

# Energy efficiency indicators

Database documentation

December 2022 edition

International  
Energy Agency

iea

# INTERNATIONAL ENERGY AGENCY

The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 31 member countries, 11 association countries and beyond.

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Korea  
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Mexico  
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This document provides information regarding the December 2022 edition. Information on this product can be found at: <https://www.iea.org/data-and-statistics/data-product/energy-efficiency-indicators>. The database is updated twice a year, in June and December, and published in Excel format, B2020 format and TXT format.

The *Energy efficiency indicators* database contains annual data from 2000 to 2020, covering end-use energy consumption by energy product, end-use carbon emissions, associated indicators across the four main sectors of final consumption (residential, services, industry and transport), and decomposition analysis data, for IEA member countries and beyond. In its Excel version, the database also includes some interactive, ready-made charts with user-friendly features, such as country-specific results of decomposition of total and sectoral energy consumption into drivers (activity, structure and efficiency, as well as carbon intensity when appropriate).

A demo file of the database containing data and graphs for selected years and countries, mirroring the structure of the full database, is available at the link above.

The IEA also releases *Energy Efficiency Indicators Highlights*, a short version of this database (free), with selected data and indicators, which can be downloaded at the following link: <https://www.iea.org/data-and-statistics/data-product/energy-efficiency-indicators-highlights>.

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Please address your inquiries to [EnergyIndicators@iea.org](mailto:EnergyIndicators@iea.org).

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# Database description

The *Energy efficiency indicators* database is available in Excel format, B2020 format, and TXT format and includes annual data for the following countries: 31 IEA member countries; 30 countries and economies beyond IEA including 5 association countries and 3 accession countries.

The data cover the interval 2000-2020, unless otherwise specified.

## Excel version

The database in **Excel version** also includes some interactive, ready-made charts and is structured into several sheets, as detailed below.

### How to use it

The Excel file includes:

- 6 worksheets with compilations of 4 to 9 ready-made graphs by topic, with interactive features for the users to explore easily the datasets;
- 19 worksheets containing the database by type of data and/or sector;
- 31 data worksheets, yielding the underlying data associated with a given graph, in a simple table format.

In each graph worksheet, users can select the country and the year(s) to be displayed through a menu on the left-hand side of the page, as well as appropriate sector, indicator or segment. All the graphs on the sheet will automatically update, with the name of the country, year(s) of concern and other details mentioned in the title. Tips on each tab provides guidance to navigate it.

Please note that macros must be enabled for this file's graphs to work properly. The data tabs remain accessible and easy to navigate in any case.

Figure 1 displays an example of the country menus, which enable users to select a country and automatically update the graphs. In the country comparison graphs worksheet, the user can select multiple countries at once.

**Figure 1 Example of a country menu included on the graph worksheets**

COUNTRY, TERRITORY OR ECONOMY			☰	🔍
IEA Total	Albania	Argentina		
Armenia	Australia	Austria		
Azerbaijan	Belarus	Belgium		
Bosnia and Herzegovina	Brazil	Bulgaria		
Canada	Chile	Colombia		
Croatia	Cyprus	Czech Republic		
Denmark	Estonia	Finland		
France	Georgia	Germany		
Greece	Hong Kong (China)	Hungary		
Ireland	Italy	Japan		
Kazakhstan	Korea	Kosovo		
Kyrgyzstan	Latvia	Lithuania		
Luxembourg	Malta	Mexico		
Moldova	Morocco	Netherlands		
New Zealand	North Macedonia	Norway		
Poland	Portugal	Romania		
Serbia	Slovak Republic	Slovenia		
South Africa	Spain	Sweden		
Switzerland	Chinese Taipei	Türkiye		
Ukraine	United Kingdom	United States		
Uruguay	Uzbekistan			

In addition, when appropriate, a sector slicer in the left-hand side menu, or a set of buttons on top of the concerned graphs, allows to switch between either the four main sectors (residential, manufacturing, services and transport), the two residential indicators (per dwelling and per floor area) or the two transport segments (passenger and freight). Figure 2 below displays an example of such buttons, from the country comparison tab.

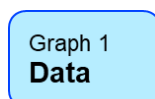
**Figure 2 Example of sectoral buttons from the country comparison graphs worksheet**



Note that time slicers (when there are several of them) and the sector slicer are colour coded to help the user: a box frames the graphs operated by the slicer of the same colour. Buttons, on the country comparison, residential and transport graphs tabs, affect the two graphs immediately below.

Finally, users can easily access the underlying data for each graph by clicking on the relevant button on the top left corner of each graph. Figure 3 shows an example of a button to access the underlying data for each individual graph.

**Figure 3 Example of button included on graph tabs for accessing data**



## Data visualization tabs

Country comparison graphs	(4 graphs)
Cross-sectoral graphs	(4 graphs)
Decomposition graphs	(6 graphs)
Residential graphs	(7 graphs)
Industry and services graphs	(9 graphs)
Transport graphs	(6 graphs)

## Database tabs

### *Energy tabs:*

Residential - Energy	Residential energy end use (9 products, 17 end uses) (PJ)
Services - Energy	Services energy end use (8 products, 17 end uses) (PJ)
Industry - Energy	Industry energy end use (8 products, 20 sub-sectors) (PJ)
Transport - Energy	Transport energy end use (10 products, 19 end uses) (PJ)

### *Activity tab:*

Activity data	Sectoral activity data (21 products)
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### *Energy indicators tabs:*

Residential - Energy Indicators	Residential energy indicators by end use (6 flows)
---------------------------------	-------------------------------------------------------

<b>Services - Energy Indicators</b>	Services energy indicators by end use (5 flows)
<b>Industry - Energy Indicators</b>	Industry energy indicators by sub-sector (2 flows)
<b>Transport - Energy Indicators</b>	Transport energy indicators by mode/vehicle type (11 flows)
<i><b>Decomposition tabs:</b></i>	
<b>Energy Decomposition data</b>	Total and sectoral energy consumption driver's decomposition data (7 flows)
<b>Carbon Decomposition data</b>	Total and sectoral energy consumption driver's decomposition data (9 flows)
<i><b>Emissions tabs:</b></i>	
<b>Residential - Emissions</b>	Residential end-use emissions (1 product, 17 end uses) (MtCO <sub>2</sub> )
<b>Services - Emissions</b>	Services end-use emissions (1 product, 6 end uses) (MtCO <sub>2</sub> )
<b>Industry - Emissions</b>	Industry end-use emissions (1 product, 20 sub-sectors) (MtCO <sub>2</sub> )
<b>Transport - Emissions</b>	Transport end-use emissions (1 product, 17 end uses) (MtCO <sub>2</sub> )
<i><b>Carbon indicators tabs:</b></i>	
<b>Residential - Carbon Indicators</b>	Residential carbon indicators by end use (4 flows)
<b>Services - Carbon Indicators</b>	Services carbon indicators by end use (4 flows)
<b>Industry - Carbon Indicators</b>	Industry carbon indicators by sub-sector (2 flows)
<b>Transport - Carbon Indicators</b>	Transport carbon indicators by mode/vehicle type (4 flows)



## B2020 version and TXT files

In its **B2020 version**, the database includes five files. Files mirroring the same structure are also available as TXTs. They are structured as follows:

### **IEA – EEI RESIDENTIAL.IVT      Sectoral detailed data and indicators**

Residential energy end use (9 products, 21 end uses) (PJ)  
Residential energy indicators (6 flows)  
Residential activity data (12 flows)  
Residential emissions (1 product, 17 end uses) (MtCO<sub>2</sub>)  
Residential carbon indicators (4 flows)

### **IEA – EEI SERVICES.IVT      Sectoral detailed data and indicators**

Services energy end use (8 products, 17 end uses) (PJ)  
Services energy indicators (5 flows)  
Services activity data (6 flows)  
Services emissions (1 product, 6 end uses) (MtCO<sub>2</sub>)  
Services carbon indicators (4 flows)

### **IEA – EEI INDUSTRY.IVT      Sectoral detailed data and indicators**

Industry energy use (8 products; 20 sub-sectors) (PJ)  
Industry energy indicators (2 flows)  
Industry activity data (6 flows)  
Industry emissions (1 product, 20 sub-sectors) (MtCO<sub>2</sub>)  
Industry carbon indicators (2 flows)

### **IEA – EEI TRANSPORT.IVT      Sectoral detailed data and indicators**

Transport energy end use (10 products, 22 end uses) (PJ)  
Transport energy indicators (5 flows)  
Transport activity data (5 flows)  
Transport emissions (1 product; 17 end uses) (MtCO<sub>2</sub>)  
Transport carbon indicators (4 flows)  
Transport activity indicators (6 flows)

### **IEA – EEI DECOMPOSITION.IVT      Energy and carbon decomposition data**

Savings due to the 3-factor analysis for energy consumption and 4-factor analysis for emissions (5 end uses, 2 products, 9 flows)

# Changes from the last edition

In order to meet increasing user's needs with more timely data, the IEA energy efficiency indicators database – this year including data up to 2020 – is released twice a year, reflecting different timings for statistical data collection among countries. The first release (in June) features the data available at the time of publication, whereas the December release has more complete data and expanded geographical coverage. We acknowledge and thank the enhanced commitment of our data providers.

Complementary to this documentation, the IEA has made available (for free) the energy efficiency indicators database [demo and availability file](#). This file mirrors the structure of the IEA Energy efficiency indicators database and provides detailed information about the data available in this database, in addition to demonstrating on two countries the full scope of visualisation features (see next section) of the extended version available for subscribers.

## New visualisation options

To provide users with additional insights on end-use data and energy efficiency indicators trends, the Excel version of this database has been redesigned to include some interactive, ready-made charts, and user-friendly features (such as the possibility to quickly copy the charts produced and the underlying data).

Thanks to a menu, the charts can be displayed for each country, providing a cross sectoral overview and sectoral highlights; as well as the possibility to compare different countries for selected variables. Figure 4 below shows the cross-sectoral graphs tab.

Several ready-made graphs, in particular regarding carbon emissions and intensities, and drivers of energy consumption and of carbon emissions are also available. The layout and the functionalities have also been improved, with more interactive menus to select years of concern for instance.

**Figure 4 Sample graphs from the Cross-sectoral graphs tab**



## Decomposition analysis

Disaggregated energy end use and activity data allow the analysis of drivers of energy consumption (decomposition analysis) and thus an assessment of the impacts of energy efficiency on energy savings. Similarly, disaggregated consumption data by fuel and carbon intensity of such fuels allow the analysis of drivers of carbon emissions. These can be done for the total energy consumption and carbon emissions, as well as at the sectoral level, provided enough data are available.

In its last editions, this database has been expanded to include country-specific results of the decomposition of total and sectoral energy consumption and emissions by factors. In its Excel format, this publication provides total and sectoral graphs of the drivers of energy consumption and carbon emissions, as well as estimated savings thanks each effect. Further information about the methodology can be found in the dedicated chapter of this documentation file.

## Geographical coverage

The IEA is working closely with countries beyond IEA membership, including association countries,<sup>1</sup> accession countries<sup>2</sup> and other countries, economies and territories, in order to expand end-use data coverage and track global energy

<sup>1</sup> IEA association countries at the time of this publication are: Argentina, Brazil, People's Republic of China, Egypt, India, Indonesia, Morocco, Singapore, South Africa, Thailand, and Ukraine.

<sup>2</sup> IEA accession countries at the time of this publication are: Chile, Colombia, Israel and Latvia.

efficiency progress. This year, this database continues to expand including, for the first time, data for Colombia, Hong Kong (China), and Chinese Taipei.

In the current edition, the database includes end-use energy and emissions data and efficiency indicators for 61 countries, namely:

- all thirty-one IEA members;
- five IEA association countries (Argentina, Brazil, Morocco, South Africa, and Ukraine);
- three OECD countries seeking full accession to the IEA (Chile, Colombia and Latvia);
- eight countries from Eastern Europe, Caucasus and Central Asia region (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova and Uzbekistan) – the data collection for these nine countries has been made possible with the financial assistance of the European Union, as part of the [EU4Energy project](#);
- ten countries with data gathered via partner institutions (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Kosovo, Malta, Republic of North Macedonia, Romania and Serbia);
- and four additional countries, economies and territories (Hong Kong (China), Slovenia, Chinese Taipei, and Uruguay).

Given the increasing importance of energy efficiency, it is our wish that more countries will share such information with IEA, to be added in future editions.

# Methodological notes

## The IEA energy efficiency indicators data collection

In 2009, IEA members committed to collect energy efficiency indicators data through a new annual questionnaire. The questionnaire collects energy consumption and activity data for various end uses, sub-sectors and modes/vehicle types across the four sectors: residential, services, industry and transport. The questionnaire is available online at the IEA web page: <https://www.iea.org/areas-of-work/data-and-statistics/questionnaires>.

The IEA also developed a manual on energy efficiency data and indicators, [\*Energy Efficiency Indicators: Fundamentals on Statistics\*](#); and one on how to use indicators to inform policies, [\*Energy Efficiency Indicators: Essentials for Policy Making\*](#), both of which can be downloaded from the IEA web page.

## Notes on data quality

The analysis of demand-side energy efficiency trends requires highly disaggregated end-use energy data across the main final consumption sectors: residential, services, transport and industry. Examples of such disaggregated data include energy consumption by end use (space heating, cooking, appliances, etc.) for the residential sector; or energy consumption by mode/vehicle type (passenger cars, motorcycles, freight trucks, etc.) for transport. Deriving energy efficiency indicators also requires consistent “activity data” covering the wide range of activities specific to each subsector/end use, such as floor area, passenger-kilometres, production of key manufacturing output (cement, iron, etc.), number of employees in services, etc.

While almost all countries have developed energy statistics to produce national energy balances, more disaggregated end-use energy and activity data are not always as readily available. Therefore, the development of energy efficiency indicators generally requires additional efforts, such as mapping the different available data through administrative sources, setting up new data collections, but also establishing new institutional arrangements to share and manage the different data.

The IEA end-use data collection agreed in 2009 is still work in progress, with developing quality and coverage across member countries. Currently, IEA

countries generally have relatively detailed data for the industry sector thanks to well-established data collections to develop energy balances. Relatively important progress has been observed in the coverage of the residential sector, while detailed data for the services sector remain unavailable for many countries. The availability of transport data varies greatly across countries, with activity data (passenger-kilometres, tonne-kilometres, vehicle stocks, etc.) often requiring additional development.

Furthermore, as indicators are calculated as a ratio of energy consumption and corresponding activity, and as the various data may not be collected by the same institution, the data quality assessment is particularly important. For example, consistency of boundaries and definition between energy and activity data is essential to create meaningful indicators, and to analyse their trends. Data users should also be aware that small changes in intensities may be caused by uncertainty in measurement of energy or activity data, and thus weight should be given to long-term trends. Other important validation criteria include internal consistency, consistency with external data sources, and plausibility (values of indicators need to fall within expected ranges to be meaningful).<sup>3</sup>

The IEA secretariat is continuously working with member countries to improve the overall quality of the energy efficiency indicators database, including its consistency with the data provided by national administrations to develop the IEA energy balances and with the data reported by other organisations. We expect to keep improving data quality over time, and are grateful for the feedback to this publication received from the different data providers and data users. In any case, the Energy Efficiency Indicators database presents the most complete and updated data available.

## Comparability with the IEA energy balances

This publication is based on the IEA energy efficiency indicators data collection which is additional to that used for the IEA energy balances. Due to the emphasis on final end uses across sectors, some differences occur between the final energy consumption in this publication and the total final energy consumption reported in the IEA energy balances, for the following reasons:

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<sup>3</sup> For a more comprehensive discussion of validation criteria by sector, please see the chapter on *Data validation* in *Energy Efficiency Indicators: Fundamentals on Statistics*: <https://www.iea.org/reports/energy-efficiency-indicators-fundamentals-on-statistics>.

- In this publication, non-energy use is excluded from final energy consumption;
- Energy consumption in ferrous metals (part of basic metals and called iron and steel in the IEA balances) also includes energy consumption and losses in transformation for blast furnaces and coke ovens, which are accounted under the energy and the transformation sectors in the IEA energy balances;
- Energy consumption in mining also include energy consumed to extract oil, gas and coal;
- Transport excludes pipeline transportation and fuel tourism;
- Military energy consumption is excluded, while it is included in the total final energy consumption in the IEA energy balances under the other non-specified category.

Besides these systematic differences, some discrepancies might occur due to the higher data disaggregation of this publication, and to the need to adapt different approaches/methodologies (e.g. bottom-up vs top-down) to collect or estimate these data at a country level. Additionally, for some countries different offices/institutions are responsible for preparing the energy balances and the energy efficiency data shown in this publication, which may also lead to unintended discrepancies.

For more information on IEA energy balances methodologies, please see the documentation of the *World Energy Balances*.<sup>4</sup>

## Estimates of CO<sub>2</sub> emissions by end use

The estimates of CO<sub>2</sub> emissions from fuel combustion presented in this publication are calculated using the IEA energy efficiency database, the IEA energy balances and the default methods and emission factors from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

This publication presents CO<sub>2</sub> emissions from fuel combustion, from all reported energy uses of fuels, excluding emissions from non-energy use of fuels and including emissions reallocated from electricity and heat generation (using the same methodology as in the IEA *Greenhouse Gas Emissions from Energy* database). For the purposes of this publication only direct emissions from combustions are considered. For more details on the emissions reallocation

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<sup>4</sup> [http://wds.iea.org/wds/pdf/worldbal\\_documentation.pdf](http://wds.iea.org/wds/pdf/worldbal_documentation.pdf)

please see the [methodological notes](#) of the *Greenhouse Gas Emissions from Energy* database.

### **CO<sub>2</sub> emissions from fuel combustion**

$$\text{CO}_2 = \text{Fuel consumption} * \text{Emission factor}$$

where:

Fuel consumption = amount of fuel combusted,

Emission factor = implied emission factor, based on the energy balances fuel mix and default emission factors

Fossil fuel categories in the energy efficiency indicators template (coal, oil, gas) are more aggregated than those within the IEA energy balances. Country-specific implied emission factor for oil, coal and gas are computed based on the mix of individual products reported within the IEA energy balances. Emissions are then summed across all fuel categories to obtain total emissions for a given end use or sub-sector.

The IPCC methodology does not assign any CO<sub>2</sub> emissions to fuel use from biofuels, unless it is used in an unsustainable way. The IEA energy efficiency indicators database follows the same rationale, except in the case of the transport sector.

This is due to the fact that both “motor gasoline” and “diesel and light fuel oil” products are reported, for this energy efficiency indicators data collection, together with liquid biofuels. Hence it is not possible to split these from biofuels to estimate the respective carbon emissions. As a result, total final emissions from transport that contain any of these two energy products also include biofuels CO<sub>2</sub> emissions.

Emissions estimates could differ from those published in the IEA *Greenhouse Gas Emissions from Energy* database mainly because the energy consumption data may differ from the IEA energy balances (see previous section). Also, the IEA secretariat estimates of CO<sub>2</sub> emissions from fuel combustion may not be the same as the figures that a country submits to the UNFCCC for a variety of reasons.



## Temperature correction<sup>5</sup>

The amount of energy required for space heating (and space cooling) is highly dependent on the ambient temperature, and this impact on energy consumption may easily mask the effects of energy efficiency improvements. For example, a country may dramatically reduce the amount of energy needed for space heating over a year simply due to an exceptionally warm winter. The opposite may also be true. The reduction in energy consumption due to the energy efficiency improvements in heating systems may be offset by an extra energy demand due to an extremely cold winter.

Therefore, in order to accurately monitor the evolution of energy consumption for space heating in the residential sector over time, it is essential to eliminate the impact of temperature variations and to analyse temperature-corrected data. In this publication one of the most common methodologies has been adopted for such correction, namely the use of heating degree days (HDD).

HDD are a simplified measure of the intensity and duration of cold weather over a certain period in a given location. The value of HDD for a period, for example a winter, is determined by subtracting for each day the average daily temperature from a base temperature (assumed to be the temperature below which heating systems are turned on), and then adding up this difference for the days of the period for which the average outside air temperature is lower than the base temperature. When the outside air temperature is equal to or higher than the base temperature, HDD are zero. The higher heating degree days, the colder the season, the greater the amount of energy required for space heating. HDD can be defined as:

### Heating degree days

$$HDD = \sum_{k=1}^n (T_{base} - T_k)$$

$$T_{base} > T_k$$

where:

$T_{base}$  is the base temperature,

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<sup>5</sup> See Annex C in *Energy Efficiency Indicators: Fundamentals on Statistics*.

$T_k$  is the average temperature of day  $k$ ,  
 $n$  is the total number of days in the given period.

As noted above, two factors are key for the calculation of HDD. The first is the base temperature, which should be set at the level of outside air temperature at which residents of a given region tend to turn on their heating systems. This level can vary across different regions depending on many factors, such as the ability to tolerate cold temperatures, the variety of building types, the thermal properties of buildings, the density of occupants, etc. For example, the base temperature in the United Kingdom is typically 15.5°C while in the United States it is typically 65°F (equivalent to 18°C). The base temperature should be carefully determined based on the characteristics of the region, since this choice will impact the temperature correction of the energy consumption data. It may also evolve in time, for example if people already turn on their thermostat at higher outside temperatures.

The second factor is the time series of average daily temperatures. For example, if the average temperature on one day is 5 degrees below the base temperature, there are five HDD for that day. To get the annual number of HDD, all positive values of HDD are summed for each day in the year.

When the national HDD figures are available, the data of energy consumption for space heating can be corrected for temperature variations. This publication uses a simplified methodology, which assumes that the elasticity for adjusting heating requirements is 1, as shown below:

### Temperature correction

$$E_i^{TC} = E_i^{act} \cdot \frac{\overline{HDD}}{HDD_i}$$

where:

$E_i^{TC}$  is the temperature-corrected energy consumption for the year  $i$ ,

$E_i^{act}$  is the actual energy consumption in year  $i$ ,

$\overline{HDD}$  is the average heating degree days of the given period (2000-latest year), and

$HDD_i$  is the total heating degree days in the year  $i$ .

Such correction intends to remove the fluctuations in energy consumption due to fluctuations in temperature in the given year compared with the average temperature of a country. For example, if a year has 500 HDD and the annual average HDD for the country is 250, the corrected energy consumption for space heating would be half of the actual energy consumption. Of course, comparison of space heating efficiency indicators across countries is still difficult as a country on average experiencing colder temperatures than another country will need on average to consume more to heat the same floor area.

Similarly, cooling degree days (CDD) are a measure of the intensity of warm weather to correct energy consumption data for space cooling. In this publication, temperature correction are made only for calculating intensity indicators, therefore energy consumption data show the fluctuations due to temperature change. Space cooling is temperature corrected only for countries where CDD are data available.

In case of interest for more weather-related data at the global level useful to understand, analyse and model the energy sector, you can refer to [the IEA and CMCC Weather for Energy Tracker](#).

## Decomposition analysis

Index decomposition or factorisation analysis quantifies the impact of different driving forces on energy consumption. Understanding how each of the elements impact energy consumption is essential to determine which have the largest potential for savings and the areas that should be prioritised for the development of energy efficiency policies.

Decomposition of energy end-use trends often distinguishes among three main components affecting energy consumption: aggregate activity, sectoral structure and energy efficiency.

Generally, indices are established to examine the changes in the factors or effects decomposed over time. Four important criteria are used to determine the choice of index decomposition analysis methodology:

The index methodology must be theoretically sound, i.e. an insignificant or no residual or interaction term and also must meet the index requirement of time reversibility.

The index methodology must be applicable to all sectors and sub-sectors so that they can all be interpreted in the same way, making it possible to aggregate the sub-sectors results.

The interpretation of the index must be straightforward (i.e. the results must be easy to understand).

Data to calculate the different effects must be available.

The decomposition analysis results included in this database are calculated using a three factor Log Mean Divisia Index I (LMDI I) methodology, which meets three of the four criteria presented above, the most important of which is perfect decomposition (i.e. does not produce a residual term). Note though that small residuals may appear when energy or activity data are not available for a limited number of years. However, it is considered relatively difficult to communicate to non-experts and is not suitable where there are zeros or negative numbers in the data set being analysed.

There are multiple forms of the same methodology as a result of the choice of base year and the type of mathematical form or configuration (additive or multiplicative analysis).

The choice of the base year is extremely important and can be fixed or chained base year. A chained base year is where there is not a single base year but it requires time series data and for every year the previous year is used as the base. The choice of additive or multiplicative configuration largely depends on data availability and whether the impact of the individual effects or factors examined as part of the decomposition analysis are required as a relative change or an absolute value.

For the results included in this database a fixed additive three-factor decomposition has been used, with 2000 as a base year. The table with the data included in the decomposition analysis is detailed at the end of this section. The formula for this methodology is presented below:

#### Fixed additive three factor LMDI methodology – energy

$$\begin{aligned}
 E_t - E_0 &= \Delta E = \Delta E^A + \Delta E^S + \Delta E^I \\
 \Delta E^A &= \sum_i L(E_t^i, E_0^i) \cdot \ln\left(\frac{A_t}{A_0}\right) \\
 \Delta E^S &= \sum_i L(E_t^i, E_0^i) \cdot \ln\left(\frac{S_t^i}{S_0^i}\right) \\
 \Delta E^I &= \sum_i L(E_t^i, E_0^i) \cdot \ln\left(\frac{I_t^i}{I_0^i}\right)
 \end{aligned}$$

where:

$E_t$  is the total energy consumption, for all sectors and end uses, in year t,

$\Delta E = E_t - E_0$  is its variation between the base year,  
 $\Delta E^A$ ,  $\Delta E^S$  and  $\Delta E^I$  are respectively the activity, structure and intensity effects of this variation,  
 $E_t^i$  is the energy consumption of sector/end use  $i$  of year  $t$ , with superscript  $i$  referring to each sub-sector or end use,  
 $L(a, b) = \frac{a-b}{\ln a - \ln b}$  with  $a, b > 0$  and  $a \neq b$ , and  $\ln a$  the natural logarithm,  
 $A_t$  is the overall activity level for all sectors and end uses in year  $t$ ,  
 $S_t^i = A_t^i / A_t$  is the activity share of sector/end use  $i$  in year  $t$ ,  
 $I_t^i = E_t^i / A_t^i$  is the energy intensity of sector/end use  $i$  in year  $t$ .

Starting from December 2021, the IEA Energy Efficiency Indicators database includes data for carbon emissions decomposition using a fixed additive four-factor decomposition, with 2000 as a base year. The formula for this methodology is presented below:

#### Fixed additive four factor LMDI methodology – emissions

$$C_t - C_0 = \Delta C = \Delta C^A + \Delta C^S + \Delta C^I + \Delta C^Y$$

$$\Delta C^A = \sum_i L(C_t^i, C_0^i) \cdot \ln\left(\frac{A_t}{A_0}\right)$$

$$\Delta C^S = \sum_i L(C_t^i, C_0^i) \cdot \ln\left(\frac{S_t^i}{S_0^i}\right)$$

$$\Delta C^I = \sum_i L(C_t^i, C_0^i) \cdot \ln\left(\frac{I_t^i}{I_0^i}\right)$$

$$\Delta C^Y = \sum_i L(C_t^i, C_0^i) \cdot \ln\left(\frac{Y_t^i}{Y_0^i}\right)$$

where:

$C_t$  is the total emissions, for all sectors and end uses, in year  $t$ ,

$\Delta C = C_t - C_0$  is its variation between the base year,

$\Delta C^A$ ,  $\Delta C^S$ ,  $\Delta C^I$ ,  $\Delta C^Y$  are respectively the activity, structure, intensity effects and carbon intensity effect of this variation,

$C_t^i$  is the energy consumption of sector/end use  $i$  of year  $t$ , with superscript  $i$  referring to each sub-sector or end use,

$$L(a, b) = \frac{a-b}{\ln a - \ln b} \text{ with } a, b > 0 \text{ and } a \neq b, \text{ and } \ln a \text{ the natural logarithm,}$$

$A_t$  is the overall activity level for all sectors and end uses in year  $t$ ,

$S_t^i = A_t^i / A_t$  is the activity share of sector/end use  $i$  in year  $t$ ,

$I_t^i = E_t^i / A_t^i$  is the energy intensity of sector/end use  $i$  in year  $t$ ,

$Y_t^i = C_t^i / E_t^i$  is the carbon intensity of sector/end use  $i$  in year  $t$ .

For the carbon emissions decomposition, the carbon intensity effect is taken into account as carbon emissions divided by energy consumption for each fuel, for all sub-sectors and end uses. All other data included are the same as the one used for the energy consumption decomposition, as given below.

Sector	Subsector/ End use	Activity	Structure	Efficiency effect
Residential	Residential space heating	Population	Floor area per population	Temperature corrected space heating energy consumption per floor area
	Residential water heating	Population	Occupied dwellings per population	Water heating energy consumption per occupied dwelling
	Residential cooking	Population	Occupied dwellings per population	Cooking energy consumption per occupied dwelling
	Residential space cooling	Population	Floor area per population	Temperature corrected space cooling energy consumption per floor area
	Residential lighting	Population	Floor area per population	Lighting energy consumption per floor area*
	Residential appliances	Population	Appliances stock per population	Appliances energy per appliance stock
Passenger transport	Cars/light trucks, Buses, Passenger trains, Domestic passenger airplanes, Domestic passenger ships	Passenger-kilometres	Share of passenger-kilometres	Energy consumption per passenger-kilometres
Freight transport	Freight trucks, Freight trains, Domestic freight airplanes, Domestic freight ships	Tonne-kilometres	Share of tonne-kilometres	Energy consumption per tonne-kilometres

Services	Total Services [ISIC 33, 37-39, 45-96 excl. 8422, 99]	Value added	Share of value added	Energy per value added
Manufacturing	Food and tobacco [ISIC 10-12], Textiles and leather [ISIC 13-15], Wood and wood products [ISIC 16], Paper pulp and printing [ISIC 17-18], Chemicals and chemical products [ISIC 20-21], Rubber and plastic [ISIC 22], Non-metallic minerals [ISIC 23], Basic metals [ISIC 24], Machinery [ISIC 25-28], Transport equipment [ISIC 29-30], Other manufacturing [ISIC 31-32]	Value added	Share of value added	Energy per value added
Other	Agriculture, forestry and fishing [ISIC 01-03], Construction [ISIC 41-43]	Value added	Share of value added	Energy per value added

For more details, you can refer to the Annex A of the manual [Energy Efficiency Indicators: Essentials for Policy Making](#).

# Sources

Most data are obtained from national administrations through annual submission of the energy efficiency indicators questionnaire. Other sources are used complementarily to submissions.

As proposed by several countries, some data are derived from the [ODYSSEE](#) database; please refer to country notes for more details. The [ODYSSEE](#) database may also be used to estimate data gaps.

Crude steel production data are derived from data from the [World Steel Association](#).

Data from the US Geological Survey are used as input for cement production figures in some countries. See [U.S. Geological Survey, 2021, Mineral commodity summaries 2021: U.S. Geological Survey, 200p.](#)

Data collected by [Eurostat](#) are used for several countries, as detailed in the country notes.

Data from the [OECD National Accounts](#) are often used as input for GDP, value added and employment macro-economic data.

Monthly heating degree days are extracted from the Joint Research Centre for computing temperature-corrected indicators. See [Joint Research Centre, Agri4Cast Resources Portal](#), re-disseminated by Eurostat.



# End use definitions

## Residential

Flow	Short name	Definition
Total Residential	R_TOTAL	Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Divisions 97 and 98] which are a small part of total residential consumption. The different end uses within the residential sector are described below.
Residential space heating	R_SPACE_H	Represents the residential sector space heating end use. Space heating includes the different means of heating spaces, which can be achieved through many systems and fuels. Heating systems can be broadly separated into two types: central heating and dedicated area/room heating. Central heating systems can heat the entire dwelling; they include hot water and steam systems with radiators, floor or wall furnaces, district heating, heat pumps, etc. Area-dedicated heating systems can be divided into several categories: stand-alone electric heaters, fireplaces, and stand-alone stoves using oil products or other fuels, such as coal or wood. It is not rare that households use a combination of several systems, e.g. electrical heaters to complement insufficient base central systems. Heating systems can generate heat using a number of energy sources such as electricity, natural gas, coal, fuel oil, liquefied petroleum gas (LPG), kerosene, biofuels, and active or passive solar energy.
Residential space cooling	R_SPACE_C	Represents the residential sector space cooling end use. Space cooling includes all equipment used for cooling a living area, which can be divided into two broad categories: central cooling systems and room-dedicated systems. Central air conditioners feed into a duct system that could also be used by a central heating system. Wall air conditioners and split systems are used to cool a room. There are other possible cooling systems such as swamp coolers (or evaporative coolers), which cool air through evaporation of water; heat pumps that can be used in reverse mode to cool the air or district cooling. Most of the cooling systems in the residential sector run exclusively on electricity.
Residential water heating	R_WATER_H	Water heating, also known as domestic hot water, includes systems that are used for heating water for showers, bathing, washing, etc. A number of tank-based or tankless systems can be used to heat the water. Water heating can be produced alone or in combination with space heating systems. The main energy sources used by water heating systems include natural gas, LPG, electricity, biofuels and, increasingly, solar thermal energy in a growing number of countries.
Residential cooking	R_COOKING	Cooking includes energy consumed to cook meals using a wide range of stoves, from advanced induction stoves to traditional three-stone stoves. A number of energy sources are used for cooking such as natural gas, electricity, biofuels, LPG, kerosene and coal. Beside stoves, ovens are also included in the energy consumption for cooking. Cooking appliances such as toasters and microwave ovens, due to the difficulty in separating their respective consumption, are normally reported under other appliances.
Residential lighting	R_LIGHTING	Residential lighting includes energy consumed for interior or exterior lighting of dwellings today mainly powered by electricity.

Flow	Short name	Definition
		Incandescent lamps, which have been around for more than a century, are slowly being replaced by more efficient fixtures, e.g. fluorescent tubes, compact fluorescent lamps and LEDs (light-emitting diodes). More and more countries are passing regulations to phase out the use of incandescent bulbs. Households that do not have any access to electricity still rely on traditional forms of lighting such as kerosene and LPG lamps, and sometimes even candles and flashlights. Moreover, off-grid solar applications for lighting may become more prominent in the future.
Residential appliances	R_APPLIANC	Residential appliances encompasses two main categories: large (or major) appliances (sometimes also called white appliances or white goods) and other (usually much smaller) appliances. Residential appliances are disaggregated as below.
Refrigerators	R_REFRIG	Refrigerator can be defined as a box, room, or cabinet in which food, drink, etc., are kept cool by means of ice or mechanical refrigeration.
Freezers	R_FREEZER	Freezers can be defined as a box, room, or cabinet held at or below 0°C (32°F).
Refrigerator/Freezer combinations	R_REFFREEZ	Refrigerator/Freezer combinations refers to a single appliance that have both a refrigerator and a freezer compartment.
Dish washers	R_DISH_W	Dish washer is a machine for washing dishes, kitchen utensils, etc., automatically.
Clothes washers	R_CLOTH_W	Clothes washers also known as washing machines are appliances for washing clothing, linens, etc.
Clothes dryers	R_CLOTH_D	Clothes dryers are appliances used to dry clothing, linens, etc.
Televisions	R_TV	Televisions, also including home entertainment devices.
Personal computers	R_PC	Personal Computers, also including other information technology devices.
Air conditioners	R_AC	Air conditioners is an equipment used to treat air for space cooling purposes including air conditioners which are reversible and therefore can also be used for heating purposes. Air conditioners don't include fans and household appliance refrigeration (e.g. refrigerators, freezers...).
Heat pumps	R_HEATPUMP	Heat pumps are mechanical devices that extract heat from one medium (air, water or ground) and transfer it to another (air or water) and are used as the primary equipment for either space heating or hot water production. Heat pumps don't include heat pumps used primarily for air conditioning or heat pumps for other household appliances (e.g. refrigerators, freezers, dryers...).
Solar thermal panels	R_SOLTHERM	Solar thermal panels collect and concentrate sunlight to produce the high temperature heat needed for many purposes, including heating water, air, and the interior of buildings and generating electricity.
Photovoltaic panels	R_PV	Photovoltaic panels are non-mechanical devices that convert sunlight directly into electricity.
Other appliances	R_OTHER	Other appliances, includes all appliances not specified above, such as hair driers, microwaves, vacuum cleaners etc. For country specific information, please refer to country notes.

Flow	Short name	Definition
Non-specified	R_NONSPEC	Non-specified includes all consumption for energy uses that are not specified above. For some countries, this category could also include data from end uses listed above. For country specific information, please refer to the chapter on <i>Country notes</i> .

## Services

Flow	Short name	Definition
Total Services	S_ALL	Services sector includes commercial activities and public services [ISIC Rev. 4 Divisions 33, 37-39, 45-47, 52, 53, 55, 56, 58-66, 68-75, 77-82, 84 (excluding Class 8422), 85-88, 90-96 and 99].
Services space heating	S_SPACE_H	Represents the services sector space heating end use. Space heating includes the different means of heating spaces, which can be achieved through many systems and fuels. Heating systems can broadly be separated into two types, namely central heating and dedicated area/room heating. Central heating systems can heat the entire dwelling; they include hot water and steam systems with radiators, floor or wall furnaces, district heating, heat pumps, etc. Area-dedicated heating systems can be divided into several categories: standalone electric heaters, fireplaces, and stand-alone stoves using oil products or other fuels, such as coal or wood. It is not rare that households use a combination of several systems, e.g. electrical heaters to complement insufficient base central systems. Heating systems can generate heat using a number of energy sources such as electricity, natural gas, coal, fuel oil, liquefied petroleum gas (LPG), kerosene, biofuels, and active or passive solar energy.
Services space cooling	S_SPACE_C	Represents the services sector space cooling end use. Space cooling includes all equipment used for cooling a living area, which can be divided into two broad categories: central cooling systems and room-dedicated systems. Central air conditioners feed into a duct system that could also be used by a central heating system. Wall air conditioners and split systems are used to cool a room. There are other possible cooling systems such as swamp coolers (or evaporative coolers), which cool air through evaporation of water; heat pumps that can be used in reverse mode to cool the air or district cooling. Most of the cooling systems in the residential sector run exclusively on electricity.
Services lighting	S_LIGHTING	Services lighting includes energy consumed for interior or exterior lighting in the services sector today mainly powered by electricity.
Other building energy use	S_NONSPEC	Other building energy use includes all consumption in the services sector for uses that are not space heating, space cooling and lighting. If data for one or more uses specified above (space heating, space cooling & lighting) are not available, then Other building energy use should also include data for consumption in these uses. i.e. other = total - (space heating + space cooling + lighting)
Non-building energy use	S_GENERIC	Includes all the consumption that happens in the services sector outside buildings (e.g. street lighting etc.)
Sewerage, waste and remediation [ISIC 37-39]	S_SEWWASTE	Includes sewerage, waste collection and remediation activities [ISIC Divisions 37 to 39].

Flow	Short name	Definition
Wholesale and retail [ISIC 46-47]	S_RETAIL	Includes wholesale and retail trade, except of motor vehicles and motorcycles [ISIC Divisions 46 and 47].
Warehousing, support for transport, postal [ISIC 52-53]	S_WARETRA	Includes warehousing and support activities for transportation and postal and courier activities [ISIC Divisions 52 and 53].
Accommodation and food [ISIC 55-56]	S_ACCFOOD	Includes accommodation, and food and beverage service activities [ISIC Divisions 55 and 56].
Information and communication [ISIC 58-63]	S_IC	Includes publishing, video and television programme production, broadcasting, telecommunications, computer programming and information service activities [ISIC Divisions 58 to 63].
Finance, insurance, real estate, science, admin [ISIC 64-82]	S_OFFICE	Includes financial service activities, insurance, real estate, legal and accounting, head offices and management consultancy, architectural and engineering, scientific research, advertising and market research, veterinary, rental and leasing, employment, travel agency, security and investigation, building and landscape and office administrative activities [ISIC Divisions 64 to 82].
Public admin, excluding defence [ISIC 84]	S_PUBLIC	Includes public administration, excluding defence activities [ISIC Division 84 (excluding Class 8422)].
Education [ISIC 85]	S_EDU	Includes all education activities [ISIC Division 85].
Health and social work [ISIC 86-88]	S_HEALTH	Includes human health, residential care and social work activities without accommodation [ISIC Divisions 86 to 88].
Arts, entertainment and recreation [ISIC 90-93]	S_ARTS	Includes arts, entertainment, libraries, gambling, sports, amusement and recreation activities [ISIC Divisions 90 to 93].
Other services [ISIC 33; 45; 94-96; 99]	S_OTHER	Includes repair and installation of machinery and equipment [ISIC Division 33], wholesale and retail trade and repair of motor vehicles and motorcycles [ISIC Division 45], activities of membership organizations, repair of computers and household goods, and other personal service activities [ISIC Divisions 94 to 96], and activities of extraterritorial organizations and bodies [ISIC Division 99].

## Industry

Flow	Short name	Definition
Manufacturing [ISIC 10-18, 20-32]	M_TOTAL	Includes all the manufacturing sub-sectors listed below [ISIC Rev. 4 Divisions 10 to 18 and 20 to 32]. Manufacture of coke and refined petroleum products [ISIC Division 19] is excluded from Manufacturing.
Food and tobacco [ISIC 10-12]	M_FOOD	Includes food, beverages and tobacco manufacturing [ISIC Divisions 10 to 12].
Textiles and leather [ISIC 13-15]	M_TEXTILE	Includes textiles and leather [ISIC Divisions 13 to 15].
Wood and wood products [ISIC 16]	M_WOOD	Includes wood and wood products (other than pulp and paper) [ISIC Division 16].
Paper pulp and printing [ISIC 17-18]	M_PAPPRINT	Includes paper, pulp and printing [ISIC Divisions 17 and 18].

Flow	Short name	Definition
Chemicals and chemical products [ISIC 20-21]	M_INDCHEMS	Includes chemical and petrochemical industry [ISIC Divisions 20 and 21] excluding petrochemical feedstocks.
Rubber and plastic [ISIC 22]	M_RUBPLAST	Includes rubber and plastics [ISIC Division 22]. If not available could be included under non-specified manufacturing.
Non-metallic minerals [ISIC 23]	M_NONMETAL	Includes non-metallic minerals such as glass, ceramic, cement, etc. [ISIC Division 23].
Of which: cement	M_CEMENT	Include the energy used for the production of cement [ISIC Division 23 Class 94]. This Class is included under Non-Metallic Minerals [ISIC Division 23].
Basic metals [ISIC 24]	M_METALS	Includes manufacture and casting of ferrous metals and non-ferrous metals [ISIC Division 24].
Ferrous metals [ISIC 2410+2431]	M_FERROUS	Covers manufacture and casting of iron and steel including energy used in blast furnaces and coke ovens [ISIC Class 2410 and Class 2431].
Non-ferrous metals [ISIC 2420+2432]	M_NONFERRO	Includes manufacture and casting of non-ferrous metals (e.g. aluminium) [ISIC Class 2420 and Class 2432].
Machinery [ISIC 25-28]	M_MACHINE	Includes machinery: fabricated metal products, machinery and equipment other than transport equipment [ISIC Divisions 25 to 28].
Transport equipment [ISIC 29-30]	M_CARS	Includes [ISIC Divisions 29 and 30].
Other manufacturing [ISIC 31-32]	M_OTHERS	Includes the manufacture of furniture and other manufacturing (e.g. jewellery) [ISIC Divisions 31 and 32].
Non-specified manufacturing	M_NONSPEC	Represents energy use in manufacturing that cannot be allocated to the previous categories.
Coke and refined petroleum products [ISIC 19]	M_REFINING	<p>This division includes the transformation of crude petroleum and coal into usable products [ISIC Division 19]. The dominant process is petroleum refining, which involves the separation of crude petroleum into component products through such techniques as cracking and distillation. This division also includes the manufacture for own account of characteristic products (e.g. coke, butane, propane, petrol, kerosene, fuel oil etc.) as well as processing services (e.g. custom refining).</p> <p>This division includes the manufacture of gases such as ethane, propane and butane as products of petroleum refineries.</p> <p>Not included is the manufacture of such gases in other units, manufacture of industrial gases (Class 2011), extraction of natural gas (methane, ethane, butane or propane) (Class 0600), and manufacture of fuel gas, other than petroleum gases (e.g. coal gas, water gas, producer gas, gasworks gas) (Class 3520).</p> <p>The manufacture of petrochemicals from refined petroleum is classified in division 20.</p>
Agriculture, forestry and fishing [ISIC 01-03]	O_AGROFISH	Includes agriculture, forestry and fishing [ISIC Divisions 01 to 03].
Mining [ISIC 05-09]	O_MINING	Covers mining and quarrying including coal, oil and gas extraction [ISIC Divisions 05 to 09].
Construction [ISIC 41-43]	O_CONSTR	Includes [ISIC Divisions 41 to 43].

## Transport

Flow	Short name	Definition
Total passenger and freight transport	TOTAL	<p>Transport covers all transport modes using commercial energy, independently of the sector where the transport activity occurs. As a consequence, cycling, walking or sailing are not covered in this sector, even though these modes could represent sizeable activities in terms of passenger-kilometres (pkm).</p> <p>Transport excludes international marine and aviation bunkers, pipeline transportation, and when possible fuel tourism (unlike world energy balances). Transport also excludes consumption in infrastructures, such as stations, terminals or warehouses, which are reported under the relevant services categories.</p> <p>The transport sector is divided by segment (passenger and freight), mode (road, rail, air and water) and by vehicle type (e.g. cars, motorcycles, etc.).</p>
Total passenger transport	P_TOTAL	Includes all mode of transportation dedicated to transporting passengers.
Cars/light trucks	P_CARS	Includes passenger light-duty vehicles carrying up to eight persons, cars, minivans, sport utility vehicles and personal-use pickup trucks. <sup>6</sup> Passenger cars cover a number of categories, such as taxis, hire cars, ambulances and motor homes.
Of which: cars	P_OCARS	This includes mini and small cars (minicompact and subcompact), medium cars or small family cars (compact), large or large family cars (mid-size), executive and luxury cars (large) and sport coupés (two-seaters).
Motorcycles	P_MCYCL	Includes powered 2- to 4-wheeled road motor vehicles not exceeding 400 kilograms.
Buses	P_BUS	Includes urban, suburban and intercity mini-coaches, trolleybuses, minibuses and bus vehicles.
Passenger trains	P_RAIL	Includes any movement of passengers through railway, on a given railway network, regional, urban or suburban, within the national boundaries. Passenger rail transport includes trains, metro vehicles and trams (streetcars). Rail transport can be powered by electricity, diesel or steam.
Of which: metro and light rail	P_MRAIL	Metro includes high-frequency services within or at the boundaries of cities, which are fully separated from other traffic. Light rail includes tramways and other transport systems moved on tracks.
Of which: conventional rail	P_CRAIL	Includes medium- to long-distance train journeys with a maximum speed under 250 kilometres per hour and suburban train journeys connecting urban centres with surrounding areas.
Of which: high-speed rail	P_HRAIL	Includes rail services over long distances between stations, operating at a maximum speed above 250 kilometres per hour.

<sup>6</sup> For some countries, pick-up trucks are reported either in passenger transport or freight transport according to their main use. For country-specific information, please refer to the chapter on *Country notes*.

Flow	Short name	Definition
Domestic passenger airplanes	P_AIR	Includes passenger airplanes, aircrafts configured for the transport of passengers, used for domestic travels. For country-specific coverage, please refer to country notes.
Domestic passenger ships	P_WATER	Covers the movement of passengers, by any kind of vessel, boat or ship, undertaken at sea, or on lakes and rivers, within the national boundaries. International water transport is excluded from national totals, while inland waterways transport is included. For country-specific coverage, please refer to country notes.
Total freight transport	F_TOTAL	Includes all mode of transportation dedicated to transporting goods.
Freight trucks	F_TRUCKS	Covers the movement of goods within the national boundaries by road vehicles designed, exclusively or primarily, to carry goods: light-duty freight vehicles (vans and pickups), heavy-duty goods vehicles (trucks or lorries), road tractors, and agricultural tractors permitted to use roads open to public traffic.
Of which: light commercial vehicle (< 3.5t)	F_LTRUCKS	Includes pickups, vans and small trucks with a gross vehicle weight (GVW) of less than 3.5 tonnes.
Freight trains	F_RAIL	Includes any movement of goods by railway vehicles on a given railway network, regional, urban or suburban, within the national boundaries. Rail transport can be powered by electricity, diesel or steam.
Domestic freight airplanes	F_AIR	Covers the movement of goods by aircrafts configured for the transport of freight or mail, operating within the national boundaries. For country-specific coverage, please refer to country notes.
Domestic freight ships	F_WATER	Covers the movement of goods by any kind of vessel, boat, barge or ship, undertaken at sea, or over lakes and rivers, within the national boundaries. International water transport is excluded from national totals, although it has been the largest carrier of freight throughout recorded history. For country-specific coverage, please refer to country notes.
Total road	ROAD	It includes passenger (cars, motorcycles, buses) and freight (trucks) road transportation.
Total trains	RAIL	It includes passenger and freight trains transportation.
Total airplanes	AIR	It includes domestic passenger and freight airplanes.
Total ships	WATER	It includes domestic passenger and freight ships and excludes fuel used for ocean, coastal and inland fishing (included under agriculture) and military consumption.

## Decomposition

Flow	Short name	Definition
Total	TOTAL	Includes Agriculture, forestry and fishing [ISIC 01-03], Mining [ISIC 05-09], Manufacturing [ISIC 10-18, 20-32], Construction [ISIC 41-43], Total passenger and freight transport, Total Residential and Total Services excluding Non-building energy use.

Total industry and services	C_TOTAL	Includes Agriculture, forestry and fishing [ISIC 01-03], Mining [ISIC 05-09], Manufacturing [ISIC 10-18, 20-32], Construction [ISIC 41-43], and Total Services [ISIC 33, 37-39, 45-96 excl. 8422, 99] excluding Non-building energy use.
Total residential	R_TOTAL	Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Divisions 97 and 98] which are a small part of total residential consumption. The different end uses within the residential sector are described below.
Total passenger transport	P_TOTAL	Includes all mode of transportation dedicated to transporting passengers.
Total freight transport	F_TOTAL	Includes all mode of transportation dedicated to transporting goods.



# Product definitions

## Products

Flow	Short name	Definition
Oil and oil products (PJ)	E_OIL	Includes crude oil, natural gas liquids, refinery feedstocks, additives as well as other hydrocarbons (including emulsified oils, synthetic crude oil, mineral oils extracted from bituminous minerals such as oil shale, bituminous sand, etc., and oils from coal liquefaction), refinery gas, ethane, LPG, aviation gasoline, motor gasoline, jet fuels, kerosene, gas/diesel oil, fuel oil, naphtha, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and other oil products.  Data shown for the transport sector in this publication present the disaggregation of oil products described below.
Motor gasoline (PJ)	E_GASOL	It is light hydrocarbon oil for use in internal combustion engines such as motor vehicles, excluding aircraft. Motor gasoline is distilled between 35°C and 215°C and is used as a fuel for land based spark ignition engines. Motor gasoline may include additives, oxygenates and octane enhancers, including lead compounds such as TEL (tetraethyl lead) and TML (tetramethyl lead). In this publication and differently from the IEA energy balances, motor gasoline for transport includes liquid biogasoline or ethanol.
Diesel and light fuel oil (PJ)	E_DIESEL	Includes diesel oil for fuel use in compression ignition (diesel) engines fitted in road vehicles. Distillation range is 160°C to 380°C. In this publication and differently from the IEA energy balances, diesel for transport includes liquid biodiesels.
LPG (PJ)	E_LPG	LPG are light paraffinic hydrocarbons derived from refinery processes, crude oil stabilisation plants and natural gas processing plants. They consist mainly of propane (C <sub>3</sub> H <sub>8</sub> ) and butane (C <sub>4</sub> H <sub>10</sub> ) or a combination of the two. They could also include propylene, butylene, isobutene and isobutylene. LPG are normally liquefied under pressure for transportation and storage.
Heavy fuel oil (PJ)	E_HFO	Fuel oil defines oils that make up the distillation residue. It comprises all residual fuel oils, including those obtained by blending. Its kinematic viscosity is above 10 cSt at 80°C. The flash point is always above 50°C and the density is always higher than 0.90 kg/l.
Jet fuel and aviation gasoline (PJ)	E_JETF	Includes Gasoline type jet fuel and Kerosene type jet fuel as described below:  Gasoline type jet fuel includes all light hydrocarbon oils for use in aviation turbine power units, which distil between 100°C and 250°C. This fuel is obtained by blending kerosenes and gasoline or naphtha in such a way that the aromatic content does not exceed 25% in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa. Additives can be included to improve fuel stability and combustibility.  Kerosene type jet fuel is a medium distillate used for aviation turbine power units. It has the same distillation characteristics and flash point as kerosene (between 150°C and 300°C but not generally above 250°C). In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport

Flow	Short name	Definition
		Association (IATA). It includes kerosene blending components. Kerosene type jet fuel excluding the liquid biofuels blended with jet kerosene.
Gas (PJ)	E_GAS	Gas includes natural gas (excluding natural gas liquids).
Coal and coal products (PJ)	E_COAL	Coal includes all coal, both primary (including hard coal and lignite) and derived fuels (including patent fuel, coke oven coke, gas coke, BKB, gas works gas, coke oven gas, blast furnace gas and other recovered gases), as well as peat (including peat products) and oil shale.
Biofuels and waste (PJ)	E_WOOD	<p>Biofuels and waste comprises solid biofuels, liquid biofuels, biogases, industrial and municipal waste. Biofuels and waste data are often based on incomplete information, with particularly high caution on data quality.</p> <p>Solid biofuels are defined as any plant matter used directly as fuel or converted into other forms (e.g. charcoal) before combustion. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes also known as black liquor, animal materials/waste and other solid biofuels).</p> <p>Liquid biofuels include biogasoline, biodiesel and other liquid biofuels. Liquid biofuels consumed in the transport sector are included, in this publication, under motor gasoline and diesel.</p> <p>Biogases comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation.</p> <p>Note that biofuels refer only to the amounts of biomass specifically used for energy purposes. Therefore, the non-energy use of biofuels is null by definition.</p> <p>Municipal waste consists of products that are combusted directly to produce heat and/or power and comprises waste produced by households, hospitals and the tertiary sector that are collected by local authorities for incineration at specific installations.</p> <p>Industrial waste of non-renewable origin consists of solid and liquid products (e.g. tyres) combusted directly, usually in specialised plants, to produce heat and/or power.</p>
Heat (PJ)	E_DHEAT	<p>Heat includes all heat produced by main activity producer CHP and heat plants, as well as heat sold by autoproducer CHP and heat plants to third parties.</p> <p>Fuels used to produce quantities of heat for sale are included in transformation processes under the rows <i>CHP plants</i> and <i>Heat plants</i>. The use of fuels for heat which is not sold is included under the sectors in which the fuel use occurs.</p>
Electricity (PJ)	E_ELEC	Electricity includes electricity generated from all sources.
Other sources (PJ)	E_OTHER	Other includes all the forms of energy not included in the list above (e.g. geothermal and solar thermal heat direct use etc.).
Of which: solar thermal (PJ)	E_SOLTHERM	Specifies the amount of solar thermal heat direct use for water heating reported in "Other sources" consumption for water heating purposes.

Flow	Short name	Definition
Total final energy use (PJ)	E_FINAL	Represents total consumption of energy including all the products listed above.
Total Final Emissions (MtCO <sub>2</sub> )	C_FINAL	Represents total CO <sub>2</sub> emissions from all reported energy uses of fuels, excluding emissions from non-energy use of fuels and from biofuels and waste, and including emissions reallocated from electricity and heat generation.  The IPCC methodology does not assign any CO <sub>2</sub> emissions to fuel use of biofuels per se, unless it is used in an unsustainable way. This is true for all the sectors except for the transport sector where “motor gasoline” and “diesel and light fuel oil” products also include liquid biofuels. Therefore, total final emissions from the transport flows that contain any of these 2 products also account for biofuels CO <sub>2</sub> emissions.

## Activity data

Flow	Short name	Definition
Population (10 <sup>6</sup> )	ACT_POP	Total population.
Occupied dwellings (10 <sup>6</sup> )	ACT_DWEL_OCC	Includes only primary residences excluding unoccupied dwellings and secondary residences.
Share of occupied dwellings heated by oil products (%)	ACT_DWEL_OIL	Includes share of occupied dwellings mainly heated by oil products.
Share of occupied dwellings heated by gas (%)	ACT_DWEL_GAS	Includes share of occupied dwellings mainly heated by natural gas.
Share of occupied dwellings heated by biofuels (%)	ACT_DWEL_REN	Includes share of occupied dwellings mainly heated by biofuels.
Share of occupied dwellings heated by district heating (%)	ACT_DWEL_HEAT	Includes share of occupied dwellings mainly heated by district heating.
Share of occupied dwellings heated by electricity (%)	ACT_DWEL_ELE	Includes share of occupied dwellings mainly heated by electricity.
Residential floor area (10 <sup>9</sup> m <sup>2</sup> )	ACT_R_AREA	Includes only floor area of occupied dwellings.
Heating degree days (10 <sup>3</sup> )	ACT_H_DDAYS	Heating Degree Days (HDD) are a simplified measure of the intensity and duration of cold weather over a certain period in a given location. The value of HDD for a period, for example a winter, is determined by subtracting for each day the average daily temperature from a base temperature (assumed to be the temperature below which heating systems are turned on), and then adding up this difference for the days of the period for which the average outside air temperature is lower than the base temperature. When the outside air temperature is equal to or higher than the base temperature, HDD are zero. The higher heating degree days, the colder the season, the greater the amount of energy required for space heating.

Flow	Short name	Definition
Cooling degree days (10 <sup>3</sup> )	ACT_C-DDAYS	Similarly to HDD, cooling degree days (CDD) are a measure of the intensity of warm weather to correct energy consumption data for space cooling. In this publication, temperature correction are made only for calculating intensity indicators, therefore energy consumption data show the fluctuations due to temperature change. Space cooling is temperature corrected only for countries where CDD are data available.
Stocks (million units)	ACT_STOCK	Includes stock of appliances within occupied dwellings.
Peak power (MWp)	ACT_POWER	Peak power of photovoltaic device is the maximum electrical power that it can generate under the standard measurement conditions.
Services employment (10 <sup>6</sup> )	ACT_S-EMPLOY	Includes the employment total in full-time equivalents in the services sector. The number of full-time equivalent jobs, defined as total hours worked divided by average annual hours worked in full-time jobs. In some cases it refers to services' employment total in persons.
Services floor area (10 <sup>9</sup> m <sup>2</sup> )	ACT_S-AREA	Includes only floor area of services' buildings.
Value added (10 <sup>9</sup> USD PPP 2015)	ACT_GDP_P	Value added in USD at the price level and purchasing power parities (PPPs) <sup>7</sup> of the year 2015.
Cement production (10 <sup>6</sup> t)	ACT_CEMENT	Includes the production of cement in tons. It excludes trades.
Steel production (10 <sup>6</sup> t)	ACT_STEEL	Includes the production of steel in tons. It excludes trades.
Passenger-kilometres (10 <sup>9</sup> pkm)	ACT_PKM	Pkm is a unit of measure of passenger transport activity. One passenger-kilometre represents the transport of one passenger over one kilometre. For all vehicles, it is the total distance travelled of all passengers summed up.
Tonne-kilometres (10 <sup>9</sup> tkm)	ACT_TKM	Tkm is a unit of measure of goods transport activity. One tonne-kilometre represents the transport of one tonne over one kilometre. For all vehicles, it is the total distance travelled of all tonnes summed up.
Vehicle-kilometres (10 <sup>9</sup> vkm)	ACT_VKM	Vkm is a unit of measure of vehicle activity. One vehicle-kilometre represents the movement of a vehicle over one kilometre. For all vehicles, it corresponds to the product of the number of vehicles in stock and the average distance travelled by vehicle.
Vehicle stock (10 <sup>6</sup> )	ACT_VST	Represents the total stock of vehicles (by type) registered in the country.

<sup>7</sup> Purchasing power parities are the rates of currency conversion that equalise the purchasing power of different currencies.

# Indicator definitions

## Energy and general indicators

Flow	Short name	Definition
Per capita energy intensity (GJ/cap)	EI_PC	Energy intensity per capita calculated as energy consumption divided by total population.
Per floor area energy intensity (GJ/m <sup>2</sup> )	EI_FA	Energy intensity per floor area (residential or services) calculated as energy consumption divided by floor area.
Per floor area TC energy intensity (GJ/m <sup>2</sup> )	EI_FA_TC	Energy intensity per floor area (residential or services) calculated as energy consumption divided by floor area (temperature corrected to take into account different average temperatures in different years).
Per dwelling energy intensity (GJ/dw)	EI_PD	Energy intensity per occupied dwelling calculated as energy consumption divided by occupied dwellings.
Per dwelling TC energy intensity (GJ/dw)	EI_PD_TC	Energy intensity per occupied dwelling calculated as energy consumption divided by occupied dwellings (temperature corrected to take into account different average temperatures in different years).
Per unit equipment energy intensity (GJ/unit)	EI_PU	Energy intensity per unit of appliance. It is calculated as energy consumption divided by the number of appliances within occupied dwellings. It represents the average unit consumption of each type of appliance in the country.
Per value added energy intensity (MJ/USD PPP 2015)	EI_GDP	Energy intensity per value added (USD PPP 2015). It is calculated as the ratio between energy consumption and value added.
Per services employee energy intensity (GJ/employee)	EI_PE	Energy intensity per employee calculated as energy consumption divided by employees (services sector only).
Per physical output energy intensity (GJ/t)	EI_PHYSICAL	Energy intensity per physical output calculated as energy consumption divided production of cement or steel.
Fuel intensity (litres/100 vkm)	EI_FUEL_INT	Fuel intensity calculated as litres consumed to drive 100 km.
Passenger-kilometres energy intensity (MJ/pkm)	EI_PKM	Represents the energy consumed to drive one passenger over the distance of one kilometre.
Vehicle-kilometres energy intensity (MJ/vkm)	EI_VKM	Represents the energy consumed to drive one vehicle over the distance one kilometre.
Tonne-kilometres energy intensity (MJ/tkm)	EI_TKM	Represents the energy consumed to transport one tonne of goods over a distance of one kilometre.
Passenger-kilometres per capita (10 <sup>3</sup> pkm/cap)	EI_PKM_PC	Represents the ratio between passenger-kilometre and total population.
Passenger load factor (pkm/vkm)	EI_LOAD_P	Represents the average number of passengers per vehicle. It can be calculated dividing pkm by vkm.

Flow	Short name	Definition
Vehicle-kilometres per capita (10 <sup>3</sup> vkm/cap)	EI_VKM_PC	Represents the ratio between vehicle-kilometre and total population.
Vehicle use (10 <sup>3</sup> vkm/vehicle)	EI_VUSE	Represents the ratio between vehicle-kilometre and vehicle stock.
Tonne-kilometres per capita (10 <sup>3</sup> tkm/cap)	EI_TKM_PC	Represents the ratio between tonne-kilometre and total population.
Freight load factor (tkm/vkm)	EI_LOAD_F	Represents the average tonnes of goods transported by one vehicle. It can be calculated dividing tkm by vkm.

## Carbon indicators

Flow	Short name	Definition
Per capita carbon intensity (tCO <sub>2</sub> /cap)	CI_PC	Carbon intensity per capita is calculated as tonnes of CO <sub>2</sub> divided by total population. <sup>8</sup>
Per floor area carbon intensity (tCO <sub>2</sub> /m <sup>2</sup> )	CI_FA	Carbon intensity per floor area is calculated as emissions divided by floor area (residential or services).
Per dwelling carbon intensity (tCO <sub>2</sub> /dw)	CI_PD	Carbon intensity per dwelling is calculated as emissions divided by occupied dwellings.
Per unit equipment carbon intensity (tCO <sub>2</sub> /unit)	CI_PU	Carbon intensity per unit of appliance is calculated as emissions divided by the number of appliances within occupied dwellings. It represents the average emissions from each type of appliance in the country.
Per value added carbon intensity (kgCO <sub>2</sub> /USD PPP 2015)	CI_GDP	Carbon intensity per value added (USD PPP 2015). It is calculated as the ratio between emissions and value added.
Per services employee carbon intensity (tCO <sub>2</sub> /employee)	CI_PE	Carbon intensity per employee calculated as emissions divided by employees (services sector only).
Per physical output carbon intensity (tCO <sub>2</sub> /t)	CI_PHYSICAL	Carbon intensity per physical output calculated as emissions divided production of cement or steel.
Passenger-kilometres carbon intensity (kgCO <sub>2</sub> /pkm)	CI_PKM	Represents the carbon emitted to drive one passenger over the distance of one kilometre.
Vehicle-kilometres carbon intensity (kgCO <sub>2</sub> /vkm)	CI_VKM	Represents the carbon emitted to drive one vehicle over the distance one kilometre.
Tonne-kilometres carbon intensity (kgCO <sub>2</sub> /tkm)	CI_TKM	Represents the carbon emitted to transport one tonne of goods over a distance of one kilometre.

<sup>8</sup> Consistent with the IEA (2022) *Greenhouse Gas Emissions from Energy* publication.

## Decomposition

Flow	Short name	Definition
Decomposition actual amount (PJ; MtCO <sub>2</sub> )	A_V	Actual energy consumption (or carbon emissions) included for the decomposition analysis. This may differ from the total energy consumption of a country depending on data availability.
Hypothetical amount due to activity (PJ; MtCO <sub>2</sub> )	HEU_ACT	Defined as the energy consumption (or carbon emissions) that would have occurred in year <i>t</i> if the activity in each sector remained constant at their base year values.
Hypothetical amount due to structure (PJ; MtCO <sub>2</sub> )	HEU_STR	Defined as the energy consumption (or carbon emissions) that would have occurred in year <i>t</i> if energy intensities in each sector remained constant at their base year values.
Hypothetical amount due to efficiency (PJ; MtCO <sub>2</sub> )	HEU_INT	Defined as the energy consumption (or carbon emissions) that would have occurred in year <i>t</i> if energy intensities in each sector remained constant at their base year values.
Hypothetical amount due to carbon intensity (MtCO <sub>2</sub> )	HEU_CINT	Defined as the carbon emissions that would have occurred in year <i>t</i> if carbon intensities in each sector remained constant at their base year values.
Savings due to activity (PJ; MtCO <sub>2</sub> )	SAV_ACT	Defined as the difference between the hypothetical amount due to activity and the actual energy consumption (or carbon emissions).
Savings due to structure (PJ; MtCO <sub>2</sub> )	SAV_STR	Defined as the difference between the hypothetical amount due to structure and actual energy consumption (or carbon emissions).
Savings due to efficiency (PJ; MtCO <sub>2</sub> )	SAV_INT	Defined as the difference between the hypothetical amount due to efficiency and actual energy consumption (or carbon emissions).
Savings due to carbon intensity (MtCO <sub>2</sub> )	SAV_CINT	Defined as the difference between the hypothetical amount due to carbon intensity and actual carbon emissions.

# Country notes

## IEA member countries

### *General notes*

The notes given in this section refer to data for the years 2000 to 2020 published in the most recent edition of the online data service.

Data are generally obtained from national administrations through annual submission of the energy efficiency indicators questionnaire. In case other sources are used, e.g. the Odyssee database, this is indicated in the relevant country sources section.

In case of estimates made by the IEA secretariat, explanations of the estimates are provided in the respective country notes.

## IEA total

### *Sources*

IEA secretariat estimates.

### *Years covered*

2000–2020.

### *General note*

The IEA total is estimated using the data of the individual countries and estimating the gaps with third parties' data where possible. The IEA total includes the following countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Lithuania, Luxembourg, the Netherlands, New Zealand, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States.

The data for IEA total are only presented through the graph tabs in the Excel file of this publication.



## Australia

### *Sources*

Australian Government, Department of Industry, Science, Energy and Resources.

### *Years covered*

2000-2020.

### *General note*

All energy data refer to financial years (e.g. July 2019 to June 2020 for 2020). The macroeconomic activity data are of calendar year (e.g. January 2020 to December 2020 for 2020).

There are some discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to improve consistency.

### *Residential sector*

Data for TVs include TVs only. Data for home entertainment are reported under other appliances.

Data for energy consumption of swimming pools and spas are included under other appliances. Data for energy consumption of natural gas for swimming pools and spa heaters are included in other appliances, other energy sources.

Data for energy consumption and stocks of refrigerators are not available.

### *Industry and services sectors*

Data for value added have been revised for most industry subsectors due to the change from financial year to calendar year.

Data for value added of textiles [ISIC 13-15] and non-metallic minerals [ISIC 23] are available from the year 2002 onwards.

Data for energy consumption of paper and printing [ISIC 17-18] also include wood [ISIC 16].

Data for value added of wood [ISIC 16], paper [ISIC 17], printing [ISIC 18], paper and printing [ISIC 17-18], rubber and plastic [ISIC 22], and other manufacturing [ISIC 31-32] are available from the year 2007 onwards.

Data for energy consumption for chemicals [ISIC 20-21] also include rubber and plastics [ISIC 22] and manufacture of coke and refined petroleum products [ISIC 19].

Data for value added for chemicals [ISIC 20-21] does not include rubber and plastics [ISIC 22], and include manufacture of coke and refined petroleum products [ISIC 19].

Data for energy consumption of biofuels and waste for non-metallic minerals [ISIC 23] have been revised in 2021.

Data for energy consumption for cement production are not available.

Data for energy consumption and value added for machinery [ISIC 25-28] include transport equipment [ISIC 29-30].

Data for energy consumption by service category are not available.

Data for services employment are not available for the year 2018-2020.

Data for services floor area are not available.

### *Transport sector*

Most of activity data have been slightly revised from the last cycle.

Data for vehicle kilometres and vehicle stocks for rail transport are not available.

Data for energy consumption for passenger cars, buses, passenger trains, trucks, and freight trains have been revised from 2017.

Data for natural gas consumption of freight trains are reported under other fuels category.

## **Austria**

### *Sources*

Energie-Control Austria, on behalf of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology; Odyssee database.

### *Years covered*

2000–2020.

### *Residential sector*

There is a break in time series for energy consumption for lighting for the year 2013.

Data for unit energy consumption are based on the IEA secretariat estimates.

Data for energy consumption and appliances stocks of refrigerators are not available.

Data for energy consumption of PC/ICTs includes home entertainment, and present a break in 2005. The whole data series for PC/ICTs have been revised. Data for appliances stocks of PCs are not available.

Data for total dwellings in 2019 are based on IEA secretariat estimates.

### *Industry and services sectors*

Data on energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified, while data for value added are reported separately.

Data for value added of basic metals [ISIC 24] show a significant decrease in 2009, leading to a considerably higher intensity in that year. This does not necessarily reflect physical intensities, as it is based on economic data.

Data for energy consumption of cement production are available from the year 2002 onwards.

Data for services energy consumption by end use are only available for space heating.

Data for services energy consumption by sub-sector are not available.

Data for services floor area are not available.

### *Transport sector*

There are some discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to improve data consistency.

Data for energy consumption and activity of the transport sector for the year 2019 are based on the IEA secretariat estimates, and are not available for 2020.

Data for energy consumption of passenger cars, buses, passenger trains, freight road transport, and freight trains for the year 2018 are based on the IEA secretariat estimates.

Data for energy consumption and activity (passenger-kilometres and tonne-kilometres) of freight airplanes and passenger ships are not available. Their energy consumption might be partially included under passenger airplanes and freight ships data, respectively.

## Belgium

### *Sources*

Direction Générale de l'Energie – Ministry of Energy; Odyssee database.

### *Years covered*

2000–2020.

### *Residential sector*

Data for energy consumption of the residential sector by end use are available from the year 2010 onwards. Data have been revised for the years 2016 onwards.

Data for energy consumption of residential appliances include lighting.

Data for energy consumption of appliances by appliance type are not available. Total appliances consumption is included under other appliances.

Data for unit energy consumption of appliances are not available.

Data for residential floor area for the years 2000 and 2002 onwards are based on IEA estimates.

### *Industry and services sectors*

Some data for energy consumption from natural gas and electricity for some industry sub-sectors up to 2004 are based on IEA estimates.

Energy consumption data have been revised for every industrial subsectors, over the periods for which data is not based on IEA estimates.

Data on energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified, while data for value added are reported separately.

Data for services energy consumption by end use are not available.

Data for energy consumption of services by subsector are available from 2014 onwards for electricity consumption of wholesale and retail trade [ISIC 46-47],

financial, insurance, real estate, scientific, and administrative activities [ISIC 64-82], public administration [ISIC 84], education [ISIC 85] and health, social work [ISIC 86-88], and other services activities. Other services activities includes all other services subsectors.

### *Transport sector*

There is a break in 2012 on the consumption of diesel and light fuel oil data for freight trains, which is under investigation, and may be subject to revisions in the future.

Data for energy consumption for domestic freight airplanes and domestic passenger ships are not available; it may be partially included in domestic passenger airplanes and domestic freight ships, respectively.

Data for energy consumption for cars, motorcycles, buses, passenger trains and trucks have been revised for most of, or the whole, time series.

Transport activity data for passenger-kilometres for cars, motorcycles and buses are estimated for 2018-2019 and are not available for 2020; data for tonne-kilometres for trucks are estimated for 2018 and are not available for 2019-2020.

Data for passenger-kilometres for passenger trains (of which metro and light rail) for 2019-2020 and for tonne-kilometres for freight trains from 2012 are country estimates.

## **Canada**

### *Sources*

Natural Resources Canada, Statistics Canada.

### *Years covered*

2000–2020.

### *General note*

Differences between the IEA energy efficiency indicators and the IEA energy balances result from different timing of reporting requirements, sources used, as well as definitions and scope of coverage. Work is ongoing to align the two databases.

Detailed energy use information for Canada is available at [Canada's National Energy Use Database](#).

### *Residential sector*

Data for energy consumption and stocks of refrigerators are not available.

### *Industry and services sectors*

There were some revisions of oil products and/or gas consumption data for most industry sub-sectors, including agriculture [ISIC 01-03], mining and quarrying [ISIC 05-09], food [ISIC 10-12], textiles ISIC [13-15], wood [ISIC 16], and pulp and paper [ISIC 17].

Sub-sectoral data reported in some fuel categories have been combined with other fuels, due to confidentiality issues. For example, energy consumption from electricity and renewables and waste are combined in the food [ISIC 10-12] sub-sector. This occurs for at least one fuel for all subsectors except refined petroleum products [ISIC 19], non-metallic minerals [ISIC 23] and basic metals [ISIC 24]. For this same reason, the total estimates of CO<sub>2</sub> emissions for those sub-sectors were provided directly by the country.

The coal consumption for agriculture [ISIC 01-03], the energy consumption for non-metallic minerals [ISIC 23] for the years 2014 and 2015, as well as other some data points for energy consumption from oil products, coal, heat and electricity of [ISIC 23], were estimated by the IEA secretariat.

Data for coal consumption for non-metallic minerals [ISIC 23] have been revised over the whole time series.

Data for biofuels and waste consumption have been revised over the whole time series, for non-metallic minerals [ISIC 23] (both total and separate account for cement), as well as other manufacturing [ISIC 31-32].

Data for electricity consumption for food [ISIC 10-12] and textiles [ISIC 13-15] have been revised over the whole time series.

Data for services energy consumption by sub-sector are not available.

### *Transport sector*

Data for buses include urban/local light rails (metro trains, light trains and urban buses).

Data for the energy use for air transport include both domestic and international transport. The energy use and activity data for water transport include domestic and transborder, but exclude other international transport.

## Czech Republic

### *Sources*

Czech Statistical Office, Ministry of Industry and Trade and Ministry of Transport; Odyssee database.

### *Years covered*

2000–2020.

### *Residential sector*

Data for energy consumption for space cooling are available from 2015 onwards.

Data on end use energy consumption since 2016 have been collected based on a different methodology than previous time series (a new residential survey), leading to breaks on energy consumption data in 2016 (e.g. clothes washers and dryers), and also on appliances stocks data.

Data on energy consumption of refrigerators, refrigerators/freezer combinations, clothes dryers, PCs and other appliances for the year 2015 are estimated by the IEA secretariat.

Data for energy consumption and stocks of clothes dryers are available from 2004 onwards.

### *Industry and services sectors*

There are discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases, especially for biofuels and waste and electricity in manufacturing sub-sectors. Work is ongoing to improve the consistency of both databases.

Coal and coal products consumption data for mining and quarrying [ISIC 05-09] excludes lignite consumption used for producing energy gas, lignite briquettes, and lignite multi-power. This has created discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases.

Energy consumption data for cement production has been reviewed for the whole time series to exclude the energy used for clinker in the 2021 cycle.

Data for value added of manufacture of coke and refined petroleum products [ISIC 19] are not available for the years 2004-2009.

Data for energy consumption of the services sector by end use are not available.

Data for energy consumption by service category are available since 2017.

Data for services floor area are not available.

### *Transport sector*

Data for transport energy consumption for 2019 are based on IEA secretariat estimates.

Data for vehicle-kilometres of passenger cars for 2001-2004, 2006-2009, 2011-2016, and for passenger trains and domestic passenger ships for the year 2016 are estimated by the IEA secretariat.

Data for vehicle-kilometres of motorcycles, buses, and freight road transport are only available for the years 2000, 2005 and 2010.

Data for energy consumption and passenger-kilometres of motorcycles are not available.

Data for energy consumption for domestic freight airplanes and domestic passenger ships are not available, and might be included under passenger airplanes and freight ships, respectively.

## **Denmark**

### *Sources*

Danish energy agency through the Odyssee database.

### *Years covered*

2000–2020 (partly).

### *General note*

There may be breaks in some time series due to data revisions.

### *Residential sector*

Data for energy consumption of water heating are included under space heating. Data for energy consumption for lighting are included under other appliances.

Data for space cooling, refrigerators and PCs are not available.

Data for energy consumption for 2020 are only available for total residential.



Data for residential activities (occupied dwellings, residential floor area, appliances stocks) for 2020 are not available.

### *Industry and services sectors*

Data for energy consumption of cement production and non-ferrous metals [ISIC 2420+2432] are not available.

Data for energy consumption for services end uses are only available for space heating. Data for energy consumption of services space heating for 2020 are not available.

Data for energy consumption of rubber and plastic [ISIC 22] for 2020 are not available.

Data for energy consumption by service category are not available.

Data for services floor area for 2020 are not available.

### *Transport sector*

Data for transport energy use and activities are not available for the year 2020.

Data for passenger-kilometres of motorcycles are not available.

Data for tonne-kilometres of freight road transport include only Danish registered vehicles with a capacity of over 6 tonnes.

Data on energy consumption of passenger ships and freight airplanes are not available, and may be partially included under freight ships and passenger airplanes, respectively.

## **Estonia**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020 (partly).

### *Residential sector*

Data for energy consumption by end use are available from 2010 onwards. Data for energy consumption of residential appliances include lighting.

Data for energy consumption for space cooling are not available.

Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified.

Data for energy consumption in the services sector by end use are not available.

Data for energy consumption by service category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Finland**

### *Sources*

Statistics Finland and Motiva.

### *Years covered*

2000–2020.

### *General note*

Some discrepancies between the IEA energy efficiency indicators and the IEA energy balances may occur. Work is ongoing to improve consistency between the two datasets.

### *Residential sector*

Data on energy consumption for space heating, and also on number of dwellings, excludes summer houses.

Data for natural gas consumption for cooking and electricity consumption for other appliances has been revised since 2008.

Data on residential floor areas includes common heated areas of buildings, and excludes summer houses.

Data for energy consumption for space cooling are available from the year 2015 onwards.

Data for energy consumption by appliance type, appliances stocks and unit energy consumption are based on IEA secretariat estimates and are discontinued since the year 2018.

Data for energy consumption for refrigerators and PCs are not available.

Data for energy consumption for total residential appliances includes electric saunas and electric preheating of cars.

Data for solar thermal and photovoltaic panels stocks refer to all sectors, not only residential. Data for solar thermal panels stocks are in thousands square meters and not in million units.

Data for cooling degree days are not available for the years 2004, 2007-2009 and 2015-2017.

### *Industry and services sectors*

Data for energy consumption of rubber manufacturing [ISIC 22] are not available due to confidentiality issues.

Data for energy consumption from heat for several industry sub-sectors up to 2006 are based on IEA secretariat estimates.

Data for energy consumption from cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for services energy consumption by end use are only available for space heating. Data for other building energy use includes energy consumption for water heating, lighting, appliances, and street lighting.

Data for services energy consumption by sub-sector are not available.

### *Transport sector*

Data for passenger-kilometres of motorcycles are the same as the respective vehicle-kilometre data (the latter being based on the LIPASTO model), assuming

a one-person occupancy for motorcycle trips, in the absence of more accurate data for passenger-kilometres.

Data for passenger-kilometres of domestic passenger airplanes are not available since the year 2016, which affects total passenger-kilometres of passenger transport. Data for tonne-kilometres for domestic freight airplanes are not available.

Data for vehicle stocks refer to vehicles registered in the country and not vehicles in circulation. Data for stocks of rail transport are not available.

Data for energy consumption from diesel and light fuel oil for passenger ships may be reported together with domestic freight ships up to 2009. Data for energy consumption of ice-breakers are included in freight ships.

Data on energy consumption of freight airplanes are not available and may be partially included under passenger airplanes.

## France

### *Sources*

Ministère de la transition écologique (SDSE – sous-direction des statistiques de l'énergie); Odyssee database.

### *Years covered*

2000–2020.

### *General note*

From 2011 onwards, energy consumption and activity data for France include Monaco, and the overseas departments (Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion); and excludes the overseas collectivities (New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna). For the transport sector both activity and energy consumption data refer only to metropolitan France. Considering overseas departments in transport would have led to significant breaks in the data reported and corresponding indicators (especially in the case of air transport if accounting for long haul flights).

### *Residential sector*

Data for energy consumption of space cooling are available from the year 2001 onwards. They have been revised from 2011 onwards, to include overseas territories, thus leading to a break.

Data for energy consumption and stocks of refrigerators and PCs are not available.

Data for electricity consumption for residential space heating includes electricity consumption from heat pumps.

### *Industry and services sectors*

There may be breaks for electricity and natural gas consumption from some industry sub-sectors for the year 2011, due to a new data collection methodology based on an annual industry survey.

Some data for energy consumption from natural gas and biofuels and waste for some industry sub-sectors before the year 2004 are based on IEA secretariat estimates.

Data on energy consumption of rubber manufacturing [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified.

Data for energy consumption for the services sector from biofuels and waste, heat, and electricity before the year 2014 are based on IEA secretariat estimates.

Data for biofuels and waste for space heating in the services sector includes biomass since the year 2014, while solar thermal and geothermal are gathered with other fuels. Data for electricity consumption for services space heating and other building use includes electricity consumption from heat pumps.

Data for energy consumption for services lighting are not available.

Ambient heat is included in the energy consumption of ISIC services categories (but not in consumption by end use). Coal consumption, as reported in the services consumption by end use, is not included in the consumption by ISIC category.

Data for energy consumption of services by service sub-sector are available since 2014, apart from sewerage and waste collection [ISIC 37-39] which are not available.

Data for value added for 2020 are provisional and may be updated later.

### *Transport sector*

Transport activity and energy consumption data have been revised since the year 2012. Revised data are based on a new information system crossing data on license plate registering and mileages, allowing fine-grain knowledge of the number of vehicles in use (vehicles stock) and traffic (vehicle-kilometres).

In addition, activity data for freight trains (in tonne-kilometres) have been revised from 2017 onwards.

Data for vehicles stocks for road transport refer to vehicles registered, not in circulation (in metropolitan France).

Data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for activity of domestic passenger ships and domestic freight airplanes are not available.

Data for gas consumption from buses only includes the urban buses, assuming it to be close to the total.

Data for gas consumption from freight trucks now includes LNG from 2014 onwards.

## **Germany**

### *Sources*

Federal Ministry for Economic Affairs and Energy, Federal Ministry for Transport and Digital Infrastructure, Federal Statistical Office, Fraunhofer-Gesellschaft.

### *Years covered*

2000–2020.

### *General note*

There are some discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Some differences result from different data scope and definitions. Work is ongoing to align these two datasets.

### *Residential sector*

Data for space cooling are available from 2010 onwards.

Data for biofuels and waste consumption from space heating for the year 2010, as well as data for electricity consumption from space cooling for the years 2010-2012 and from other appliances for the years 2014-2015, are based on IEA secretariat estimations.

Data for appliances stock over the period 2000-2013 are based on IEA secretariat estimations.

Data for energy consumption and appliances stock of refrigerators and PCs are not available.

Data for new dwellings are not available for the year 2020.

There is a break in the time series for floor area of dwellings, for the year 2010, which may affect residential energy intensities. This may be due to the results of the building and housing census from 2011 onwards.

### *Industry and services sectors*

Data for energy consumption of agriculture, forestry and fishing [ISIC 01-03] are based on a national survey.

Data for energy consumption for construction [ISIC 41-43] are available from 2010 onwards.

Data for oil products consumption for agriculture [ISIC 01-03] and construction [ISIC 41-43] have been revised over the period 2010-2019. However, the energy consumption of these sectors are not yet fully consistent with the IEA energy balances database. Work is ongoing to improve alignment between the two databases.

Data for biofuels and waste consumption are based on IEA secretariat estimates, for food [ISIC 10-12] and machinery [ISIC 25-28] for the years 2000-2002, and non-ferrous metals [ISIC 2420+2432] for 2004-2005. Data for heat consumption are based on IEA secretariat estimates, for machinery [ISIC 25-28] for the years 2003-2006.

Data for energy consumption of the services sector by end use are available from 2001 onwards.

Data for energy consumption of the services sector by sub-sector are not available.

Data for services floor area are not available for the year 2020.

### *Transport sector*

Data for passenger-kilometres of motorcycles are not available.

Data for vehicle-kilometres and energy consumption for motorcycles, buses and trucks show a break in 2017 due to a revision confirmed by the country.

Data for energy consumption and activity of passenger ships and freight airplanes (passenger-kilometres and tonne-kilometres, respectively) are not available. They might be partially included under freight ships and passenger airplanes, respectively.

## **Greece**

### *Sources*

Ministry for Environment and Energy (CRES).

### *Years covered*

2000–2020 (partly).

### *Residential sector*

In 2013, taxation on oil products for space heating increased substantially, leading to reduced consumption in the residential sector. According to external sources, the consumption of oil products has been partially replaced by non-commercial solid biofuels not yet reported. This leads to a significant reduction of total space heating consumption in 2013, affecting also the energy intensity of this end use. The space heating intensity shown should, thus, be considered with caution.

Data for the energy consumption for other appliances includes lighting.

Data for energy consumption split by appliance type are not available since the year 2014, and data for energy consumption and stocks of refrigerators and PCs, and energy consumption for clothes dryers are not available.

### *Industry and services sectors*

Data on energy consumption of rubber manufacturing [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified.

Data for energy consumption for cement production are not available since the year 2010.



Data for energy consumption in the services sector by end use are not available.  
Data for energy consumption by service category are not available.

Data for services floor area are not available.

### *Transport sector*

Data for transport energy use and activities are not available for the year 2020.

Data for passenger-kilometres of motorcycles are based on IEA secretariat estimates and discontinued since 2015.

Data for passenger-kilometres of domestic passenger ships are not available.  
Data for tonne-kilometres of domestic freight airplanes and domestic freight ships are not available.

Data for vehicle-kilometres of buses and freight trucks from 2000 to 2009 are based on IEA secretariat estimates.

Data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for energy consumption for passenger ships and freight airplanes might be partially included under freight ships and passenger airplanes, respectively.

## **Hungary**

### *Sources*

Hungarian Energy and Public Utility Regulatory Authority; Odyssee database.

### *Years covered*

2000–2020.

### *General note*

Some breaks in energy consumption data may occur in 2013, resulting from an energy consumption survey introduced in 2014. For instance, some energy consumption was reallocated between industry and services sectors.

### *Residential sector*

Some data for energy consumption across residential end uses for different fuels and years are based on IEA secretariat estimates.

Some breaks in energy consumption data may occur in 2020, resulting from an energy consumption survey in the residential sector in 2020.

Data for energy consumption for other appliances includes all residential appliances and lighting, and may include cooling up to 2010. Data for energy consumption for space cooling is reported separately since the year 2011.

Data for energy consumption by appliance type are not available.

Data for stocks of dish washers are available from 2002 onwards. Data for stocks of clothes dryers are available from 2006 onwards.

Data for unit energy consumption of appliances are not available.

### *Industry and services sectors*

Data for energy consumption for cement production are available from 2020 onwards.

Data for energy consumption for rubber and plastics [ISIC 22] and for other manufacturing [ISIC 31-32] are reported separately from 2013 onwards.

Data for energy consumption for mining and quarrying [ISIC 05-09] are from the IEA energy balances for gas and electricity for the years 2019-2020.

There are some breaks in time series of value added data. Specifically, data for value added of basic metals [ISIC 24] show a significant decrease in 2009, leading to a considerably higher intensity in that year. This does not necessarily reflect physical intensities, as it is based on economic data.

Data for energy consumption of the service sector by end use are not available. Data for energy consumption by service category are available from 2016 onwards.

Data for services floor areas are not available.

### *Transport sector*

Data for energy consumption and passenger-kilometres for passenger cars include motorcycles.

Data for passenger-kilometres for passenger trains from 2000 to 2006 are based on IEA secretariat estimates.

Data for tonne-kilometres of freight transport include both domestic and international transport.

Data for vehicle-kilometre and occupancy of passenger cars are not available after 2010. Data for vehicle-kilometres of motorcycles, buses, passenger trains, freight trucks, and freight trains are not available.

Data for vehicle stocks of rail transport are not available.

Data for activity of air transport are not available. Data on energy consumption of passenger airplanes are not available, and may be partially included under freight airplanes.

Data for energy consumption for freight ships include passenger ships up to the year 2012.

Data for energy consumption of passenger and freight trains from 2000 to 2012 are based on IEA secretariat estimates.

## Ireland

### *Sources*

Sustainable Energy Authority of Ireland.

### *Years covered*

2000–2020.

### *Residential sector*

Data for energy consumption and appliances stock have been revised for the whole time series. Energy consumption data for other fuels may show some breaks in the year 2016, due to a new data collection methodology adopted since then.

Data for electricity in the residential sector up to the year 2015 are based on IEA secretariat estimates. Data for natural gas in the residential sector up to the year 2014 are based on IEA secretariat estimates.

Data for energy consumption from biofuels and waste for water heating is available from 2016 onwards.

Data for energy consumption for space cooling, lighting and residential appliances split by appliance type are not available. Data for lighting may be reported with other appliances.

Data for appliances stocks for refrigerators and PCs are not available.

Data for cooling degree days are not available.

### *Industry and services sectors*

Data for value added of chemicals [ISIC 20-21] include only [ISIC 21]. Data for value added of machinery [ISIC 25-28] include only [ISIC 25 and 27] from the year 2015 onwards. Data for value added of services sector do not include [ISIC 33] from the year 2015 onwards.

Due to confidentiality issues, value added of chemicals [ISIC 20-21] and other manufacturing [ISIC 31-32] are not available since the year 2015.

Energy consumption data for the manufacture and casting of iron and steel [ISIC 2410+2431] since the year 2016 are not available, due to confidentiality issues. They are reported under basic metals [ISIC 24] together with manufacture and casting of precious and non-ferrous metals [ISIC 2420+2432].

Data for energy consumption for cement production are not available.

Data for energy consumption from refined petroleum products [ISIC 19] and non-ferrous metals [ISIC 2420+2432] have been revised over the whole time series. Data for energy consumption from construction have been revised over the period 2016-2019, and from most other industrial subsectors over the years 2018-2019.

Data for energy consumption of the service sector split by end use are not available. Data for services floor area are not available.

Data for energy consumption by sub-sector are available from the year 2009 onwards. Data for energy consumption for sewerage and waste [ISIC 37-39] also includes [ISIC 36]. Data for energy consumption for wholesale and retail trade [ISIC 46-47] also include [ISIC 45]. Data for energy consumption for warehousing and postal services [ISIC 52-53] also include services portion of [ISIC 49-51]. Data for energy consumption for financial, insurance and administrative [ISIC 64-82] only contain data for [ISIC 64-68]. Data for energy consumption for arts, entertainment and recreation [ISIC 90-93] are included in other services activities. Data for energy consumption for other services activities do not contain [ISIC 33] nor [ISIC 45], and may include [ISIC 69-82].

Data for energy consumption for education [ISIC 85] have been revised over the whole time series.

### *Transport sector*

Discrepancies between the IEA energy efficiency indicators and the IEA energy balances for oil products are due to different reporting sources. Work is ongoing to align the two datasets.

Data for passenger-kilometres of cars and buses are not available from the year 2016 onwards. Data for passenger-kilometres of motorcycles, passenger airplanes and ships are not available.

Data for tonne-kilometres of ships are not available after 2008. Data for tonne-kilometres of freight airplanes are not available.

Data for vehicle-kilometres and energy consumption of passenger cars also include taxis. Data for vehicle-kilometres for trucks are not available.

Data for vehicle-kilometres for passenger trains are available from 2010 onwards. Other data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for energy consumption and activity of freight road transport exclude light duty vehicles (< 2tn).

Data for energy consumption of motorcycles and freight trains are not available.

Data for energy consumption of passenger ships and freight airplanes are not available, and may be partially included under freight ships and passenger airplanes, respectively.

## **Italy**

### *Sources*

Ministry of Economic Development, Terna and ENEA; Ricerca Sistema Energetico (RSE).

### *Years covered*

2000–2020.

### *Residential sector*

Data for energy consumption and appliances stock of refrigerators are not available.

### *Industry and services sectors*

Data for energy consumption of manufacture of rubber and plastics [ISIC 22] are included in manufacturing not elsewhere specified. Data for energy consumption and value added of metal products and machinery [ISIC 25-28] include manufacture of motor vehicles [ISIC 29-30].

Data for energy consumption of some industry sub-sectors for natural gas and heat for the years 2000-2003 are based on IEA secretariat estimates.

Data for energy consumption by services category are not available for warehousing, support activities for transportation, postal services [ISIC 52-53]. Data for energy consumption by services category are only available for electricity, and not available for the years 2019-2020 for sewerage, waste collection and remediation activities [ISIC 37-39] and for the year 2020 for information and communication [ISIC 58-63], financial and administrative activities [ISIC 64-82], public administration [ISIC 84], arts, entertainment and recreation [ISIC 90-93], and other services activities.

Data for value added of several industry subsectors and services are not available in 2020. Data for value added of manufacture of coke and refined petroleum products [ISIC 19] are not available for 2014.

Data for services floor area are not available.

### *Transport sector*

Data for vehicle-kilometres of buses and freight trucks are available up to 2002. Data for vehicle-kilometres of motorcycles and rail transports are not available.

Data for energy consumption for passenger ships and freight airplanes might be partially included under freight ships and passenger airplanes, respectively.

## **Japan**

### *Sources*

Ministry of Economy Trade and Industry (METI), Agency for Natural Resources and Energy; and Institute of Energy Economics (IEEJ).

### *Years covered*

2000–2020.

### *General note*

There are some discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to improve consistency.

### *Residential sector*

Data for energy consumption for coal and coal products, biofuels and waste, and heat have been revised for the whole time series.

Data for energy consumption for residential appliances include lighting.

Data for energy consumption of residential appliances by appliance type are not available.

Data for stocks of dish washers are available from 2004 onwards. Data for stocks of refrigerators and freezers are not available.

There is a break in stocks of clothes dryers for the year 2013 as, from this year onwards, it includes bathroom dryers.

### *Industry and services sectors*

Data for oil consumption for agriculture [ISIC 01-03] and refined petroleum products [ISIC 19] has been revised for the whole time series.

Data for energy consumption for manufacturing of rubber and plastics [ISIC 22], for cement production, and for other manufacturing [ISIC 31-32] are included in manufacturing not elsewhere specified.

Energy and activity data for paper and printing [ISIC 17-18] are allocated in full to pulp and paper [ISIC 17], as more detailed data are not available, especially concerning printing [ISIC 18].

Data for value added of textiles [ISIC 13-15] include only [ISIC 13] and value added of machinery [ISIC 25-28] do not include [ISIC 26]. Data for value added of wood [ISIC 16] and rubber and plastics [ISIC 22] are not available.

Data for energy consumption for services end uses have been revised for the whole time series.

Data for energy consumption for lighting in the services sector are included in other building energy use in services.

Data for energy consumption by services category are not available.

### *Transport sector*

Data for passenger-kilometres and vehicle-kilometres of motorcycles are not available.

Data for vehicle stocks of passenger trains are not available.

## **Korea**

### *Sources*

Korea Energy Economics Institute.

### *Years covered*

2000–2020.

### *Residential sector*

Data for other appliances include electricity consumption for cooking, lighting, freezers, dish washers, and clothes dryers. This may affect related end-use indicators.

Data for energy consumption of refrigerators/freezer combinations include refrigerators before 2002. Data for energy consumption and stocks of refrigerators are available from 2002 onwards.

Data for PCs start to include tablet PC from 2017.

Data for energy consumption and stocks of freezers and clothes dryers are not available. Data for energy consumption of dish washers are not available.

Data on dwellings refer to the number of households instead of occupied dwellings.

### *Industry and services sectors*

Data for energy consumption for manufacture of rubber and plastic [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified.

Data for energy consumption for cement production are not available.

Data for biofuels and waste consumption of services sector include other fuels consumption.

Data for energy consumption by services category are not available.



### *Transport sector*

Data for passenger-kilometres of passenger cars are available starting in the year 2011. Data for passenger-kilometres of total passenger transport until the year 2010 are not available, due to partial data coverage.

Data for tonne-kilometres of freight trucks and domestic freight ships are available from 2001 onwards. Data for tonne-kilometres of total freight transport for the year 2000 is not available, due to partial data coverage.

Data for vehicle-kilometres of passenger cars and freight trucks are available from 2001 onwards.

Data for vehicle stocks of buses and passenger trains are available from 2001 onwards.

Data for passenger cars include passenger vans (up to 15 passengers). Data for passenger-kilometres of cars include taxis.

Data for energy consumption from LPG for passenger cars are based on IEA estimates until the year 2018.

Data for energy consumption for freight trains and freight ships have been revised from 2018.

Data for energy consumption for freight airplanes have been revised from 2017.

## **Lithuania**

### *Sources*

Lithuanian Energy Agency, and Odyssee database.

### *Years covered*

2000-2020 (partly).

### *Residential sector*

Data for energy consumption for space cooling, lighting and residential appliances split by appliance type are not available. Data for lighting may be reported together with other appliances.

Data for stocks of freezers, refrigerator/freezer combinations, clothes washers and TVs are available up to the year 2009. Data for appliances stocks of dish washers

are available for the year 2009. Data for appliances stocks of refrigerators, clothes dryers and PCs are not available.

Data for residential activities (occupied dwellings and residential floor area) for 2020 are not available.

### *Industry and services sectors*

Data for energy consumption for manufacturing of rubber and plastics [ISIC 22] and other manufacturing [ISIC 31-32] are available from 2008 onwards. Data for energy consumption for cement production are not available.

Data for value added of manufacturing of coke and refined petroleum products [ISIC 19] are not available due to confidentiality reasons.

Data for value added of industry subsectors and services are not available in 2020.

Data for energy consumption for the services sector split by end use and services category are not available.

Data for services floor areas are not available.

### *Transport sector*

Data for transport energy use and activities are not available for the year 2020.

Data for passenger-kilometres for motorcycles are not available.

Data for vehicle-kilometres for passenger cars, motorcycles, and freight trucks are not available.

Data for energy consumption for motorcycles are not available for 2019.

Data for energy consumption for buses are available from 2008 onwards.

Data for energy consumption for domestic passenger airplanes are not available for the years 2017-2019.

Data for energy consumption for domestic passenger ships and domestic freight airplanes are not available. Their energy consumption might be partially included under passenger airplanes and freight ships data, respectively.

## Luxembourg

### *Sources*

STATEC–NSI Luxembourg.

### *Years covered*

2000–2020.

### *General note*

There are some discrepancies between the energy efficiency indicators and the IEA energy balances databases.

### *Residential sector*

Data for energy consumption by end use are available from the year 2008 onwards.

Data for energy consumption for space heating, lighting and other appliances have unexplained breaks in the years 2017 and 2018.

Data for energy consumption of residential appliances by appliance type are not available. Data for unit energy consumption of appliances are not available.

Data for electricity consumption from all end uses, for heat consumption from space heating and for oil and gas consumption from water heating have been revised over the period 2008-2019.

Data for new dwellings are not available for the year 2020. Data for occupied dwellings have been revised for the years 2018-2019.

### *Industry and services sectors*

Data for heat consumption in industry are available from 2003 onwards.

Data for energy consumption from biofuels and waste in wood manufacturing [ISIC 16] are available from 2005 onwards.

Data for energy consumption and value added for refined petroleum products [ISIC 19], cement (as part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Due to confidentiality issues, data for energy consumption for chemicals [ISIC 20-21] include rubber [ISIC 22], whereas value added of rubber [ISIC 22] is included

in the manufacture of non-metallic mineral products [ISIC 23]. For this reason, the corresponding intensities are not calculated.

Data for value added of basic metals [ISIC 24], machinery [ISIC 25-28], and transport equipment [ISIC 29-30] are not available. Value added of [ISIC 20-21] includes only [ISIC 20].

Data for energy consumption from several subsectors have been revised, most notably for manufacturing of textiles [ISIC 13-15] over the period 2010-2014, non-metallic minerals [ISIC 23] in 2010-2019, iron and steel [ISIC 2410+2431] in 2018-2019 and construction [ISIC 41-43] in 2013-2019.

Data for gross domestic product (GDP) and value added for every available subsector have been revised over the whole time series.

Data for value added for 2020 for manufacturing subsectors are not available.

Data for energy consumption of the services sector by end use are not available. Total energy consumption is partly from the IEA energy balances.

Data for energy consumption of services by subsector are available from 2011 or 2012 onwards for all but three sub-sectors (namely sewerage, waste collection and remediation activities [ISIC 37-39], warehousing, support activities for transportation, postal services [ISIC 52-53] and other services activities [ISIC 33; 45; 94-96; 99]). Those only available from 2012 onwards are information and communication [ISIC 58-63], financial, insurance, real estate, scientific, and administrative activities [ISIC 64-82] and arts, entertainment and recreation [ISIC 90-93].

Data for energy consumption of services by subsectors have been revised for the years 2017-2019, leading to an unexplained break for education [ISIC 85] in 2017.

Data for services floor areas are not available.

### *Transport sector*

Data for passenger-kilometres of motorcycles, passenger airplanes and passenger ships are not available.

Data for tonne-kilometres for domestic freight airplanes are not available. Data for tonne-kilometres for domestic freight ships and total freight are not available for the year 2020.

Data for vehicle-kilometres of passenger cars and freight road transport are available from 2008 onwards. Data for vehicle-kilometres of motorcycles and

freight trains are not available. Data for vehicle-kilometres of passenger trains are not available for the year 2020.

Data for vehicle stocks of passenger trains are not available.

Data for energy consumption for motorcycles, domestic freight airplanes and domestic freight ships are not available.

The full amount of energy consumption in water transport is allocated to passenger ships.

Data for energy consumption for various end uses have been revised, namely for cars and freight trucks (electricity) over the period 2011-2019, for freight trucks (motor gasoline and diesel) in 2017-2019, for passenger trains (electricity) in 2018-2019, and for domestic passenger ships (diesel) in 2012-2019.

## Mexico

### *Sources*

SENER - Secretaría de Energía, Gobierno de México and CONUEE – Comisión Nacional para el Uso Eficiente de la Energía.

### *Years covered*

2000–2020.

### *Residential sector*

The data coverage of end-use energy consumption for the residential sector in Mexico is limited. Work is ongoing (including a new household survey) to improve the availability of residential end use data. This should be included in future editions of this database.

Data for floor areas for the years 2018-2020 are based on estimates from the IEA secretariat.

Data for oil and electricity consumption in the residential sector have been revised for the year 2020.

Data for appliances stocks are available only for refrigerators, clothes washers and TVs. They refer to stocks in households, not in dwellings like for other countries.

### *Industry and services sectors*

Revisions of energy consumption data in the past have created discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to improve consistency.

Data for energy consumption from manufacturing of textiles [ISIC 13-15] are available from 2009 onwards. Data for energy consumption from manufacturing of wood [ISIC 16] are not for the year 2004 and from 2015 onwards.

Data for energy consumption from manufacturing of ferrous metals [ISIC 2410+2431] for the years 2016-2020 may be based on estimates from the IEA secretariat, depending on the fuel.

The electricity consumption of the services sectors may be partially included in the industry sector due to the current data collection methodology.

Data for energy consumption by end use in the services sector are not available. Data for energy consumption by service sub-sector are not available.

Data for floor areas of services are not available.

### *Transport sector*

Data for energy consumption by transport mode/vehicle type are not available. Work is ongoing to increase the detail of the coverage of energy consumption for transport.

Activity data for passenger transport (passenger-kilometres) are only available for domestic passenger airplanes and domestic passenger ships. Data for domestic passenger airplanes are not available for 2020.

Activity data for freight transport (freight-kilometres) for domestic freight airplanes are available from 2010 onwards.

Vehicle-kilometres and passenger occupancy are not available.

## **Netherlands**

### *Sources*

Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (TNO) through the Odyssee database.

### *Years covered*

2000–2020 (partly).

### *Residential sector*

Data for residential energy use and activities are not available for the year 2020.

Data for energy consumption and appliances stocks of clothes dryers for the years 2019 are not available.

Data for energy consumption and appliances stocks of refrigerators and PCs are not available.

Data for cooling degree days are not available.

### *Industry and services sectors*

Heat consumption for casting of precious and non-ferrous metals [ISIC 2420+2432] up to the year 2011 is based on IEA secretariat estimates.

Data for energy consumption for rubber and plastic [ISIC 22] are not available for 2020. Data for energy consumption for cement production are available up to 2010.

Data for energy consumption for other manufacturing [ISIC 31-32] are included in manufacturing not elsewhere specified.

Data for services floor area are not available for 2020.

### *Transport sector*

Data for transport energy use and activities are not available for the year 2020.

Data for passenger-kilometres of motorcycles, passenger airplanes and passenger ships are not available.

Data for tonne-kilometres of freight road transport include national transport by Dutch vehicles and the share of international transport by Dutch vehicles taking place within Dutch borders (estimated as 100 km per international trip).

Data for tonne-kilometres for freight ships includes freight traffic only in rivers, and data for tonne-kilometres for freight airplanes are not available.

Data for vehicle-kilometres for rail transport modes are not available.

Data for energy consumption for domestic passenger ships and domestic freight airplanes are not available. These may be partially included under domestic freight ships and domestic passenger airplanes, respectively.

## New Zealand

### *Sources*

Ministry of Business, Innovation & Employment (MBIE).

### *Years covered*

2000–2020.

### *General note*

There may be some discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to align the two datasets.

### *Residential sector*

Data for energy consumption in the residential sector are based on country estimates.

Data for energy consumption from biofuels and waste are based on IEA secretariat estimates. Data for the years 2013-2019 for natural gas and for other fuels across end uses and, for oil and oil products for space heating are based on IEA secretariat estimates.

Data for energy consumption of refrigerators and freezers are not available.

Data for coal and electricity consumption across end uses, as well as data for appliances stock, have been revised over the period 2016-2019. Data for biofuels and waste consumption across end uses have been revised over the whole time series.

Data for unit energy consumption are available from 2002 onwards. Data for unit energy consumption of TVs are available from 2013 onwards. Data for unit energy consumption of freezers, refrigerators and PCs are not available.

Data for residential floor areas are based on country estimates. Data for dwellings, household occupancy and residential floor area have been revised over the whole time series.



### *Industry and services sectors*

Data for consumption of natural gas in manufacture of wood and wood products [ISIC 16] show an unexplained break for the year 2014 onwards and are not anymore aligned with the IEA energy balances. Work is ongoing to clarify this issue.

Data for energy consumption from oil and oil products for the year 2019 show an unexplained upward break across industry sub-sectors and for the services sector. Work is ongoing to clarify this issue.

Data for oil consumption across almost every industrial subsector have been revised over the whole time series, without resolving the 2019 break. Data for gas consumption across almost every industrial subsector are based on estimates from the IEA secretariat.

Data for energy consumption for cement production are not available.

Data for services energy consumption by sub-sector are not available.

Data for energy consumption from services space heating have been revised over the whole time series.

Data for value added for chemicals [ISIC 20-21] include rubber and plastics [ISIC 22] and manufacture of coke and refined petroleum products [ISIC 19].

Data for population, total and services employment and services floor area have been revised over the whole time series.

Data for value added have been revised for every subsector, sometimes over the whole time series, sometimes from 2010, 2016 or 2017 onwards.

### *Transport sector*

Data for passenger-kilometres of trains and ships are not available for 2020. Data for tonne-kilometres of trains are not available for the years 2019-2020, and are not available at all for airplanes.

Data for vehicle-kilometres for passenger trains are available over the period 2010-2017; other data for vehicle-kilometres and vehicle stocks for rail transport are not available.

Data for energy consumption of domestic freight airplanes are not available; they may be partially included in domestic passenger airplanes.

Both activity and energy consumption data have been extensively revised over the whole time series, apart from a few items in activity data which were revised from 2012, 2016 or 2018 onwards.

## Norway

### *Sources*

Statistics Norway, Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2010 onwards. Data for energy consumption of residential appliances include lighting.

Data for energy consumption and stocks by appliance type are not available.

### *Industry and services sectors*

Data for energy consumption from oil have been revised for almost every industry subsector and for the services sector, over the period 2010-2019. Data for gas and biofuels and waste have been revised for several of these subsectors too, over variable periods within 2014-2019.

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data on value added are available at the level of ISIC section (Rev. 4) for 2020, except for services [ISIC 33-99]. Data on value added for chemicals [ISIC 20-21] are not available.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are not available.

### *Transport sector*

Data for energy consumption split by segment/mode/vehicle type for the transport sector are not available. Totals consumption data are from the IEA energy balances and have been revised over the period 2010-2019.

Data for passenger-kilometres for cars, SUVs and personal light trucks are not available. Data for passenger-kilometres for passenger trains and domestic passenger airplanes are available from 2012 and 2007 onwards, respectively.

Data for tonne-kilometres for freight trains are available from 2003 onwards. Data for tonne-kilometres for domestic freight airplanes and ships are not available.

Data for vehicle-kilometres for cars, SUVs and personal light trucks and buses are available from 2005 onwards, and from 2004 onwards for passenger trains. Data for vehicle stocks of cars detailed by propulsion, namely gasoline, diesel and battery and plug-in hybrids, are available from 2008 onwards. Data for vehicle stocks of passenger trains are not available.

Data for vehicle-kilometres and vehicle stocks for the freight segment are not available.

## Poland

### *Sources*

Statistics Poland.

### *Years covered*

2000–2020.

### *Residential sector*

Data for energy consumption for water heating and appliances are available from 2015 onwards.

Data for energy consumption for appliances include lighting, and data for energy consumption by appliance type and for space cooling are not available.

Data for stocks of refrigerators are available from the year 2009 onwards. Data for stocks of freezers are not available for the years 2007-2008.

Data for stocks of clothes dryers and PCs are not available. Data for stocks of refrigerators, freezers and refrigerator/freezer combinations are based on IEA secretariat estimates for the years 2010-2011, 2013-2014, 2016-2017, and 2019-2020.

Data for unit energy consumption of appliances are not available.

### *Industry and services sectors*

Data for value added for manufacture of coke and refined petroleum products [ISIC 19] before the year 2005 are not available.

Data for energy consumption of the services sector includes water supply and treatment [ISIC 36].

Data for energy consumption of the services sector by end use are not available.

Data for services energy consumption by sub-sector are not available.

Data for natural gas consumption for services have been collected based on a new methodology for the year 2017, leading to a break in this year.

Data for services sector floor areas are not available.

### *Transport sector*

Data for passenger-kilometres of motorcycles and passenger ships are not available.

Data for tonne-kilometres of domestic freight airplanes are available from 2003 onwards.

Data for vehicle-kilometres are available from 2010 to 2019.

Data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for energy consumption for 2020 are not available except passenger airplanes.

Data for energy consumption and activity of passenger ships and freight airplanes (passenger-kilometres and tonne-kilometres, respectively) are not available. Data for energy consumption for these two transport segments might be partially included under freight ships and passenger airplanes, respectively.

## **Portugal**

### *Sources*

Direcção Geral de Energia e Geologia.

### *Years covered*

2000–2020.

### *General note*

Some transport energy consumption may be included under industry and services.

### *Residential sector*

There may be some breaks between 2019 and 2020 for energy consumption of different end uses, due to new household survey.

Data for biofuels and waste have a break in series in the year 2010, due to the results of a new household energy consumption survey.

Data for oil & oil products, natural gas and electricity of space heating prior to the year 2013 are based on IEA secretariat estimates.

Data for water heating for biofuels and waste from 2005 to 2009, natural gas for the year 2008, and electricity for 2018-2019 are based on IEA secretariat estimates.

Data for electricity consumption for cooking and lighting up to the year 2009 are based on IEA secretariat estimates. Data for other appliances are based on IEA secretariat estimates.

Energy intensities for cooking are significantly higher than those for other IEA member countries. This may be explained by the fact that several appliances used for cooking purposes are accounted under “cooking” instead of “other appliances”. A new survey is expected in the future, which may help understanding this aspect.

Data for energy consumption of residential appliances by appliance type are available from 2010 onwards. From 2017 to 2019, data are the same (following the country’s suggestion), as official values are not available.

Data for appliances stocks from 2018 to 2019 are also the same (following the country’s suggestion), as official values are not available.

Data for stocks of refrigerators and PCs are only available for years 2010-2012 and 2020.

### *Industry and services sectors*

There are some breaks for the year 2012 for some sub-sectors (e.g. for non-metallic minerals) in energy consumption data from biofuels and waste, due to a more recent industry survey.

Data for heat consumption from chemicals [ISIC 20-21] for the years 2014-2018 are based on IEA secretariat estimates.

Data for energy consumption for the services sector by end use are available from 2005 onwards. Data for energy consumption by services category are available from 2012 onwards; in such data, other fuels may refer to gas.

Data for services other building energy use for electricity from 2005 to 2018, natural gas from 2015 to 2016, and heat for the year 2018 are based on IEA secretariat estimates.

Data for services floor area are available for the years 2005-2011.

### *Transport sector*

Data for passenger-kilometres of motorcycles are not available. Data for passenger-kilometres of domestic passenger ships are available from 2014 onwards.

Data for passenger-kilometres of buses were revised from 2015 to 2016 based on national statistics publication, resulting in a break for the year 2015.

Data for tonne-kilometres of domestic freight airplanes are available from 2015 onwards. Data for tonne-kilometres of domestic freight ships are not available.

Data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for energy consumption for passenger and freight trains from diesel and electricity for the year 2017 and for electricity only for the years 2013 and 2016 are based on IEA secretariat estimates. Additionally, data for electricity consumption from freight trains for 2019 are based on IEA secretariat estimates.

Data for energy consumption of domestic passenger ships and domestic freight airplanes are not available, and may be partially included under freight ships and passenger airplanes, respectively.

Data for the stocks of freight trucks include commercial road transport, although data for tonne-kilometres of freight trucks may exclude commercial road transport.

## **Slovak Republic**

### *Sources*

Ministry of Economy; Odyssee database.

### *Years covered*

2000–2020 (partly).

### *Residential sector*

Data for energy consumption by end uses, appliances stocks, number of dwellings and residential floor area are not available for the year 2020.

Data for energy consumption for space heating include cooking.

Data for energy consumption for space cooling are not available.

Data for energy consumption for other appliances include dish washers, clothes dryers and PCs.

Data for stocks of dish washers, clothes dryers and PCs are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified, while data for value added are reported separately.

Data for energy consumption of cement production are not available.

Data for energy consumption for the services sector by end use are not available.

Data for energy consumption by services category are not available.

Data for services floor area are not available.

### *Transport sector*

Data for passenger-kilometres of passenger cars are not available in 2020. Data for passenger-kilometres of motorcycles are not available.

Data for vehicle-kilometres of passenger trains are available from 2006 onwards.

Data for vehicle-kilometres for freight trucks and freight trains are not available.

Data for vehicle stocks of passenger trains are not available.

Data for energy consumption by transport modes are not available in 2020.

Data for energy consumption of domestic passenger airplanes are available for the years 2004-2006.

Data for energy consumption of domestic freight ships are available from 2006 onwards.

Data for energy consumption of domestic passenger ships and domestic freight airplanes are not available. These may be partially included under freight ships and passenger airplanes, respectively.

## Spain

### *Sources*

Instituto para la Diversificación y Ahorro de la Energía (IDAE); Odyssee database.

### *Years covered*

2000–2020.

### *Residential sector*

There may be some breaks between 2009 and 2010 for energy consumption of different end uses, due to different data collection methodologies.

Data for energy consumption of residential appliances by appliance type are not available, except for refrigerators/freezers combinations until 2008, clothes washers until 2010 and dish washers over the period 2005-2008.

Data for stocks of residential appliances are available only up to 2002 for TVs, 2005 for freezers, 2008 for refrigerators/freezers combinations and dish washers, and 2010 for clothes washers. Data for appliances stock of refrigerators, clothes dryers, and PCs are not available.

Data for dwelling floor area (total and new) are not available for 2020.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are included under non-specified manufacturing, while data for value added for other manufacturing [ISIC 31-32] are available separately.

Data for energy consumption of pulp and paper [ISIC 17] and printing [ISIC 18] are not available.

Data for energy consumption of cement (part of non-metallic minerals [ISIC 23]) may be inconsistent with that of non-metallic minerals [ISIC 23], as they come from different sources.

Data for energy consumption of services by sub-sector only includes the following branches: wholesale and retail [ISIC 46-47], accommodation [ISIC 55-56],



information and communication [ISIC 58-63], financial and administrative services [ISIC 64-82], public administration [ISIC 84], education [ISIC 85] and health [ISIC 86-88].

Data for value added of industry and manufacturing subsectors for 2020 are provisional.

### *Transport sector*

Data for passenger-kilometres for motorcycles are not available. Data for passenger-kilometres for buses show a break in 2017 due to a change in methodology.

Data for tonne-kilometres for domestic freight airplanes are not available.

Data for vehicle-kilometres of freight trucks are not available for 2020. Data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for diesel and light fuel oil consumption of freight trains show a break in 2013 due to a change in methodology. Data for energy consumption for freight trains are not available in 2020.

Energy consumption data for domestic freight airplanes and domestic passenger ships may be partially included in domestic passenger airplanes and domestic freight ships, respectively.

## **Sweden**

### *Sources*

Swedish Energy Agency; Odyssee database.

### *Years covered*

2000–2020.

### *General note*

There are some discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to improve consistency between the two databases.

### *Residential sector*

Data for oil consumption for space heating from 2005 to 2014 are based on IEA secretariat estimates.

Data for energy consumption for space cooling are not available.

Data for energy consumption for lighting and for residential appliances by appliance type are available until the year 2013. Data for total energy consumption of residential appliances include lighting since the year 2014.

Data for energy consumption of other appliances include clothes dryers, TVs and PCs. Data for energy consumption for other appliances in the period 2000-2015 are based on IEA secretariat estimates.

Data for stocks and unit energy consumption of appliances for freezers, refrigerator/freezer combinations, dish washers, clothes washers and TVs are only available up to 2013. Data for refrigerators, clothes dryers and PCs are not available.

Data for household occupancy and residential floor area are not available for 2020.

### *Industry and services sectors*

Data for energy consumption from other manufacturing [ISIC 31-32] are not available.

Data for biofuels & waste consumption from pulp and paper [ISIC 17], except for 2020, and for other building energy use in services sector, are based on IEA secretariat estimates. Data for most fuels consumptions from printing [ISIC 18] over the period 2000-2008, and pulp and paper [ISIC 17] over the period 2000-2008 and some years in the period 2011-2018, are based on IEA secretariat estimates.

Data for value added for the year 2020 for manufacturing sub-sectors and for services are not available.

Data for services energy consumption by sub-sector are not available.

Data for services floor area are not available for 2020.

### *Transport sector*

Data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for tonne-kilometre for domestic freight airplanes for 2019 are not available.

Data for passenger-kilometres of cars, and vehicle stocks of gasoline cars, have been revised from 2016 and 2017 onwards, respectively.

Data for energy consumption of both passenger and freight road transport (passenger cars, motorcycles, buses, and trucks) are not available since the year 2015.

Energy consumption data for domestic freight airplanes and domestic passenger ships are not available and may be partially included in domestic passenger airplanes and domestic freight ships, respectively.

## Switzerland

### *Sources*

Swiss Federal Office of Energy (SFOE).

### *Years covered*

2000–2020.

### *Residential sector*

Data for energy consumption for space cooling are not available.

Data for energy consumption for lighting have been revised since the year 2014, due to higher diffusion of LED.

Data for cooling degree days are not available.

Data for total number of dwellings, occupied dwellings and household occupancy were revised over the whole time series.

Data for end-uses energy consumption were revised over the whole time series.

### *Industry and services sectors*

Data for energy consumption for mining and quarrying [ISIC 05-09], wood [ISIC 16], rubber and plastic [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available, while data for value added are.

Data for energy consumption for machinery [ISIC 25-28] may also include transport equipment [ISIC 29-30], while value added data are available separately.

Data for cement production for the years 2017-2018 are based on IEA secretariat estimates, and are not available for the years 2019-20.

Data for services energy consumption by sub-sector are not available.

Data for agriculture [ISIC 01-03] energy consumption were revised over the whole time series.

### *Transport sector*

Discrepancies in energy consumption data for transport in relation to the IEA energy balances are mostly due to different accounting methodologies (e.g. fuel tourism is excluded in this publication).

Activity data (passenger-kilometres and tonne-kilometres) for domestic airplanes and domestic ships are not available, whether passenger or freight.

Data for vehicle-kilometres of passenger ships are available up to 2006. Vehicle stocks for rail transport are not available, whether passenger or freight.

Data for energy consumption from domestic freight airplanes are not available.

Activity data (passenger-kilometres and vehicle-kilometres) for buses, (tonne-kilometres and vehicle-kilometres) for freight road transport, and (vehicle-kilometres) for freight trains for the year 2020 are partial estimates, as official values are not published at the time of this release.

## **Republic of Türkiye**

### *Sources*

General Directorate of Energy Affairs (GDEA).

### *Years covered*

2000–2020.

### *Residential sector*

Data for energy consumption for appliances, by appliance type are not available.

Data for energy consumption for space cooling are available from 2019 onwards.

Data for energy consumption for cooking and lighting have been revised over the whole time series, leading to unexplained breaks in 2019 and 2020. There are

also unexplained breaks for space heating and water heating. Work is ongoing to improve data quality.

Various data are based on IEA secretariat estimates, namely coal consumption from space heating over the years 2017-2020, electricity consumption from other appliances in 2020, and consumption for other energy use which has been revised over the whole time series.

Data for appliances stocks for refrigerators, clothes dryers, TVs, and PCs are not available.

Data for residential floor areas are not available.

Data for unit energy consumption of appliances are not available.

### *Industry and services sectors*

Data for biofuels and waste and heat consumption across manufacturing subsectors are available from 2018 (sometimes 2020) and 2015 onwards, respectively.

Data for biofuels and waste energy consumption has been revised for various manufacturing subsectors.

Data for energy consumption for manufacturing of rubber [ISIC 22] and for other manufacturing [ISIC 31-32] are available from 2016 and 2015 onwards, respectively.

There is a break in energy consumption for manufacture of non-metallic minerals [ISIC 23] in 2017. The break is due to the reporting of petroleum coke for the first time this year.

Data for energy consumption for cement, as part of non-metallic minerals [ISIC 23], are not available.

Data for electricity consumption for manufacture of transport equipment [ISIC 29-30] are available from 2014 onwards.

Data for value added are available at the level of ISIC section (Rev. 4). Further data availability for the different manufacturing sub-sectors may be available in the future. Data for value added for the services sector are not available for 2020.

Data for employment are available from the year 2005 onwards.

Data for services floor areas are not available.

Data for energy consumption for the services sector by end use are not available.  
Data for services energy consumption by sub-sector are not available.

Data for heat and other fuels consumption for the services sector are available from 2017 onwards. Other fuels here encompasses geothermal energy.

### *Transport sector*

Data for passenger-kilometres of passenger cars and buses are available for the years 2000, 2010 and from 2015 onwards. Data for passenger-kilometres of passenger trains are available from 2014 onwards. Data for passenger-kilometres of domestic passenger airplanes and ships are available from 2011 and 2004 onwards, respectively. Data for passenger-kilometres of total passenger transport are not available before the year 2015 due to partial coverage.

Data for tonne-kilometres of freight trucks are available from 2001 onwards. Data for tonne-kilometres of domestic freight ships and domestic freight airplanes are available from 2014 onwards. Data for tonne-kilometres of total freight transport are not available before the year 2014 due to partial coverage.

Data for vehicle-kilometres of passenger cars, buses, and freight trucks are available for the years 2000, 2010 and from 2015 onwards. Data for vehicle-kilometres of passenger trains and freight trains are available from 2004 onwards, and both have been revised over the period 2014-2019.

Data for passenger-kilometres and vehicle-kilometres of motorcycles are not available.

From 2019 onwards, data for passenger-kilometres and vehicle-kilometres for passenger trains include Başkentray (in Ankara urban area) data, explaining the 2019 break.

Data for vehicle stocks of rail transport are available from the year 2001 onwards.

There are unexplained breaks remaining for vehicle-kilometres for passenger and freight trains in 2014, and in 2010 for the passenger segment, as well as for vehicle stocks for freight trains in 2017 and 2019.

Data for energy consumption by transport mode/vehicle type are not available. Work is ongoing in order to improve data availability by mode/vehicle type for the transport sector.

## United Kingdom

### *Sources*

Department for Business, Energy and Industrial Strategy (BEIS); Odyssee database.

### *Years covered*

2000–2020.

### *General note*

There are some historical discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Ongoing work is allowing continuous improvement of consistency between these two.

### *Residential sector*

Data for energy consumption for other residential appliances may include space cooling.

Data for energy consumption for lighting up to the year 2005 are based on IEA secretariat estimates.

Data for biofuels and waste and electricity consumption from space heating are based on IEA secretariat estimates for the years 2012-2015 and 2008, respectively.

Data for gas consumption from water heating are based on IEA secretariat estimates build on Odyssee data for the period 2000-2009.

Data for energy consumption for clothes washers and clothes dryers are based on IEA secretariat estimates before the year 2015. Data for energy consumption for clothes washers and clothes dryers in 2020 are country estimates.

Data for energy consumption for televisions for the years 2017-2018 are based on IEA secretariat estimates, and data for 2019-2020 are provisionally kept the same as 2018 while more accurate data become available.

Data for appliances stocks for clothes dryers have been revised over the period 2017-2019. Data for unit energy consumption for clothes dryers are estimates from the IEA secretariat over the years 2017-2019.

Data for appliances stocks and appliances unit energy consumption for TVs are not available for 2020.

Data for stocks and energy consumption of personal computers include desktop computers, laptops, monitors, printers and multifunction devices from 2010 onwards. Before 2010 they do not include monitors.

Data for occupied dwellings for the years 2004 and 2019-2020 are based on IEA secretariat estimates.

Data for heating degree days are based on a threshold temperature of 15.5°C. Data for cooling degree days have been discontinued from the year 2019 onwards.

### *Industry and services sectors*

Data for energy consumption from biofuels and waste split by industry sub-sector except non-metallic minerals [ISIC 23] are available from 2015 onwards.

Data for electricity consumption for mining and quarrying [ISIC 05-09] for the year 2000 are based on IEA secretariat estimates. Data for biofuels and waste consumption for printing [ISIC 18] for the years 2015-2020 are based on IEA secretariat estimates, as well as oil, gas, and electricity consumption over the period 2008-2014..

Data for energy consumption for other manufacturing [ISIC 31-32] are available from 2010 onwards.

Data for energy consumption for the services sector by end use are available from 2001 onwards. Data for gas, heat and electricity consumption from space heating, space cooling and lighting have been revised over the period 2017-2019.

Data for services energy consumption by sub-sector are not available.

There are some breaks for energy consumption data of the services sector for the year 2015, due to the new BEES survey results.

### *Transport sector*

Data for energy consumption and activity (passenger-kilometres and tonne-kilometres) of domestic passenger ships and domestic freight airplanes are not available. Their energy consumption might be partially included under freight ships and passenger airplanes data, respectively.

Data for vehicle-kilometres of rail transport are available from 2011 onwards. Data for vehicle stocks of rail transport are not available.



Data for gasoline consumption from cars and motorcycles, and for diesel consumption from buses are country estimates which may not reflect the true picture of such atypical year.

Data for gasoline consumption from freight trucks are based on IEA secretariat estimates for the years 2006-2014. Data for electricity consumption from freight trains for the years 2016-2020 are based on IEA secretariat estimates.

## United States

### *Sources*

United States Energy Information Administration (EIA); U.S. Department of Transportation (DOT) for transport activity data.

### *Years covered*

2000–2020.

### *General note*

There are discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to improve consistency between these two.

Data for non-marketed electricity generation from non-combustible renewable energy is estimated by EIA based on the average electric power sector fossil-fuels net heat rate. This portion of delivered electricity is converted based on the heat content of electricity.

### *Residential sector*

Data for appliances stocks between and before the years (2001, 2005, 2009, 2015, and 2020) covered by Residential Energy Consumption Surveys (RECS) and based on IEA secretariat estimates. Since 2015, these data for freezers, refrigerator/freezer combinations and clothes dryers are based on the EIA's Annual Energy Outlook.

Data for energy consumption and stocks of refrigerators are not available.

Data reported under other fuels for clothes dryers refer to energy consumption from natural gas.

Data for energy consumption for non-specified residential energy use includes appliances such as pool heaters, spa heaters, and backup electricity generators.

### *Industry and services sectors*

Data for energy consumption of some manufacturing sub-sectors across fuels, prior to the year 2012 are based on IEA secretariat estimates.

Data for energy consumption for cement production are available from 2010 onwards and correspond to the cement and lime industries energy consumption.

Data for energy consumption for the services sector by end use are available from 2010 onwards. Data for energy consumption for the services sector show some breaks (e.g. lighting) for the year 2015. This is partially due to methodological changes (the incorporation of data from the 2012 Commercial Buildings Energy Consumption Survey in the new report), and partially reflecting real trends.

Data for energy consumption by services subsector are available from the year 2016 onwards. Data reported in other fuels include electricity and other fuels (the latter are in gross calorific values). For this reason, the total energy consumption by service sub-sector is higher than the total energy consumption by end use. Data for energy consumption for sewerage and waste [ISIC 37-39], information and communication [ISIC 58-63], financial, insurance and administrative [ISIC 64-82], and public administration [ISIC 84] might be included under other services activities.

Data for floor areas of services are not available for the years 2001-2007 and the year 2009.

### *Transport sector*

Data for passenger-kilometres of passenger cars include light duty vehicles, short wheelbase from the year 2007 onwards, and hence data are not comparable before and after 2007.

Data for passenger-kilometres of domestic passenger ships are not available.

Data for tonne-kilometres for the years 2019-2020 are not available.

Data for vehicle-kilometres of freight trains for 2020 is not available.

Data for vehicle stocks of rail transport are not available.

Data for diesel consumption for passenger cars show a break for the year 2017 due to a decline of diesel cars for that year.

Data for energy consumption from LPG for passenger cars prior to the year 2014 are based on IEA secretariat estimates.

Data for energy consumption for LPG and natural gas for buses show a break for the year 2016 due to updates in the national reporting from this year onwards.

Data for energy consumption for domestic passenger airplanes up to 2015 and for domestic freight airplanes up to 2008 are based on IEA secretariat estimates.

Data for energy consumption of domestic passenger ships for 2000-2005 and consumption of domestic freight ships for 2000-2010 are based on IEA secretariat estimates.

Data for energy consumption for passenger ships show a break for the year 2018 due to a change in methodology.

Data for energy consumption for domestic passenger airplanes show a break for the year 2018 due to the inclusion of jet fuel consumed in the U.S. by internationally flagged carriers from 2018 onwards.

## Beyond IEA Member Countries

### *General notes*

The notes in this section refer to data for the years 2000 to 2020 (unless otherwise specified) for countries and economies beyond IEA, which have voluntarily partnered with the agency on the development of energy efficiency indicators.

We are delighted to include an increasing number of countries in this publication, thanks to bilateral collaborations beyond the IEA family. Morocco was the first IEA association country reporting sub-sectoral/end use data in 2018. Brazil followed in 2019, thanks to a very close collaboration, and Chile in 2020 and Slovenia, Argentina and Uruguay in June edition 2021, Colombia and Chinese Taipei in June 2022. For this edition, we are delighted to welcome the data for Hong Kong, China. The addition of Chinese Taipei and Hong Kong, China was possible thanks to the synergies with our partner organization Asia Pacific Energy Research Centre (APEREC). IEA thank our colleagues of APERC and look forward to continuing the fruitful collaboration with all international bodies.

Thanks to the ongoing collaboration with the IEA under the [EU4Energy programme](#), Armenia, Belarus, Republic of Moldova and Ukraine started being published in 2018, while Azerbaijan, Georgia and Uzbekistan were included in 2019 and Kazakhstan and Kyrgyzstan were included in the 2020 edition. The [EU4Energy programme](#) develops energy statistics capacity in Eastern Europe, Caucasus and Central Asia.

Finally, this edition also includes eleven countries whose data were not directly submitted to the IEA but rather collected via Eurostat: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Kosovo, Latvia, Malta, Republic of North Macedonia, Romania and Serbia.

The IEA welcomes this voluntary effort from countries beyond members with a view to strengthen global end-use data availability. It is our wish that more countries may follow in the future.

For the countries referred to above, data availability may differ from that of IEA member countries and is expected to expand over time.

Data are obtained from national administrations through direct submission of the energy efficiency indicators questionnaire or indirectly through partner institutions such as Eurostat, as indicated for each country under the sources section.

In case of estimates made by the IEA secretariat, explanations are provided in the respective country notes.

## Albania

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2010 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

Data for cooling degree days and for heating degree days are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]), machinery [ISIC 25-28], transport equipment [ISIC 29-30] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified. Data for energy consumption for wood [ISIC 16] are available from 2011 onwards.

Data for value added are not available.

Data for energy consumption in the services sector by end use are not available.

Data for energy consumption by services category are not available.

Activity data for services (employment and floor area) are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## Argentina

### *Sources*

Secretaría de Energía, Ministerio de Economía de la República Argentina.

### *Years covered*

2000-2019.

### *Residential sector*

Data for energy consumption by end use are not available for the year 2019.

Data for energy consumption for space cooling are available from 2005 onwards, and may be included under other appliances for the years before then.

Data for energy consumption by appliance type and for appliances unit energy consumption are not available. Data for appliances stocks are only available for refrigerators (2001 and 2010), clothes washers (2001) and TVs (2001).

Data for number of dwellings and for household occupancy are not available for the year 2019.

Data for residential floor areas are only available for the years 2005 and 2012. Data for cooling degree days are not available for 2018 and 2019, and for heating degree days for 2019.

### *Industry and services sectors*

Data for energy consumption of the manufacturing sub-sectors in LPG are reported under natural gas instead of oil and oil products.

Data for energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are reported in manufacturing not elsewhere specified.

Data for machinery [ISIC 25-28] are available since the year 2015.

Data for energy consumption for construction [ISIC 41-43] are not available.

Data for cement production are not available.

Data for value added are not available for the year 2019, and are only available for agriculture [ISIC 01-03] and services for the year 2018.

Data for energy consumption in the services sector by end use are not available. Data for energy consumption by services category are not available.

Data for services floor areas are not available.

### *Transport sector*

Data for passenger-kilometres are only available for buses (until 2010), passenger trains (2006-2010) and domestic passenger airplanes (2005-2009).

Data for tonne-kilometres are only available for freight trains (until 2008) and domestic freight ships (2006-2010).

Data for vehicle-kilometres are only available for buses (until 2016).

Data for vehicle stocks are available for passenger cars and buses (until 2017), and for freight road (2004-2017).

Data for energy consumption by segment mode/vehicle type for the transport sector are not available.

## **Armenia**

### *Sources*

Statistical Committee of the Republic of Armenia, Yere-van.

### *Years covered*

2000-2020.

### *General note*

Sub-sectoral energy consumption data are only available for the industry sector.

Data for dwellings (occupied and floor area) are not available. Data for services employment and floor area are not available.

### *Industry and services sectors*

Data split by industry sub-sector for oil products, natural gas and biofuels and waste consumption in the industry sector are reported from the year 2014 (sometimes 2015) onwards. This leads to breaks in the time series for total final energy consumption of several industry sub-sectors.

Data for coal and heat consumption in the industry sector are not available.

Partial data availability of energy consumption (by fuel) may lead to relatively low energy intensities. Work is ongoing to improve data availability across industry sub-sectors.

Data for value added are available from 2012 onwards and are based on price levels and PPP of 2015. The conversion of these data into 2015 USD PPP was made by IEA secretariat, based on country submission. Data for value added were revised over the whole time series.

Data for energy consumption in the services sector by end use are not available. Data for energy consumption by services category are not available.

### *Transport sector*

Data for energy consumption split by segment mode/vehicle type for the transport sector are not available.

Data for passenger-kilometres of passenger cars are available from the year 2002 onwards. Data for passenger-kilometres of buses and passenger trains are available from the year 2001 onwards.

Data for tonne-kilometres of freight trucks and freight trains are available from the year 2001 onwards.

Data for vehicle-kilometres of passenger cars, buses and freight trucks are available from the year 2001 onwards.

Other activity data are not available, namely passenger-kilometres and vehicle-kilometres for motorcycles, vehicle-kilometres for rail transport, all activity data for air and water transport, and all data for vehicle stocks.

## **Azerbaijan**

### *Sources*

The State Statistical Committee of the Republic of Azerbaijan.

### *Years covered*

2000-2019.

### *General note*

Sub-sectoral data are only available for the industry sector.



### *Residential sector*

Data for energy consumption disaggregated by end use are not available.

Data for appliances stocks are available from the year 2001 onwards. Data for appliances stocks of freezers, refrigerator/freezer combinations, and clothes dryers are not available.

Data for occupied dwellings are not available. Data for heating and cooling degree days are not available.

### *Industry and services sectors*

Data for gas consumption from each industry sub-sector have been revised over the period 2015-2019 to express net calorific values (NCV).

Data for energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified.

Data for energy consumption of cement production are not available.

Data for value added are available from 2010 onwards and are based on price levels and PPP of 2015. The conversion of these data into 2015 USD PPP was made by IEA secretariat, based on country submission.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are not available.

### *Transport sector*

Data for energy consumption split by segment mode/vehicle type for the transport sector are not available.

Data for passenger-kilometres of motorcycles, domestic passenger airplanes and domestic passenger ships are not available.

Data for tonne-kilometres of domestic freight airplanes and domestic freight ships are not available.

Data for vehicle-kilometres are not available.

There is a break for vehicle stocks of passenger trains and freight trains in 2016 due to amortization of coaches expired service life.

## Belarus

### *Sources*

National Statistical Committee of the Republic of Belarus.

### *Years covered*

2000-2019.

### *Residential sector*

Data for energy consumption disaggregated by end use are available from 2010 onwards.

Data for energy consumption for space cooling, lighting and split by appliance type are not available. These are all reported together under other appliances.

Data for appliances stocks are available for refrigerator/freezer combinations, clothes washers, TVs and PCs, since the year 2010. Data for appliances stocks for dish washers are available from the year 2017.

Data for residential floor are available from 2010. Data for cooling degree days are not available.

### *Industry and services sectors*

Data for energy consumption for paper and printing [ISIC 17-18] are allocated in full to paper production [ISIC 17].

Data for energy consumption for rubber [ISIC 22] are included in non-metallic minerals [ISIC 23]. Data for energy consumption of cement production are available from 2014 onwards.

Data for energy consumption from other manufacturing [ISIC 31-32] are not available.

Data for value added are available from the year 2014 onwards and are based on price levels and PPP of 2015.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are not available.

Data for services floor area are not available.

### *Transport sector*

Data for transport energy consumption split by segment/mode/vehicle type are not available, except for buses and freight trucks from 2016 onwards.

Activity data are available from 2010 onwards.

Data for passenger-kilometres of passenger cars, motorcycles and domestic passenger airplanes are not available.

Data for tonne-kilometres of domestic freight airplanes are not available.

Data for vehicle-kilometres are not available.

## **Bosnia and Herzegovina**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2014 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

Data for cooling degree days and for heating degree days are not available.

### *Industry and services sectors*

Data for energy consumption by end use are available starting from 2008 onwards, apart from non-metallic minerals [ISIC 23] and ferrous metals (part of basic metals [ISIC 24]) from 2004 onwards.

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for value added are not available.

Data for energy consumption in the services sector by end use are not available. Data for energy consumption by services category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Brazil**

### *Sources*

Empresa de Pesquisa Energética (EPE) and Ministério de Minas e Energia (MME).

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from the year 2005 onwards.

Data for energy consumption, stocks and unit energy consumption for refrigerators and clothes dryers are not available.

Data for gas and electricity consumption, as well as for appliances stocks and unit energy consumption, have been revised over the whole time series, following a new household survey.

Data for occupied dwellings and household occupancy are available starting in the year 2005.

Data for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption for wood and wood products [ISIC 16], rubber and plastics products [ISIC 22], machinery and equipment [ISIC 26-28], and transport equipment [ISIC 29-30], and other manufacturing [ISIC 31-32] are reported in manufacturing not elsewhere specified.

Data for energy consumption for manufacture of food, beverages and tobacco [ISIC 10-12] only include food and beverages [ISIC 10-11]. Tobacco [ISIC 12] is reported under manufacturing not elsewhere specified.

Data for energy consumption for manufacture of textiles, wearing apparel and leather [ISIC 13-15] only include textiles [ISIC 13]. Wearing apparel and leather [ISIC 14-15] are reported under manufacturing not elsewhere specified.

Data for energy consumption for manufacture of chemicals and chemical products [ISIC 20-21] only includes chemicals [ISIC 20]. Pharmaceuticals [ISIC 21] is reported under manufacturing not elsewhere specified.

Data for energy consumption for manufacture of glass are not reported under non-metallic minerals [ISIC 23], but under manufacturing not elsewhere specified.

Data for energy consumption of iron and steel [ISIC 2410+2431] has been revised to better include coke ovens in the coal and electricity figures.

Data for energy consumption of non-ferrous metals [ISIC 2420+2432] also include manufacture of fabricated metal products [ISIC 25].

Data for energy consumption of manufacturing not elsewhere specified also include repair of machinery and equipment [ISIC 33], typically reported in services.

Data for energy consumption of construction [ISIC 41-43] are not available.

Data for value added has similar boundaries as those from the data for energy consumption mentioned above, and have been revised over the whole time series to be rebased on the year 2015.

Data for energy consumption of the services sector by end use are not available.

Data for services electricity consumption by sub-sector are available over the period 2012-2019. Data for energy consumption of sewerage and waste collection [ISIC 37-39], warehousing [ISIC 52-53], information and communication [ISIC 58-63], financial and administrative services [ISIC 64-82] and arts and entertainment [ISIC 90-93] are not available.

Data for non-building energy use in the services sector refers to street lighting and data are available from the year 2004 onwards. Before the year 2004, street lighting is reported under other building energy use.

Data for total and services employment are not available for the year 2020, and data on services floor areas are not available at all.

### *Transport sector*

Data for passenger-kilometres, vehicles stocks and energy consumption of passenger cars, SUV and personal light trucks include light commercial vehicles.

Data for passenger-kilometres for cars have been revised from 2010 onwards.

Data for passenger-kilometres for motorcycles are not available. Data for passenger-kilometres of trains only include metro and trams.

Data for tonne-kilometres for freight trucks and ships have been revised over the whole time series.

Data for vehicle-kilometres are only available for trucks; they have been revised over the whole time series.

Data for vehicle stock for cars and diesel cars, as well as for freight trucks, have been revised over the whole time series, and they have been added for gasoline cars. Data for vehicle stock of rail are not available.

Data for energy consumption of motorcycles are reported together with passenger cars.

Data for diesel consumption from cars and freight trucks, as well as jet fuel consumption from passenger and freight planes, have been revised over the whole time series.

Data for diesel consumption from passenger and freight ships have been revised from 2016 and 2015, respectively. Data for heavy fuel oil from freight ships have been revised from 2014 onwards.

Data for ethanol consumption are reported under other fuels under passenger cars – otherwise typically reported together with motor gasoline – given the importance of this fuel in the country.

## Bulgaria

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2010 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for value added are not available.

Data for energy consumption in the services sector by end use are not available.

Data for energy consumption by services category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Chile**

### *Sources*

Ministerio de Energía, Gobierno de Chile.

### *Years covered*

2000-2020 (partially).

### *Residential sector*

Data for energy consumption for the residential sector by end use are available for the years 2010 and 2018.

Data for non-specified residential are based on the IEA energy balances except the year 2010 and 2018. The Chilean administration applied a new revised methodology for final consumption of primary solid biofuels of residential sector. This may lead to data breaks in time series between 2013 and 2014.

Data for appliances stocks and unit energy consumption are available only for the year 2018.

Data for energy consumption, appliances stocks, and unit energy consumption of refrigerator/freezer combinations are not available.

Data for residential floor areas are not available.

### *Industry and services sectors*

Data for manufacture of textiles [ISIC 13-15], wood and wood products [ISIC 16], rubber and plastics [ISIC 22], machinery [ISIC 25-28] and transport equipment [ISIC 29-30], and other manufacturing [ISIC 31-32] are included in manufacturing not elsewhere specified.

Data for energy consumption for manufacture of food [ISIC 10-12] are available from the year 2014 onwards, and for construction [ISIC 41-43] from 2017 onwards.

Data for energy consumption for non-metallic minerals [ISIC 23] include only cement energy consumption.

Data for value added for several manufacturing subsectors are not available for the year 2020.

Data for energy consumption of the services sector by end use are not available. Data for energy consumption by services category are only available for sewage [ISIC 37-39] and public administration [ISIC 84] for 2018-2020 and 2019-2020 respectively..

Data for employment are available from the year 2010 onwards.

### *Transport sector*

Data for transport activity are not available except for vehicle stocks for road transport. Data for stocks of freight road vehicles are available from 2015 onwards.

Data for transport energy consumption by segment/mode/vehicle type are not available.

## **Colombia**

### *Sources*

Unidad de Planeación Minero Energética (UPME), Ministerio de Minas y Energía.

### *Years covered*

2000-2019.

### *Residential sector*

Data for energy consumption by end use are not available. Data for appliances stock and unit energy consumption are not available.



Data for residential floor areas and heating and cooling degree days are not available.

### *Industry and services sectors*

Data for energy consumption by subsector are available from 2006 onwards, except for gas consumption sometimes available from 2007 onwards.

Data for energy consumption for cement (part of non-metallic minerals [ISIC 23]), ferrous metals [ISIC 2410+2431] and non-ferrous metals [ISIC 2420+2432] are not available.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are available from 2005 onwards, except for other services [ISIC 33, 45, 94-96, 99].

Data for services floor area are not available.

### *Transport sector*

Activity data are not available, apart from vehicle-kilometres for cars over the period 2009-2018 and vehicle stocks for cars, gasoline, diesel and electric cars, motorcycles and buses for the year 2019.

Data for energy consumption for passenger planes and ships, and for freight trucks, are available from 2006 onwards. Other energy consumption data are not available.

## **Croatia**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2010 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for energy consumption in the services sector by end use are not available.  
Data for energy consumption by services category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Cyprus**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2018 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption for industry sub-sectors are available from various years onwards, depending on the fuel considered. This may cause breaks in the data series.

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for value added for some industry subsectors and services are not available for the year 2020.

Data for total services energy consumption is available from 2005 onwards. Data for energy consumption in the services sector by end use are not available. Data for energy consumption by services category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Georgia**

### *Sources*

National Statistics Office of Georgia – GEOSTAT.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption disaggregated by end use are available from 2016 onwards.

Data for energy consumption for split by appliance type are not available. Data for energy consumption for lighting are reported under other appliances.

Data for appliances stocks and degree days are not available.

Data for number of dwellings, residential floor areas and household occupancy are available only for the year 2014.

### *Industry and services sectors*

Data for GDP is based on SNA 2008 methodology from 2010. Data for GDP before 2010 is based on SNA 1993.

Data for energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are available from the year 2013 onwards.

Data for energy consumption for refined petroleum products [ISIC 19] are available from the year 2015 onwards.

Data for energy consumption for basic metals [ISIC 24] split by ferrous and non-ferrous metals are not available. Data for energy consumption for cement (part of non-metallic minerals [ISIC 23]) are not available.

Data for energy consumption for mining and quarrying [ISIC 05-09] and all other available manufacturing subsectors are available from 2001 onwards.

Data on value added are available at the level of ISIC section (Rev. 4) from 2010 onwards.

Data for value added are based on price levels and PPP of 2015 as for other countries. The PPP adjustment was done by the IEA secretariat, based on country submission.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are not available.

Data for services floor area are not available, and for services employment are available from 2017 onwards.

### *Transport sector*

Data for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

Data for passenger-kilometres are not available for passenger cars and motorcycles, and are available from 2010 onwards for domestic passenger ships.

Data for tonne-kilometres for domestic freight ships are not available for the years 2009-2010 and from 2013 onwards.

Data for vehicle-kilometres are not available.

Data for vehicle stocks are only available for passenger cars, buses and freight trucks, except for the years 2004-2005 and 2020 for which no stock data are available.

## **Hong Kong, China**

### *Sources*

Electrical and Mechanical Services Department (EMSD).

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption of refrigerator/freezer combinations include refrigerators and freezers as well. Data for energy consumption of clothes washers include clothes dryers as well. Data for energy consumption of TVs include PCs

as well. Data for energy consumption of cooking includes other kitchen facilities as well.

Data for appliances stocks are not available.

Data for occupied dwellings are only available for the years 2001, 2006, 2011, and 2016. Data for total dwelling area are only available from 2011 to 2015.

Data for heating degree days are not available.

### *Industry and services sectors*

The categorisation of energy data in these sectors follows Hong Kong Standard Industrial Classification (HSIC) version 1.1 until 2008, and data from 2009 follows HSIC version 2.0. Data for value added are available at current price local currency units following HSIC 2.0.

Data for energy consumption for agriculture, forestry and fishing [ISIC 01-03] are available from 2011 onwards. Prior to 2011, energy consumption for agriculture was included in non-manufacturing, which includes mining and quarrying [ISIC 05-09] and construction [ISIC 41-43].

Data for energy consumption for machinery [ISIC 25-28] also includes basic metals [ISIC 24] and transport equipment [ISIC 29-30].

Data for energy consumption for wood [ISIC 16], paper and printing [ISIC 17-18], coke and refined petroleum products [ISIC 19], chemicals [ISIC 21], rubber [ISIC 22], non-metallic minerals [ISIC 23], cement production and other manufacturing [ISIC 31-32] are included in Manufacturing.

Data for value added for paper and printing [ISIC 17-18] [HSIC 2.0 (17-18) Manufacture of Paper products, printing and reproduction of recorded media] are available from 2009 onwards. Data for value added for construction [ISIC 41-43] [HSIC 2.0 (41-43): Construction] are available from 2005 onwards.

Data for value added for wood [ISIC 16] [HSIC 1.1 (331): Manufacture of Wood and cork products except furniture], paper [ISIC 17] [HSIC 1.1 (341): Manufacture of Paper and paper products], basic metals [ISIC 24] [HSIC 1.1 (371-372): Manufacture of Basic metal industries], machinery [ISIC 25-28] [HSIC 1.1 (380-381): Manufacture of Fabricated metal products, except machinery and equipment], and transport equipment [ISIC 29-30] [HSIC 1.1 (388): Manufacture of Transport equipment] are not available from 2009.

Data for value added for textiles and leather [ISIC 13-15] excludes leather [ISIC 15] [HSIC 2.0 (13-14): Manufacture of Textiles and Wearing apparel] from 2009, it is included in other manufacturing [ISIC 31-32] together with wood [ISIC 16] [HSIC 2.0 (15-16 and 31-32): Other miscellaneous manufacturing industries]. Data for value added for non-metallic minerals [ISIC 23] also includes coke and refined petroleum products [ISIC 19] and rubber [ISIC 22] from 2009 [HSIC 2.0 (19, 22-23): Manufacture of Rubber, plastic and non-metallic mineral products].

Data for value added for agriculture, forestry and fishing [ISIC 01-03], mining and quarrying [ISIC 05-09], printing [ISIC 18], coke and refined petroleum products [ISIC 19], rubber [ISIC 22], electricity, gas, and water supply [ISIC 35-36] are not available for the whole time series.

Data for energy consumption for services space heating are available from 2001 onwards.

Data for energy consumption by services category are available from 2009 to 2020 for wholesale and retail trade [ISIC 46-47], accommodation and food services [ISIC 55-56], offices [ISIC 64-82], and other services activities. Data for energy consumption for education [ISIC 85] and health and social work [ISIC 86-88], excluding social work, are available from 2012 to 2020. Data for information and communication [ISIC 58-63] which includes only energy consumption in data centre are available for the years 2018-2020.

Data for total employment are not available from 2015. Data for total services employment are not available from 2012. Data for value added for total services are not available from 2016. Data for total services floor area are not available.

### *Transport sector*

Data for passenger-kilometres are only available for passenger cars, motorcycles, and buses from 2015 onwards.

Data for tonne-kilometres are not available.

Data for vehicle-kilometres for freight trains are not available.

Data for vehicle stocks for rail, air, and water transport are not available. Freight trains stopped operating in 2011, as such data for energy consumption for freight trains are not available from 2010. Data for energy consumption for freight airplanes are not available.

## Kazakhstan

### *Sources*

Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.

### *Years covered*

2000-2020.

### *General note*

Sub-sectoral data are only available for the industry sector.

### *Residential sector*

Data for energy consumption disaggregated by end use are not available.

Partial data availability of energy consumption (by fuel) for residential sector before the year 2008 may lead to relatively low energy intensities. Work is ongoing to improve data availability.

Data for appliances stocks are available for the year 2018 based on the pilot survey “Household Fuel and Energy Survey Questionnaire”. Data for appliances stocks of refrigerator/freezer combinations and clothes dryers are not available.

Data for residential floor area are available from 2003 onwards. Data for occupied dwellings, and heating and cooling degree days are not available.

### *Industry and services sectors*

In the result of methodological change, breaks in time series appear for many product and flows between 2014 and 2015 data.

Data split by industry sub-sector for natural gas, coal products, and heat consumption in the industry sector are reported from the year 2008 onwards except basic metals [ISIC 24]. This leads to breaks in the time series for total final energy consumption of several industry sub-sectors.

Data for energy consumption from rubber [ISIC 22] and other manufacturing [ISIC 31-32] are not available.

Data for biofuels and waste consumption in the industry sector are not available.

Data on value added are not available for the year 2019. Data on value added are available at the level of ISIC section (Rev. 4) before the year 2010. Data for value added are based on price levels and PPP of 2015. The conversion of these data into 2015 USD PPP was made by IEA secretariat, based on country submission.

Partial data availability of energy consumption (by fuel) for services sector before the year 2008 may lead to relatively low energy intensities. Work is ongoing to improve data availability.

Data for energy consumption in the services sector by end use are not available. Data for energy consumption by services category are not available.

### *Transport sector*

Data for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

Data for passenger-kilometres for passenger cars shows a break in 2017 following a change in methodology.

Data for passenger-kilometres of domestic passenger airplanes are available from the year 2001 onwards. Data for passenger-kilometres and vehicle stock of motorcycles are not available.

Data for tonne-kilometres of domestic freight airplanes are available from the year 2001 onwards.

Data for vehicle-kilometres are not available.

## **Kosovo**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2017 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.



Data for occupied dwellings and for residential floor areas are not available.

Data for cooling degree days and for heating degree days are not available.

### *Industry and services sectors*

Data for energy consumption for mining and quarrying [ISIC 05-09], wood and wood products [ISIC 16], cement (part of non-metallic minerals [ISIC 23]) and transport equipments [ISIC 29-30] are not available.

Data for value added are not available.

Data for energy consumption of the services sector by end use are not available.

Data for energy consumption by services category are not available.

Activity data for services (employment and floor area) are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Kyrgyzstan**

### *Sources*

National Statistical Committee of the Kyrgyz Republic.

### *Years covered*

2000-2020.

### *General note*

Sub-sectoral data are only available for the industry sector.

### *Residential sector*

Partial data availability of energy consumption (by fuel) for services sector before the year 2013 may lead to relatively low energy intensities. Data for gas and heat are not available before 2005. Work is ongoing to improve data availability.

Data for dwellings (occupied and floor area) are not available.

### *Industry and services sectors*

Data split by industry sub-sector for oil and oil products, natural gas, and heat consumption in the industry sector are reported from the year 2005 onwards. This leads to breaks in the time series for total final energy consumption of several industry sub-sectors.

Data for energy consumption split by fuel types for manufacturing sub-sectors are not available for the years 2005-2011, and for some sub-sectors and/or fuels for 2012 as well. Only electricity consumption data is available before 2005.

Data for energy consumption from rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]), ferrous metals (part of basic metals [ISIC 24]) and other manufacturing [ISIC 31-32] are not available.

Data for biofuels and waste consumption in the industry sector are not available.

Data on value added are not available.

Partial data availability of energy consumption (by fuel) for services sector before the year 2016 may lead to relatively low energy intensities. Data are not available before 2005. Work is ongoing to improve data availability.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are not available.

### *Transport sector*

Data for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

Data for passenger-kilometres of motorcycle and domestic passenger ships are not available.

Data for tonne-kilometres of domestic freight ships are not available.

Data for vehicle-kilometres are not available.

Data for vehicle stocks of motorcycles, buses, freight trucks, and rail transport are not available.

## **Latvia**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2010 onwards. Data for energy consumption of residential appliances include lighting.

Data for energy consumption for space cooling are not available. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for value added for industry subsectors and services are not available for the year 2020.

Data for energy consumption in the services sector by end use are not available. Data for energy consumption by services category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Malta**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2015 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption by end use are available starting from 2010 onwards and only electricity consumption is available for manufacturing subsectors. Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for value added for industry subsectors are partly available. Data for value added for mining and quarrying [ISIC 05-09], wood [ISIC 16], paper [ISIC 17], rubber and plastic [ISIC 22], non-metallic minerals [ISIC 23], electricity, gas, and water supply [ISIC 35-36], and services are not available.

Data for total services energy consumption are available from 2005 onwards. Data for energy consumption in the services sector by end use are not available. Data for energy consumption by services category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Republic of Moldova**

### *Sources*

National Bureau of Statistics of the Republic of Moldova.

### *Years covered*

2000-2020.

### *General note*

The data presented does not include the districts from the left side of the river Nistru and municipality Bender. Some discrepancies may exist between the final energy consumption in this publication and that reported in the IEA energy balances, where official figures on natural gas imports, natural gas inputs to power plants, electricity production and consumption are modified by the IEA secretariat to include estimates for supply and demand for the autonomous region of Stînga Nistrului (also known as the Pridnestrovian Moldavian Republic or Transnistria).

### *Residential sector*

Data for energy consumption from biofuels and waste shows a break for the year 2010, which is also affecting the time series for total energy consumption of this

sector. This may be due to different data collection methodologies, and work is ongoing to improve consistency of the time series.

Energy consumption data split by end use are available from the year 2015 onwards.

Data for energy consumption for lighting are included under residential appliances.

Data for appliances stocks are available from the year 2010 onwards. Data for appliances stocks of refrigerators, freezers, clothes dryers are not available. Data for appliances stocks of dish washers are available for the years 2015 and 2019-2020.

Data for energy consumption of residential appliances by appliance type are not available.

Data for occupied dwellings are not available. Hence, energy intensities per dwelling are calculated using total number of dwellings instead of occupied dwellings.

Data for total dwellings and residential floor area are available from 2005 onwards.

Data for heating and cooling degree days are not available.

### *Industry and services sectors*

Data for energy consumption from biofuels and waste are available from 2005 onwards.

Data for energy consumption for refined petroleum products [ISIC 19], rubber [ISIC 22] and other manufacturing [ISIC 31-32] are available from 2015 onwards.

Data for energy consumption from cement (part of non-metallic minerals [ISIC 23]) and non-ferrous metals (part of basic metals [ISIC 24]) are not available.

Data on value added are available at the level of ISIC section (Rev. 4) from the year 2010 onwards, and not available before; they are based on price levels and PPP of 2015.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are not available.

Activity data for services (employment and floor area) are not available.

### *Transport sector*

Data split by segment/mode/vehicle type for the transport sector are not available.

Data for passenger-kilometres are only available for buses and passenger trains.

Data for tonne-kilometres are only available for freight trains.

No other activity data are available for the transport sector.

## **Morocco**

### *Sources*

Ministère de l'Energie, des Mines et du Développement Durable.

### *Years covered*

2000-2020.

### *General note*

There are some discrepancies between the IEA energy efficiency indicators and the IEA energy balances databases. Work is ongoing to improve data consistency.

### *Residential sector*

Data for energy consumption split by end use are available from the year 2004 onwards.

Data for energy consumption per appliance type are available for refrigerators, clothes washers and TVs. Data for energy consumption for other appliances are not available.

Data for appliances stocks are not available.

Data for residential floor areas are available only for the year 2012.

Data for heating and cooling degree days are not available.

Other product used for residential lighting corresponds to estimation of *gaz butane* consumption used for non-electrified households.

### *Industry and services sectors*

Data for energy consumption for manufacturing of rubber and plastic products [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified.

Data for value added for manufacturing sub-sectors are available between the year 2008 and the year 2020. Data for value added are not available for several manufacturing sub-sectors.

Data for energy consumption for the services sector split by end use are available from 2004 onwards. Data for energy consumption by services category are not available.

Non-building energy use in the service sector refers to street lighting.

Data for services floor areas are not available.

### *Transport sector*

Data for passenger-kilometres and tonne-kilometres are available for rail only from the year 2004 onwards.

Data for vehicle stocks and vehicle-kilometres are based on country estimates, and are available from the year 2004 onwards.

Data for vehicle stocks of passenger cars may include buses.

Data for energy consumption of passenger cars and freight road transport are based on country estimates, and are available from the year 2004 onwards. Data for energy consumption of passenger cars also include buses.

Data for energy consumption of domestic passenger airplanes may also include domestic freight airplanes.

Data for energy consumption of rail transport split between passenger and freight rail are not available and the total rail consumption is allocated in passenger trains for years before 2012.

Data for energy consumption of domestic water transport are not available.

Following years of decrease, passenger train activity rebounded in 2019 due to the opening of AI Boraq high-speed train line.

## **Republic of North Macedonia**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from the year 2010 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

Data for cooling degree days and for heating degree days are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for value added are not available.

Data for energy consumption in the services sector by end use are not available.

Data for energy consumption by services category are not available.

Activity data for services (employment and floor area) are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Romania**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2015 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.



Data for occupied dwellings and for residential floor areas are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for energy consumption in the services sector by end use are not available.

Data for energy consumption by services category are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Serbia**

### *Sources*

Eurostat and IEA Energy Balances.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption by end use are available from 2010 onwards. Data for energy consumption of residential appliances include lighting. Data for energy consumption and stocks by appliance type are not available.

Data for occupied dwellings and for residential floor areas are not available.

Data for cooling degree days and for heating degree days are not available.

### *Industry and services sectors*

Data for energy consumption by end use are available starting from 2004 onwards, or later years depending on the fuel. This may cause breaks in the time series for total consumption from sub-sectors.

Data for energy consumption for rubber [ISIC 22], cement (part of non-metallic minerals [ISIC 23]) and other manufacturing [ISIC 31-32] are not available.

Data for value added are not available.

Data for energy consumption in the services sector by end use are not available.  
Data for energy consumption by services category are not available.

Activity data for services (employment and floor area) are not available.

### *Transport sector*

Data for activity and for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

## **Slovenia**

### *Sources*

Statistical Office of Slovenia (SURS); Odyssee database.

### *Years covered*

2000-2020.

### *Residential sector*

Data for energy consumption for refrigerator/freezer combinations include consumption of refrigerators and combined refrigerators with freezers.

Data for stocks of refrigerators and PCs are not available.

Data for 2020 for total, occupied and new dwellings, as well as residential floor area, are not available.

Data for appliances stock and appliances unit energy consumption for 2020 are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are available from 2008 onwards, while data for value added are available from 2000.

Data for energy consumption for cement production are not available. Data for energy consumption of the services sector by end use are not available. Data for energy consumption by services category are available only for sewerage and waste [ISIC 37-39], from 2019 onwards.

Data for gas consumption in 2018 have been revised for manufacturing of food [ISIC 10-12], textiles [ISIC 13-15] and machinery [ISIC 25-28] as well as for the services sector.

Data for services floor areas are not available.

### *Transport sector*

Transport activity and energy consumption data for 2020 are not available.

Data for passenger-kilometres for motorcycles, domestic passenger airplanes and domestic passenger ships are not available. Data for tonne-kilometres for domestic freight airplanes domestic freight and ships are not available.

Data for vehicle-kilometres and vehicle stocks of rail transport are not available.

Data for energy consumption for domestic freight airplanes may be partially included in domestic passenger airplanes. Data for energy consumption for domestic ships are not available, whether passenger or freight.

## **South Africa**

### *Sources*

South African National Energy Development Institute (SANEDI), Department of Mineral Resources and Energy (DMRE).

### *Years covered*

2000-2019.

### *Residential sector*

Data for energy consumption by end use are not available.

Data for stocks and diffusion of residential appliances are available for the year 2015, except for refrigerators and PCs/ICTs.

Data for occupied dwellings are available for the years 2002-2019. Data for residential floor areas are not available.

Data for cooling degree days and for heating degree days are not available.

### *Industry and services sectors*

Data for energy consumption for rubber [ISIC 22] and other manufacturing are included under non-specified manufacturing.

Data for energy consumption for cement production are not available.

Data for value-added are available for the years 2014-2018, without details on manufacturing subsectors level.

Data for energy consumption of the services sector by end use and by sub-sector are not available.

Data for services floor areas are not available.

### *Transport sector*

Data for road transport energy by segment and vehicle type are available for the year 2010. Data for energy transport by rail, air and water are not available.

Data for transport activity are available for the years 2006, 2010 and 2014.

Data for passenger-kilometres for passenger airplanes are available for the year 2006. Data for passenger ships are not available.

Data for tonne-kilometres for freight trains are available for the year 2010. Data for domestic freight airplanes and ships are not available.

Data for vehicle-kilometres and vehicle stocks of rail, air and water transport are not available, except for domestic passenger airplanes vehicle-kilometres in 2006. Data for freight road are available for the years 2006 and 2010.

## **Chinese Taipei**

### *Sources*

Taiwan Research Institute.

### *Years covered*

2000-2019.

### *Residential sector*

Energy consumption data split by end use are available from 2010 to 2019.

Data for energy consumption of refrigerators, freezers, clothes dryers, PCs, and other appliances are not available.

Data for appliances stocks are not available.

Data for occupied dwellings are only available for the years 2000, 2005, and 2015.

Data for heating degree days are not available.

### *Industry and services sectors*

Data for energy consumption from biofuels and waste are available from 2005 onwards.

Data for energy consumption for rubber [ISIC 22], cement production, and other manufacturing [ISIC 31-32] are not available.

Data on value added are available at 2016 constant local currency units.

Data for energy consumption in the services sector by end use are available from 2010 onwards. Data for services energy consumption by sub-sector are not available.

### *Transport sector*

Data for energy consumption split by segment/mode/vehicle type for the transport sector are not available.

Data for passenger-kilometres are only available for passenger trains.

Data for vehicle-kilometres for passenger cars and motorcycles are available from 2003 onwards.

Data for vehicle stocks are only available for passenger cars, motorcycles, and buses.

No other activity data are available for the transport sector.

## **Ukraine**

### *Sources*

State Statistics Service of Ukraine.

### *Years covered*

2000-2019.

### *General note*

Due to limited information available to the State Statistics Service of Ukraine from the Donetsk and Luhansk regions of Ukraine and from the Autonomous Republic of Crimea, breaks in the time series occur after the year 2013.

### *Residential sector*

Data for energy consumption split by end use are available from the year 2016 onwards.

Data for energy consumption of residential appliances include lighting, and data for energy consumption of residential appliances by appliance type are not available.

Data for appliances stocks of refrigerators, freezers, dish washers, clothes washers, TVs, and PCs are available for the year 2016.

Data for occupied dwellings are not available. Hence, energy intensities per dwelling are calculated using total number of dwellings instead of occupied dwellings.

Data for heating degree days are available from 2014 onwards. Data for cooling degree days are not available.

### *Industry and services sectors*

Data split by industry sub-sector for each fuel consumption except electricity are reported from the year 2004 or 2005 onwards, depending on the fuel. This may lead to breaks in the time series for total final energy consumption of several industry sub-sectors.

Data for energy consumption for rubber [ISIC 22] and other manufacturing [ISIC 31-32] are included under manufacturing not elsewhere specified. Data for energy consumption from cement (part of non-metallic minerals [ISIC 23]) are not available.

Data on value added are available at the level of ISIC section (Rev. 4) from the year 2010 onwards, and not available before; data for value added by manufacturing sub-sector are available since the year 2012 onwards. They are based on price levels and PPP of 2015. The adjustment of these data for PPP was made by the IEA secretariat, based on country submission.

Partial data availability of energy consumption (by fuel) for services sector before the year 2007 may lead to relatively low energy intensities. Work is ongoing to improve data availability.

Data for energy consumption in the services sector by end use are not available. Data for services energy consumption by sub-sector are not available.

Data for services floor area are not available.

### *Transport sector*

Energy consumption data split by segment/mode/vehicle type for the transport sector are not available.

Passenger-kilometres data are not available for passenger cars and motorcycles. Passenger-kilometres of domestic passenger airplanes and tonne-kilometres of domestic freight airplanes are available from the year 2002 onwards.

Data for vehicle-kilometres of passenger cars are available from 2003 onwards. Vehicle-kilometres of buses and freight trucks are available from 2002 onwards. Vehicle-kilometres of motorcycles and rail transport are not available.

Data for vehicle stocks of passenger cars, motorcycles, buses and freight trucks are available until the year 2013.

## Uruguay

### *Sources*

Dirección Nacional de Energía Ministerio de Industria, Energía y Minería.

### *Years covered*

2000-2019 (partially).

### *Residential sector*

Data for energy consumption by end use are available for the years 2006-2018.

Data for energy consumption for lighting are included under other appliances.

Data for energy consumption by appliance type, appliances unit energy consumption, and appliances stocks are not available.

Data for population are not available for the year 2019.

Data for number of dwellings and for residential floor areas are available for the years 2006-2018.

Data for cooling degree days and for heating degree days for the year 2019 are not available.

### *Industry and services sectors*

Data for energy consumption for other manufacturing [ISIC 31-32] includes non-metallic minerals [ISIC 23] up to the year 2012 and basic metals [ISIC 24] and machinery [ISIC 25-28] up to the year 2018.

Data for energy consumption for mining and quarrying [ISIC 05-09], rubber and plastic [ISIC 22], and transport equipment [ISIC 29-30] are not available.

Data for energy consumption for non-metallic minerals [ISIC 23] and construction [ISIC 41-43] are available from 2013 onwards.

Data for cement production are available for the years 2005, 2008, and 2013-2018.

Data for value added are available up to the year 2018 and are based on price levels and PPP of 2005.

Data for value added for rubber and plastics [ISIC 22] are included in chemicals [ISIC 20-21]. Data for value added for non-metallic minerals [ISIC 23], basic metals [ISIC 24], machinery [ISIC 25-28], and transport equipment [ISIC 29-30] are included in other manufacturing [ISIC 31-32].

Data for energy consumption in the services sector by end use are available up to the year 2018 based on BNEU 2008. Data for services energy consumption by sub-sector are available up to 2018.

Data for services floor areas are not available.

### *Transport sector*

Data for passenger-kilometres are not available.

Data for tonne-kilometres are only available for freight trucks (2002-2015) and freight trains (2006-2018).

Data for vehicle-kilometres are only available for passenger cars, motorcycles, and buses up to the year 2018.



Data for vehicle stocks are available for passenger cars, motorcycles, buses and freight trucks up to the year 2018. Data for vehicle stocks for rail transport are not available.

Data for energy consumption for passenger cars, motorcycles, buses, domestic passenger airplanes and freight trucks are available up to the year 2018. Data for freight trains and domestic freight ships are available from the year 2006 onwards.

Data for energy consumption for passenger trains, passenger ships and freight airplanes might be partially included under freight trains, freight ships and passenger airplanes, respectively.

## Uzbekistan

### *Sources*

State Committee of the Republic of Uzbekistan on Statistics.

### *Years covered*

2000-2017.

### *General note*

Sub-sectoral data are only available for the industry sector.

### *Industry and services sectors*

There are discrepancies between the IEA energy efficiency indicators and the IEA energy balances data. Work is ongoing to improve consistency between these two databases.

Data split by industry sub-sector are available from 2014 to 2017.

Data for value added are available from 2010 until 2016 and are based on price levels and PPP of 2010, instead of 2015 as for other countries. The conversion of these data into 2010 USD PPP is made by IEA secretariat, based on country submission.

# Units and conversions

## General conversion factors for energy

To	TJ	Gcal	Mtoe	MBtu	GWh
From	multiply by				
terajoule (TJ)	1	2.388x10 <sup>2</sup>	2.388x10 <sup>-5</sup>	9.478x10 <sup>2</sup>	2.778x10 <sup>-1</sup>
gigacalorie (Gcal)	4.187x10 <sup>-3</sup>	1	1.000x10 <sup>-7</sup>	3.968	1.163x10 <sup>-3</sup>
million tonnes of oil equivalent (Mtoe)	4.187x10 <sup>4</sup>	1.000x10 <sup>7</sup>	1	3.968x10 <sup>7</sup>	1.163x10 <sup>4</sup>
million British thermal units (MBtu)	1.055x10 <sup>-3</sup>	2.520x10 <sup>-1</sup>	2.520x10 <sup>-8</sup>	1	2.931x10 <sup>-4</sup>
gigawatt hour (GWh)	3.600	8.598x10 <sup>2</sup>	8.598x10 <sup>-5</sup>	3.412x10 <sup>3</sup>	1

## Conversion factors for mass

To	kg	t	lt	st	lb
From	multiply by				
kilogramme (kg)	1	1.000x10 <sup>-3</sup>	9.842x10 <sup>-4</sup>	1.102x10 <sup>-3</sup>	2.205
tonne (t)	1.000x10 <sup>3</sup>	1	9.842x10 <sup>-1</sup>	1.102	2.205x10 <sup>3</sup>
long ton (lt)	1.016x10 <sup>3</sup>	1.016	1	1.120	2.240x10 <sup>3</sup>
short ton (st)	9.072x10 <sup>2</sup>	9.072x10 <sup>-1</sup>	8.929x10 <sup>-1</sup>	1	2.000x10 <sup>3</sup>
pound (lb)	4.536x10 <sup>-1</sup>	4.536x10 <sup>-4</sup>	4.464x10 <sup>-4</sup>	5.000x10 <sup>-4</sup>	1

## Conversion factors for volume

To	gal U.S.	gal U.K.	bbl	ft <sup>3</sup>	l	m <sup>3</sup>
From	multiply by					
U.S. gallon (gal U.S.)	1	8.327x10 <sup>-1</sup>	2.381x10 <sup>-2</sup>	1.337x10 <sup>-1</sup>	3.785	3.785x10 <sup>-3</sup>
U.K. gallon (gal U.K.)	1.201	1	2.859x10 <sup>-2</sup>	1.605x10 <sup>-1</sup>	4.546	4.546x10 <sup>-3</sup>
barrel (bbl)	4.200x10 <sup>1</sup>	3.497x10 <sup>1</sup>	1	5.615	1.590x10 <sup>2</sup>	1.590x10 <sup>-1</sup>
cubic foot (ft <sup>3</sup> )	7.481	6.229	1.781x10 <sup>-1</sup>	1	2.832x10 <sup>1</sup>	2.832x10 <sup>-2</sup>
litre (l)	2.642x10 <sup>-1</sup>	2.200x10 <sup>-1</sup>	6.290x10 <sup>-3</sup>	3.531x10 <sup>-2</sup>	1	1.000x10 <sup>-3</sup>
cubic metre (m <sup>3</sup> )	2.642x10 <sup>2</sup>	2.200x10 <sup>2</sup>	6.290	3.531x10 <sup>1</sup>	1.000x10 <sup>3</sup>	1

**Figure 5**      **Decimal prefixes**

$10^1$	deca (da)	$10^{-1}$	deci (d)
$10^2$	hecto (h)	$10^{-2}$	centi (c)
$10^3$	kilo (k)	$10^{-3}$	milli (m)
$10^6$	mega (M)	$10^{-6}$	micro ( $\mu$ )
$10^9$	giga (G)	$10^{-9}$	nano (n)
$10^{12}$	tera (T)	$10^{-12}$	pico (p)
$10^{15}$	peta (P)	$10^{-15}$	femto (f)
$10^{18}$	exa (E)	$10^{-18}$	atto (a)

# Abbreviations

MJ	megajoule ( $10^6$ joules)
GJ	gigajoule ( $10^9$ joules)
PJ	petajoule ( $10^{15}$ joules)
GWh	gigawatt hour
CO <sub>2</sub>	carbon dioxide
MtCO <sub>2</sub>	million tonnes of carbon dioxide
LPG	liquefied petroleum gases
Gas	natural gas
m <sup>2</sup>	square metre
pers	person
pass	passenger
dw	dwelling
PCs	personal computers and information technologies
TVs	televisions and home entertainment
TC	temperature corrected
HDD	heating degree days
CDD	cooling degree days
USD	United States dollar
GDP	gross domestic product
PPP	purchasing power parity
VA	value added
pkm	passenger-kilometres
tkm	tonne-kilometres
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
OECD	Organisation for Economic Co-Operation and Development
UNFCCC	United Nations Framework Convention on Climate Change
..	not available

# Useful resources

Energy Efficiency Indicators Highlights: <https://www.iea.org/data-and-statistics/data-product/energy-efficiency-indicators-highlights>

Energy Efficiency Indicators: Fundamentals on Statistics: <https://www.iea.org/reports/energy-efficiency-indicators-fundamentals-on-statistics>

Energy Efficiency Indicators: Essentials for Policy Making: <https://www.iea.org/reports/energy-efficiency-indicators-essentials-for-policy-making>

Energy Efficiency Indicators Questionnaire: <https://www.iea.org/areas-of-work/data-and-statistics/questionnaires>

IEA online courses on Energy Efficiency: <https://elearning.iea.org/>

IEA and CMCC Weather for Energy Tracker: <https://www.iea.org/articles/weather-for-energy-tracker>

G20 Energy end-use data and energy efficiency metrics initiative: <https://www.iea.org/areas-of-work/international-collaborations/g20>

Energy end-use data collection methodologies and the emerging role of digital technologies: <https://www.iea.org/reports/energy-end-use-data-collection-methodologies-and-the-emerging-role-of-digital-technologies>

National data collection practices: <https://www.iea.org/articles/national-data-collection-practices>

International Standard Industrial Classification of All Economic Activities (ISIC) Rev.4: [https://unstats.un.org/unsd/publication/seriesm/seriesm\\_4rev4e.pdf](https://unstats.un.org/unsd/publication/seriesm/seriesm_4rev4e.pdf)

General data and statistics landing page: <https://www.iea.org/data-and-statistics>

World Energy Balances Overview and free Excel file: <https://www.iea.org/reports/world-energy-balances-overview>

International Recommendations for Energy Statistics: <https://unstats.un.org/unsd/energystats/methodology/ires/>

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Typeset in France by IEA – December 2022

Cover design: IEA