Data service

Energy and Carbon Tracker Users Guide

2020 edition

This document provides information regarding the 2020 edition of the International Energy Agency (IEA) *Energy and Carbon Tracker* Excel database. This database can be found online at:

https://webstore.iea.org/iea-energy-and-carbon-tracker

We would like to hear your feedback on the type of variables and functionalities which if incorporated in the next editions of this product would be beneficial to your needs.

Please address your inquiries to emissions@iea.org

Please note that all IEA data are subject to the following Terms and Conditions found on the IEA website: www.iea.org/t&c/termsandconditions/

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1. Database description

Tracking progress in the transition to low-carbon energy systems provides valuable insight into the steps needed today to achieve both short- and long-term climate goals. The IEA *Energy and Carbon Tracker* is a new interactive product showcasing a wide set of indicators to analyse historical trends of CO_2 emissions, energy, power and sectoral patterns at country level. This product, published in Excel format, includes graphs of time series and decomposition analyses, and allows for country comparisons.

The data are derived based on the 2020 editions of the following IEA databases: *World Energy Balances, CO_2 Emissions from Fuel Combustion* and *Energy Efficiency Indicators*. The user-friendly design allows visual presentation of a set of analyses that help users to track decarbonisation by country, as well as globally.

The *Energy and Carbon Tracker* includes annual data from 1990 to 2019 for selected indicators for all OECD countries, IEA family countries, and other selected countries; and data up to 2018 for the global set of indicators for over 160 countries and regions.

The *Tracker* includes graphs and data for the following indicators:

- CO_2 emissions by sector and by product
- CO_2 and energy-related socio-economic indicators
- Total energy supply by source and by product
- Sectoral shares in total final consumption
- Power generation and sectoral CO_2 emissions by product
- Share of power generation by product
- Drivers of CO_2 emissions from electricity generation
- Sectoral energy consumption by product
- End-use energy consumption by sector.

2. How to use this product

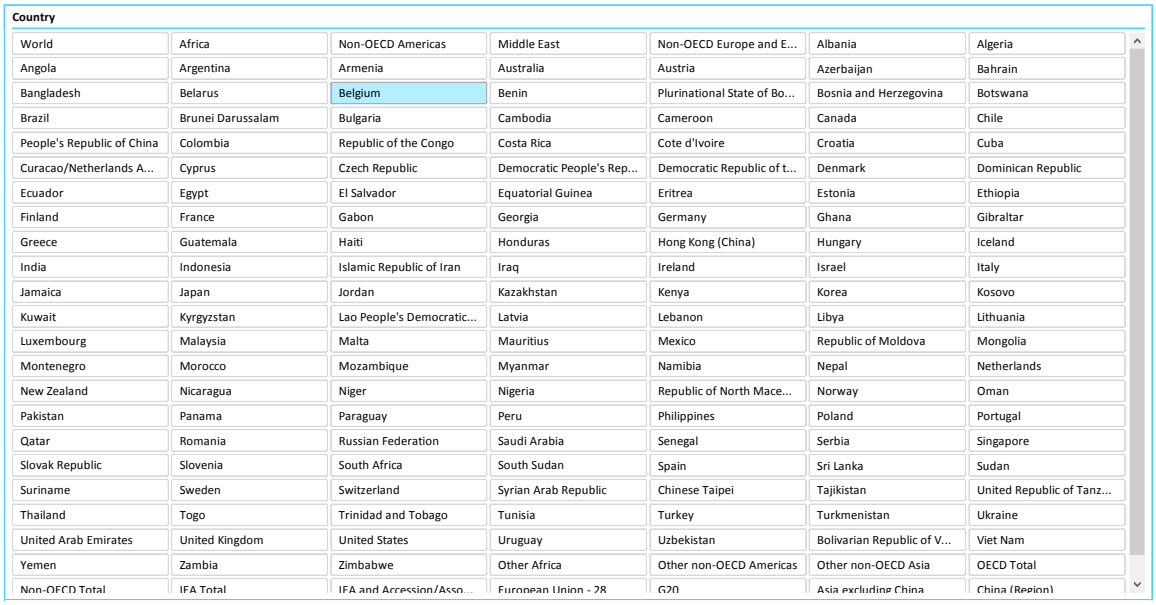
This section outlines the structure of the file and discusses its functionalities.

The Excel file includes 12 main worksheets with compilations of interactive graphs by topic, which allow the user to select the country to be displayed and compared. In addition, there are 43 data worksheets, each which is accompanied by the underlying data associated with a given graph, in a simple table format.

In each worksheet, users can select the country to be displayed through a menu on the right side of the page. All the graphs on the sheet will automatically update, with the name of the country in the title.

Figure 1 displays an example of the country menus, which enable users to select a country and automatically update the graphs.

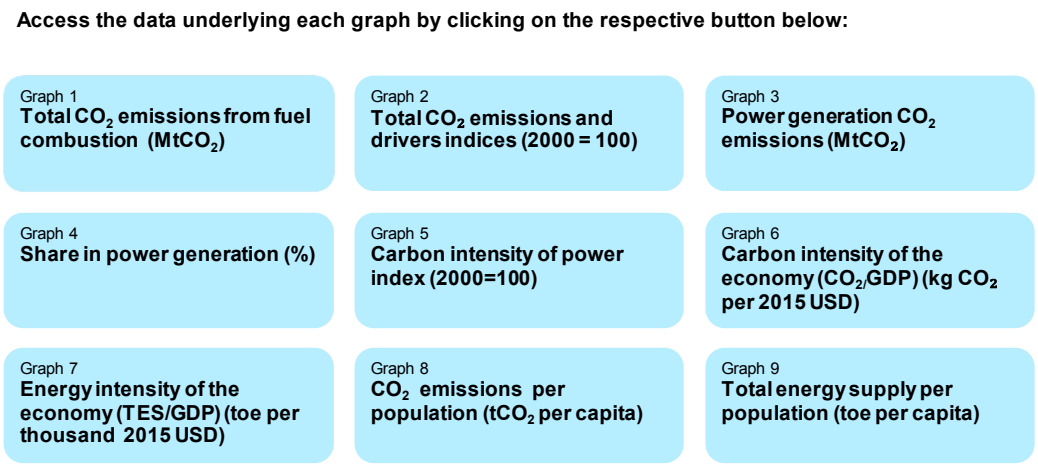
Figure 1 Example of a country menu included on the main worksheets



Users can easily access the underlying data for each graph by clicking on the relevant button under the country menu.

Figure 2 shows an example of the buttons to access the underlying data for each individual graph.

Figure 2 Example of the buttons included on the main worksheets for accessing data



Note: Macros must be enabled for this file to work properly.

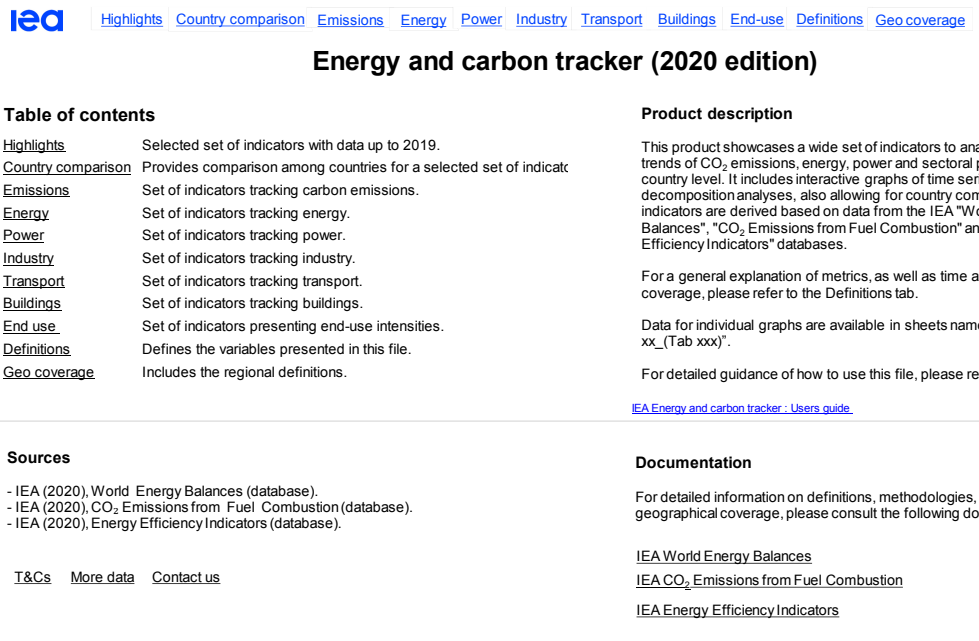
The worksheets included in the file are:

Contents

The Contents sheet includes the table of contents, to help users navigate through the Excel file, as well as a brief product description, links to the sources and supporting documentation.

Figure 3 represents the structure of the Contents sheet.

Figure 3 Structure of the Contents sheet



Highlights

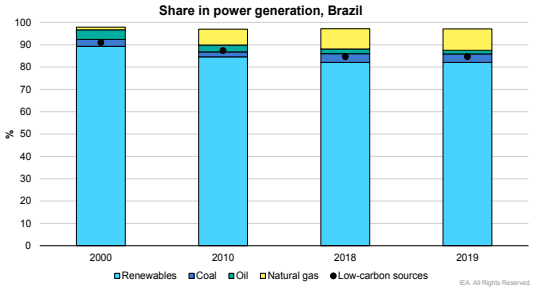
The Highlights sheet includes nine interactive graphs for a selected set of indicators, with data up to the most recent year.

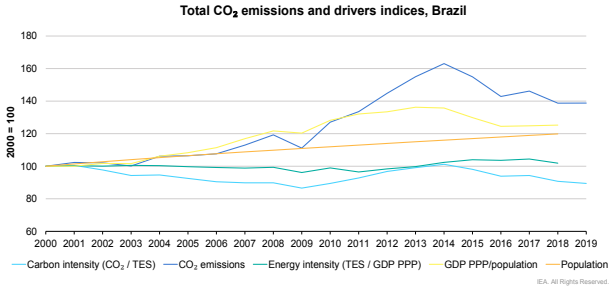
By selecting a country or region from the country list, the graphs display the corresponding indicators.

Data for individual graphs are available in individual sheets labelled "Graph #_Highlights" and can be accessed by clicking on the relevant buttons.

Figure 4 shows samples from the interactive graphs included on the Highlights sheet.

Figure 4 Sample graphs from the Highlights sheet





The full list of indicators included in this sheet includes:

- Total CO_2 emissions from fuel combustion
- Total CO_2 emissions and drivers indices
- Power generation CO_2 emissions by product
- Share of power generation by product
- Carbon intensity of power index
- Carbon intensity of the economy
- Energy intensity of the economy
- CO_2 emissions per population
- Total energy supply (TES) per population.

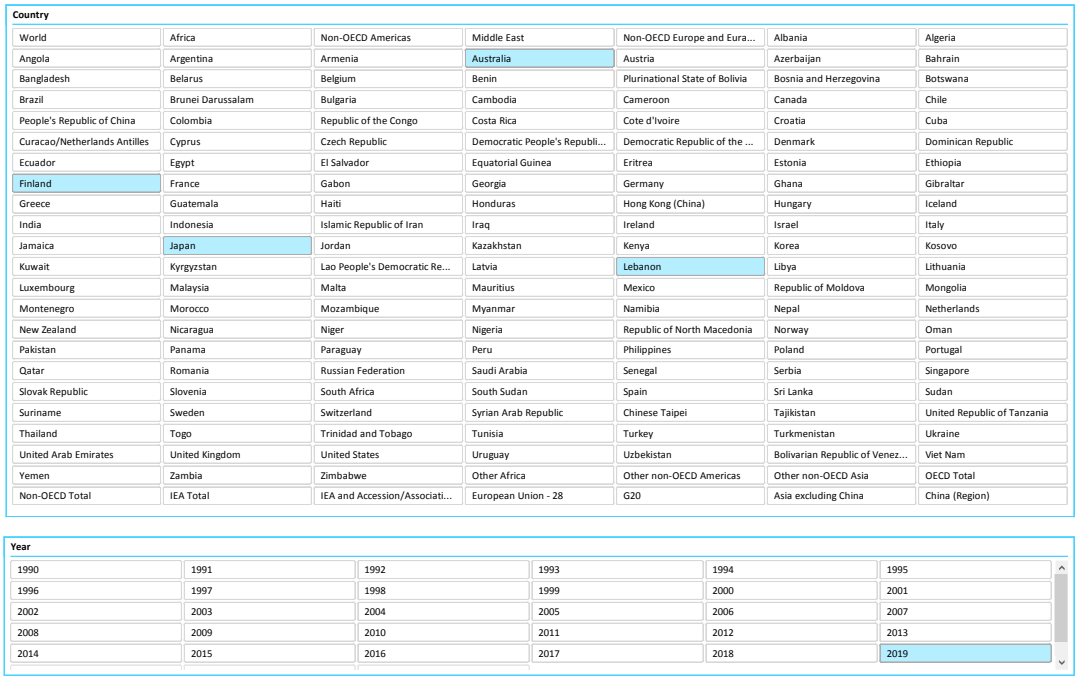
Country comparison

The Country comparison sheet includes 11 interactive graphs for a selected set of indicators, which allows for comparison among countries and regions.

By holding the Control key (CTRL) on the keyboard multiple countries/regions can be selected. Moreover, the year for the desired comparison can be selected for all graphs in bar format, while the time series graphs remain complete. The names of the countries selected will appear in the legends.

Figure 5 presents the country and year menus which allow filtering the graphs included on the Country comparison sheet.

Figure 5 Country and year menus from the Country comparison sheet



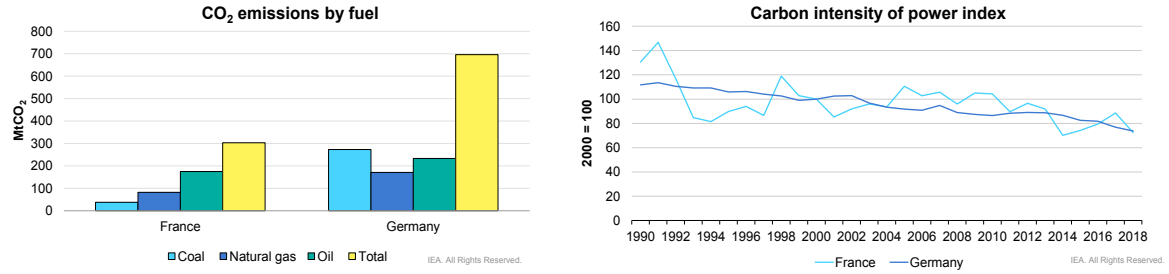
Country						
World	Africa	Non-OECD Americas	Middle East	Non-OECD Europe and Eura...	Albania	Algeria
Angola	Argentina	Armenia	Australia	Austria	Azerbaijan	Bahrain
Bangladesh	Belarus	Belgium	Benin	Plurinational State of Bolivia	Bosnia and Herzegovina	Botswana
Brazil	Brunei Darussalam	Bulgaria	Cambodia	Cameroon	Canada	Chile
People's Republic of China	Colombia	Republic of the Congo	Costa Rica	Cote d'Ivoire	Croatia	Cuba
Curacao/Netherlands Antilles	Cyprus	Czech Republic	Democratic People's Republi...	Democratic Republic of the ...	Denmark	Dominican Republic
Ecuador	Egypt	El Salvador	Equatorial Guinea	Eritrea	Estonia	Ethiopia
Finland	France	Gabon	Georgia	Germany	Ghana	Gibraltar
Greece	Guatemala	Haiti	Honduras	Hong Kong (China)	Hungary	Iceland
India	Indonesia	Islamic Republic of Iran	Iraq	Ireland	Israel	Italy
Jamaica	Japan	Jordan	Kazakhstan	Kenya	Korea	Kosovo
Kuwait	Kyrgyzstan	Lao People's Democratic Re...	Latvia	Lebanon	Libya	Lithuania
Luxembourg	Malaysia	Malta	Mauritius	Mexico	Republic of Moldova	Mongolia
Montenegro	Morocco	Mozambique	Myanmar	Namibia	Nepal	Netherlands
New Zealand	Nicaragua	Niger	Nigeria	Republic of North Macedonia	Norway	Oman
Pakistan	Panama	Paraguay	Peru	Philippines	Poland	Portugal
Qatar	Romania	Russian Federation	Saudi Arabia	Senegal	Serbia	Singapore
Slovak Republic	Slovenia	South Africa	South Sudan	Spain	Sri Lanka	Sudan
Suriname	Sweden	Switzerland	Syrian Arab Republic	Chinese Taipei	Tajikistan	United Republic of Tanzania
Thailand	Togo	Trinidad and Tobago	Tunisia	Turkey	Turkmenistan	Ukraine
United Arab Emirates	United Kingdom	United States	Uruguay	Uzbekistan	Bolivarian Republic of Venez...	Viet Nam
Yemen	Zambia	Zimbabwe	Other Africa	Other non-OECD Americas	Other non-OECD Asia	OECD Total
Non-OECD Total	IEA Total	IEA and Accession/Associati...	European Union - 28	G20	Asia excluding China	China (Region)

Year					
1990	1991	1992	1993	1994	1995
1996	1997	1998	1999	2000	2001
2002	2003	2004	2005	2006	2007
2008	2009	2010	2011	2012	2013
2014	2015	2016	2017	2018	2019

Data for all the bar charts are accessible by clicking on the relevant buttons, and included on the Bar charts_Country comparison sheet, while the corresponding data for all the time series are included on the Time series_Country comparison sheet. By referring to the graph titles, the relevant data for each graph can be obtained.

Figure 6 represents samples of the interactive graphs included on the Country comparison sheet.

Figure 6 **Sample graphs from the Country comparison sheet**



The full list of indicators included in this sheet includes:

- Total energy supply (TES)
- Total CO_2 emissions from fuel combustion
- Carbon intensity of power index
- CO_2 emissions by product
- Power generation CO_2 emissions by product
- Sectoral CO_2 emissions
- Carbon intensity of the economy
- Energy intensity of the economy
- Final energy carbon intensity
- TES and total final consumption (TFC) per population
- CO_2 emissions per population.

Emissions

Energy is at the core of the greenhouse gas (GHG) emissions. It is estimated that energy accounts for around three-quarters of total GHG emissions globally. Among energy-related emissions, CO_2 from fuel combustion accounts for the largest fraction. Understanding the fuels, sectors and macro-economic factors driving these emissions trends is pivotal to address the priorities needed to achieve energy and climate targets.

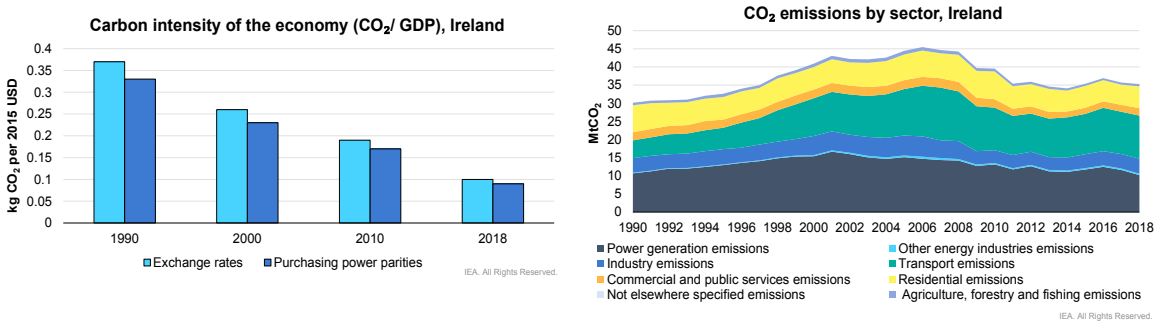
The **Emissions** sheet includes six interactive graphs showcasing a set of indicators tracking CO_2 emissions from fuel combustion, also including the decomposition of CO_2 emissions into four macro-economic driving factors (Kaya identity). Please refer to "Identifying drivers of CO_2 emissions trends" included on the "Definitions" tab for more information on this decomposition analysis.

By selecting a country or region from the country list, the graphs display the corresponding indicators.

Data for individual graphs are available in individual sheets labelled "Graph #_Emissions" and can be accessed by clicking on the relevant buttons.

Figure 7 represents samples from the interactive graphs included on the **Emissions** sheet.

Figure 7 Sample graphs from the Emissions sheet



The full list of indicators included in this sheet includes:

- CO_2 emissions by product
- CO_2 emissions by sector
- Total CO_2 emissions and drivers indices
- Annual average change of CO_2 emissions
- Carbon intensity of the economy
- CO_2 emissions per population.

Energy

Tracking the contribution of different energy sources in total energy supply (TES), alongside the share of end sectors in total final consumption (TFC), provides valuable input in energy and climate policy making. Moreover, energy-related economic metrics can help to understand the energy intensity of economies.

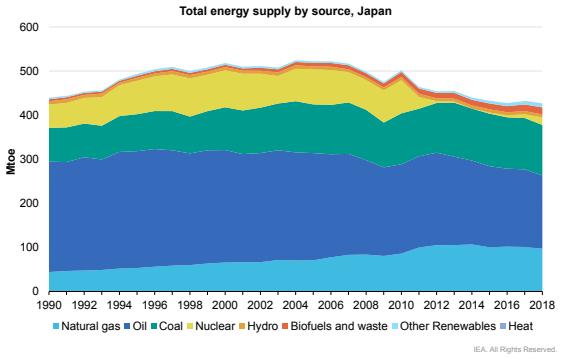
The **Energy** sheet includes five interactive graphs displaying a set of indicators tracking energy transition.

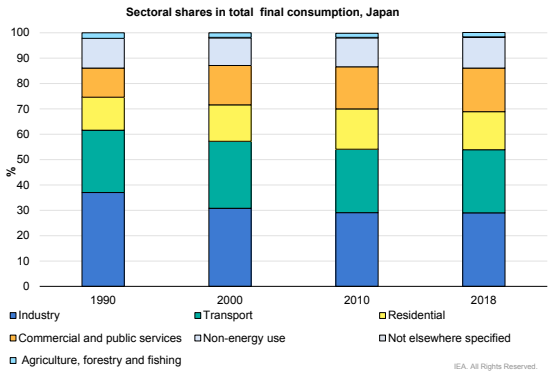
By selecting a country or region from the country list, the graphs display the corresponding indicators.

Data for individual graphs are available in individual sheets labelled "Graph #_Energy" and can be accessed by clicking on the relevant buttons.

Figure 8 represents samples from the interactive graphs included on the **Energy** sheet.

Figure 8 Sample graphs from the Energy sheet





The full list of indicators included in this sheet includes:

- Total energy supply (TES) by source
- Sectoral shares in total final consumption (TFC)
- Energy per population
- Energy intensity of the economy
- Final energy carbon intensity.

Power

Transforming the power sector is critical to clean energy transitions, as the sector accounts for over 40% of CO_2 emissions from fuel combustion globally.

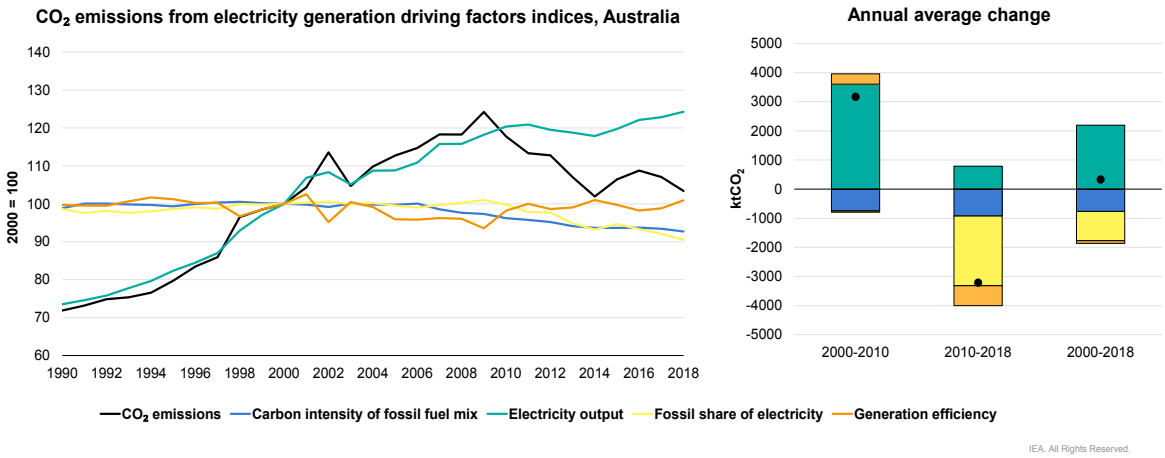
The **Power** sheet includes five interactive graphs outlining a set of indicators tracking electricity and heat. This includes a graph outlining the decomposition of CO_2 emissions from electricity generation into four driving factors. Please refer to "Drivers of electricity generation emissions trends" included on the "Definitions" tab for more information on this decomposition analysis.

By selecting a country or region from the country list, the graphs display the corresponding indicators.

Data for individual graphs are available in individual sheets labelled "Graph #_Power" and can be accessed by clicking on the relevant buttons.

Figure 9 represents samples from the interactive graphs included on the **Power** sheet.

Figure 9 Sample graphs from the Power sheet



The full list of indicators included in this sheet includes:

- Power generation CO_2 emissions by product
- Share of power generation by product
- Carbon intensity of power index
- CO_2 emissions from electricity generation driving factors indices
- Annual average change of power generation CO_2 emissions.

Industry

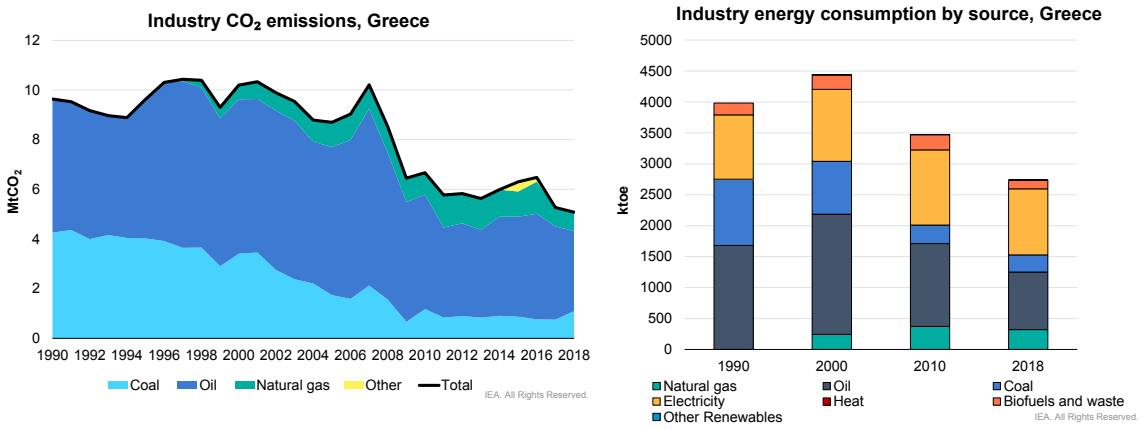
The increased demand for industrial output in recent decades has resulted in growing energy consumption and emissions. Despite improvements in industrial productivity, energy efficiency and up take of low carbon energy sources, further progress is inevitable.

The **Industry** sheet includes four interactive graphs showcasing a set of indicators tracking industry.

By selecting a country or region from the country list, the graphs display the corresponding indicators. Data for individual graphs are available in individual sheets labelled "Graph #_Industry" and can be accessed by clicking on the relevant buttons.

Figure 10 represents samples from the interactive graphs included on the **Industry** sheet.

Figure 10 Sample graphs from the Industry sheet



The full list of indicators included in this sheet includes:

- Industry CO_2 emissions by product
- Industry energy consumption by product
- Carbon intensity of industry
- Industry consumption per population.

Transport

Despite recent trends towards electrification, greater use of biofuels and fuel efficiency improvements, transportation is still responsible for around 25% of global CO_2 emissions from fuel combustion. Tracking the sector's energy consumption, emissions and energy intensity helps in understanding the opportunities and challenges ahead.

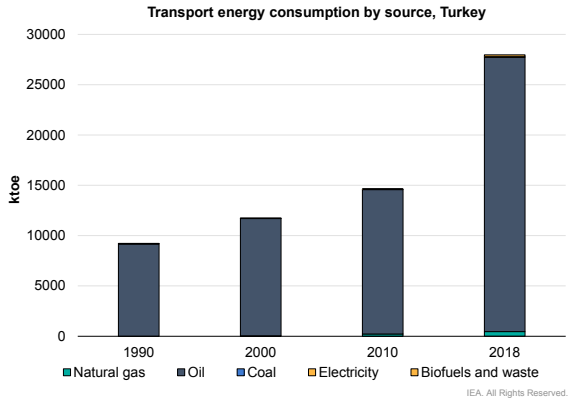
The **Transport** sheet includes four interactive graphs displaying a set of indicators tracking transport.

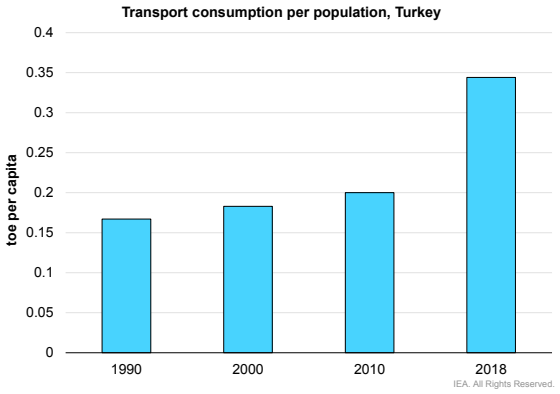
By selecting a country or region from the country list, the graphs display the corresponding indicators.

Data for individual graphs are available in individual sheets labelled "Graph #_Transport" and can be accessed by clicking on the relevant buttons.

Figure 11 represents samples from the interactive graphs included on the **Transport** sheet.

Figure 11 Sample graphs from the Transport sheet





The full list of indicators included in this sheet includes:

- Transport CO_2 emissions by product
- Transport energy consumption by product
- Carbon intensity of road transport
- Transport consumption per population.

Buildings

With the rise in house ownership and extreme weather conditions, energy consumption in the global buildings sector has increased in recent years. On the other hand, applying energy efficiency measures and penetration of more efficient appliances corresponds to energy and emissions savings. Tracking indicators corresponding to this end sector help to demonstrate the strengths and shortcoming of current policies.

The **Buildings** sheet includes four interactive graphs comprising a set of indicators tracking buildings.

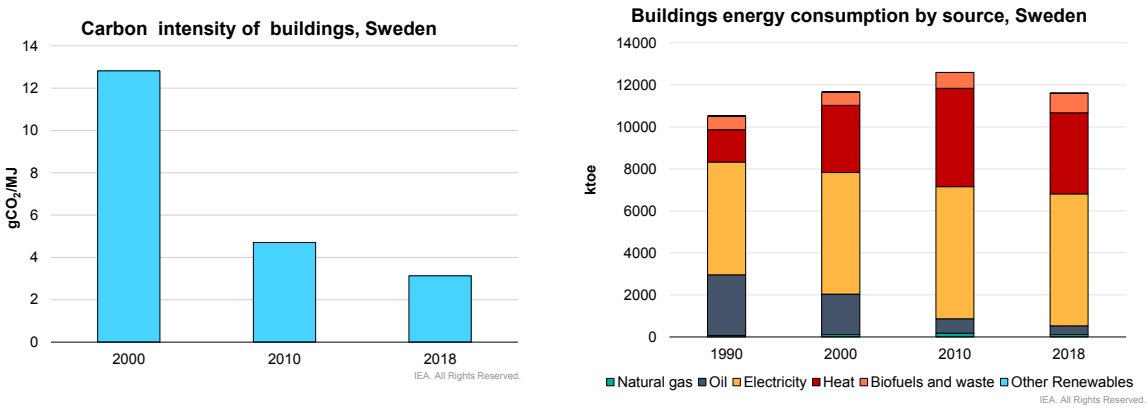
By selecting a country or region from the country list, the graphs display the corresponding indicators.

Data for individual graphs are available in individual sheets labelled "Graph #_Buildings" and can be accessed by clicking on the relevant buttons.

*Note: **Buildings** corresponds to the sum of residential and commercial and public services sectors. You may refer to the "Definitions" sheet in the Excel file for the full list of ISIC[1] categories included in these sectors.*

Figure 12 represents samples from the interactive graphs included on the **Buildings** sheet.

Figure 12 Sample graphs from the Buildings sheet



The full list of indicators included in this sheet includes:

- Buildings CO_2 emissions by product
- Buildings energy consumption by product
- Carbon intensity of buildings
- Buildings consumption per population.

End use

Energy efficiency is the one energy source which all countries possess in abundance. Reliable end-use indicators provide a reliable means to understand the drivers of energy demand and are crucial in informing and monitoring the effectiveness of energy efficiency policies.

The **End use** sheet includes four interactive graphs presenting sectoral end use energy intensities.

[1] ISIC corresponds to the "International Standard Industrial Classification of All Economic Activities – Revision 4" published by the Department of Economic and Social Affairs of the United Nations:.

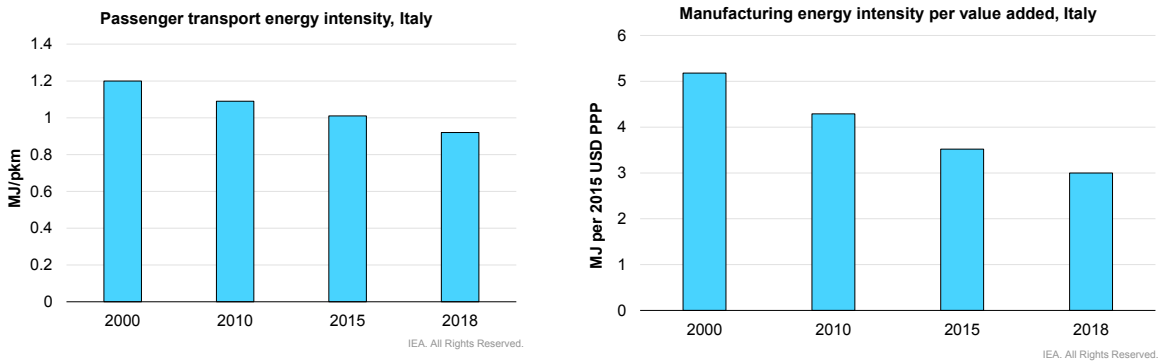
By selecting a country or region from the country list, the graphs display the corresponding indicators.

Data for individual graphs are available in individual sheets labelled "Graph #_End use" and can be accessed by clicking on the relevant buttons.

Note: The end-use indicators are available for a selected set of countries and cover the period of 2000 to 2018.

Figure 13 represents samples from the interactive graphs included on the **End use** sheet.

Figure 13 Sample graphs from the End use sheet



The full list of indicators included in this sheet includes:

- Passenger transport energy intensity
- Manufacturing energy intensity per value added
- Services energy intensity per value added
- Residential energy intensity per floor area (temperature corrected).

Definitions

The **Definitions** sheet defines the variables and products presented in the "Tracker" file. Moreover, it includes the list of countries and regions covered.

Geo coverage

The **Geo coverage** sheet includes the regional definitions.

Graph #_sheet xxx

This series of sheets include the pivot tables comprising the data underlying individual graphs located on the Highlights, Emissions, Energy, Power, Industry, Transport, Buildings and End use sheets.

As discussed in the above sections, these data sheets can be accessed by clicking on the buttons on the sheets depicting the respective graphs.

It is possible to adjust the country filter on the data sheets to obtain the data corresponding to other countries/regions without having to move back to the sheets showing the graphs. Additionally, the year filter can be adjusted on the pivot tables to view more or fewer data points.

There are buttons located on these data sheets that allow users to navigate back to the sheets depicting the corresponding graphs.

Figure 14 below shows an example of this series of sheets containing the data underlying graphs.

Figure 14 Sample table from the Graph #_sheet xxx data sheets

Country	Brazil	Back to the "Highlights" tab
Graph 1 - Highlights:	**Total CO_2 emissions from fuel combustion, Brazil**	
Years	**Total**	
2000	292.85	
2001	299.57	
2002	299.01	
2003	293.3	
2004	310.81	
2005	311.62	
2006	315.15	
2007	330.76	
2008	349.29	
2009	325.51	
2010	372	
2011	391.04	
2012	424.08	
2013	453.81	
2014	477.52	
2015	453.68	
2016	418.29	
2017	428.05	
2018	406.25	
2019	406.45	

Note: The data sheets corresponding to the graphs located in the "Country comparison" tab are structured differently. Please refer to the sections below for details.

Time series_Country comparison

This sheet includes the data corresponding to the three time series graphs placed on the Country comparison sheet.

As discussed in the Country comparison section, this data sheet can be accessed by clicking on the buttons corresponding to the time series graphs.

The year filter can be adjusted on all three pivot tables to view more or fewer data points.

The sheet contains a button that allows navigating back to the Country comparison sheet.

Figure 15 represents a sample table from Time series_Country comparison data sheet.

Figure 15 Sample table from the Time series_Country comparison data sheet

Time series 1 - Country comparison:	Total CO_2 emissions from fuel combustion ($MtCO_2$)		Back to the "Country comparison" tab
Years	France	Germany	
1990	345.6	940.01	
1991	370.3	917.64	
1992	359.31	877.6	
1993	340.93	871.82	
1994	335.7	859.11	
1995	343.65	856.6	
1996	359.52	887.06	
1997	351.03	854.92	
1998	372.5	846.94	
1999	366.62	814.96	
2000	364.68	812.31	
2001	368.21	831.48	
2002	362.52	817.9	
2003	368.28	820.69	
2004	368.88	804.63	
2005	371.71	786.93	
2006	362.43	798.68	
2007	353.57	767.02	
2008	349.33	773.89	
2009	336.2	720.18	
2010	340.05	758.85	
2011	325.47	731.24	
2012	328.83	745.14	
2013	329.33	763.65	
2014	297.55	723.11	
2015	303.92	729.68	
2016	306.07	734.49	
2017	309.87	718.79	
2018	303.48	696.13	

Bar charts_Country comparison

This sheet includes the data corresponding to the eight bar charts placed on the Country comparison sheet.

As discussed in the Country comparison section, this data sheet can be accessed by clicking on the buttons corresponding to the bar charts.

It is possible to adjust the country filters of all eight pivot tables to compare the data corresponding to other countries/regions without having to move back to the sheet showing the graphs. Additionally, the year filters can be adjusted on the pivot tables to view more or fewer data points.

The sheet contains a button that allows navigating back to the Country comparison sheet.

Figure 16 displays a sample table from Bar charts_Country comparison data sheet.

Figure 16 Sample table from the Bar charts_Country comparison data sheet

Year	2018	Back to the "Country comparison" tab		
Bar chart 1 - Country comparison:	**CO_2 emissions by fuel ($MtCO_2$)**			
Countries	**Coal**	**Natural gas**	**Oil**	**Total**
South Africa	349.98	4.5	73.49	427.97
Croatia	1.46	4.29	9.43	15.29

3. Units and conversion

General conversion factors for energy

To:	TJ	Gcal	Mtoe	MBtu	GWh
From:	multiply by:				
terajoule (TJ)	1	$2.388x10^{2}$	$2.388x10^{-5}$	$9.478x10^{2}$	$2.778x10^{-1}$
gigacalorie (Gcal)	$4.187x10^{-3}$	1	$1.000x10^{-7}$	3.968	$1.163x10^{-3}$
million tonnes of oil equivalent (Mtoe)	$4.187x10^{4}$	$1.000x10^{7}$	1	$3.968x10^{7}$	$1.163x10^{4}$
million British thermal units (MBtu)	$1.055x10^{-3}$	$2.520x10^{-1}$	$2.520x10^{-8}$	1	$2.931x10^{-4}$
gigawatt hour (GWh)	3.600	$8.598x10^{2}$	$8.598x10^{-5}$	$3.412x10^{3}$	1

Conversion factors for mass

To:	kg	t	lt	st	lb
From:	multiply by:				
kilogramme (kg)	1	$1.000x10^{-3}$	$9.842x10^{-4}$	$1.102x10^{-3}$	2.205
tonne (t)	$1.000x10^{3}$	1	$9.842x10^{-1}$	1.102	$2.205x10^{3}$
long tonne (lt)	$1.016x10^{3}$	1.016	1	1.120	$2.240x10^{3}$
short tonne (st)	$9.072x10^{2}$	$9.072x10^{-1}$	$8.929x10^{-1}$	1	$2.000x10^{3}$
pound (lb)	$4.536x10^{-1}$	$4.536x10^{-4}$	$4.464x10^{-4}$	$5.000x10^{-4}$	1

Conversion factors for volume

To:	gal U.S.	gal U.K.	bbl	ft^3	l	m^3
From:	multiply by:					
US gallon (gal US)	1	$8.327x10^{-1}$	$2.381x10^{-2}$	$1.337x10^{-1}$	3.785	$3.785x10^{-3}$
UK gallon (gal UK)	1.201	1	$2.859x10^{-2}$	$1.605x10^{-1}$	4.546	$4.546x10^{-3}$
barrel (bbl)	$4.200x10^{1}$	$3.497x10^{1}$	1	5.615	$1.590x10^{2}$	$1.590x10^{-1}$
cubic foot (ft^3)	7.481	6.229	$1.781x10^{-1}$	1	$2.832x10^{1}$	$2.832x10^{-2}$
litre (l)	$2.642x10^{-1}$	$2.200x10^{-1}$	$6.290x10^{-3}$	$3.531x10^{-2}$	1	$1.000x10^{-3}$
cubic metre (m^3)	$2.642x10^{2}$	$2.200x10^{2}$	6.290	$3.531x10^{1}$	$1.000x10^{3}$	1

The IEA unit converter is a tool that allows converting between units of energy, mass and volume. This tool can be found online at:

www.iea.org/reports/unit-converter-and-glossary

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 (μ)
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)

Tonne of CO_2

The 2006 *IPCC Guidelines for GHG Inventories* and the *UNFCCC Reporting Guidelines on Annual Inventories* both ask that CO_2 emissions and removals be reported in Gg (gigagrammes) of CO_2. A million tonnes of CO_2 is equal to 1 000 Gg of CO_2, so to compare the numbers in this publication with national inventories expressed in Gg, multiply the IEA emissions by 1 000.

Other organisations may present CO_2 emissions in tonnes of carbon instead of tonnes of CO_2. To convert from tonnes of carbon, multiply by 44/12, which is the molecular weight ratio of CO_2 to C.

4. Abbreviations

CO_2	carbon dioxide
CTRL	control
g CO_2	grammes of carbon dioxide
GDP	gross domestic product
GHG	greenhouse gas
Gg	gigagramme
kg CO_2	kilogrammes of carbon dioxide
kt CO_2	thousand tonnes of carbon dioxide
ktoe	thousand tonnes of oil equivalent
MJ	megajoule
Mtoe	million tonnes of oil equivalent
Mt CO_2	million tonnes of carbon dioxide
OECD	Organisation for Economic Co-Operation and Development
pkm	passenger kilometre
PPP	purchasing power parity
t CO_2	tonnes of carbon dioxide
TES	total energy supply
TFC	total final consumption
toe	tonne of oil equivalent = 10^7 kcal

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 30 member countries, 8 association countries and beyond.

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