural population (corresponding to more than 300 million people). The UN pledge is “sustainable energy for all”. The EAPI has therefore set a target of less than 5% for this indicator. The target value represents the ideal state of country level electrification rates (a score of <5% being the highest score historically). The low performance distribution threshold is based on the lowest performance values from the 2010 data range.
Energy imports, net (% of energy use)	The security of a country’s primary energy supplies may be threatened if it is reliant on a high proportion of imports (especially if these are concentrated among relatively few trade partners). A high import ratio within a country’s total percentage of energy used indicates an exposure to supply shocks and price spikes in commodities, and risks stemming from political decisions that might restrict trade with energy suppliers.	2014	World Bank (International Energy Agency and United Nations, Energy Statistics Yearbook.)	1980 - 2014	Net energy imports are estimated as energy use less production, both measured in oil equivalents. A negative value indicates that the country is a net exporter. Energy use refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.	http://data.worldbank.org/indicator/EG.IMP.CONS.ZS/countries	No specific targets available. The low performance distribution threshold is based on the lowest performance value for 2014. The target value is based on the highest performance value for 2014.
Diversity of TPES (Herfindahl index)	Energy resilience rather than independence is more aligned with energy security.	2014	International Energy Agency	1980 - 2014	Total primary energy supply represents domestic supply only and is broken down into energy type. It represents inland demand only and, except for world energy supply, excludes international marine and aviation bunkers. The Herfindahl index is used here as a measure of the size of fuel-type consumption in relation to a country’s total energy industry. The score represents the sum of the squares of the total primary energy supply types of the different country’s being analysed within the energy industry, where the energy shares are expressed as fractions. The result can range from 0 to 1.0, moving from a large number of individual energy sources to a single-source supply. In this case, increases in the score indicate a decrease in diversity and vice versa. The formula is as follows: $H = N \sum si\ 2$ where si is the fuel mix share of the fuel i in the overall mix and N is the number of fuels. Then, to normalize: $H = (H-1/N)/(1-1/N)$ The normalized result can range from 0 to 1.0	n/a – data provided by IEA	No target data available. The low performance distribution threshold is based on the lowest performance value for 2014. The target value is based on the highest performance value for 2014. *NB: The diversity score was worked out using a wide array of countries, not all of which could be included in the final version of the EAPI due to data paucity. This means the target and threshold scores do not equate to 0 and 1 respectively, but 0.09 and 0.88, in line with the performance of the various countries included in the Index relative to all countries analysed (217 in total).*

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Diversification of import counterparts (Herfindahl Index)	Having a variety of import counterparts means market risk diversification including exposure to supply shocks, tariffs and price spikes in commodities, and risk stemming from political decisions that might restrict trade with energy suppliers. A diverse import portfolio can mitigate these potential risks.	2015	United Nations Conference on Trade and Development (UNCTAD)	1995-2015	Data presents merchandise trade by trading partner and product based on SITC, Rev.3 commodity classification (the most detailed level is two digit), expressed in thousands of dollars. Herfindahl Indexation scores countries based on number of trade partners and distribution of trade ($ value) across trade partners. *Herfindahl Index methodology: as above.* This indicator applies only to net importing countries as defined by the data in the indicator for *Energy imports, net (% of energy use)*.	http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx?sCS_referer=&sCS_ChosenLang=en	No specific targets available. The low performance distribution threshold is based on the lowest performance value for 2015. The target value is based on the highest performance value for 2015.