Emissions methodology for the transport sector

Thomas ELGHOZI | International Energy Agency (IEA), Energy Data Centre (EDC)
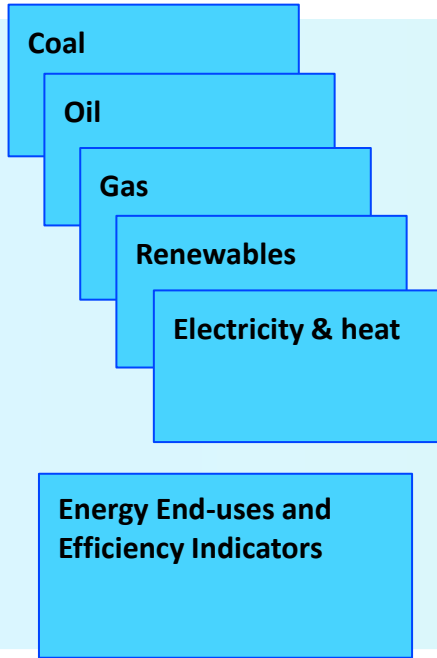
UNECE working party on transport statistics – Apr. 24th, 2024

Overview

1. **Data collections** and data processing

2. Emissions **methodology**
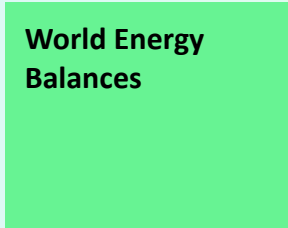
3. Targets for the **near / mid-future**

Data collections
and methods for data processing
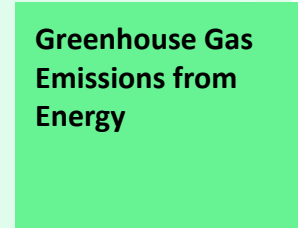
The IEA data collections

Annual Questionnaires

- Coal
- Oil
- Gas
- Renewables
- Electricity & heat

Energy End-uses and Efficiency Indicators

OR National publications & websites

Energy balances

World Energy Balances

GHG emissions

Greenhouse Gas Emissions from Energy

Demand consumption and emissions

Energy End-uses and Efficiency Indicators
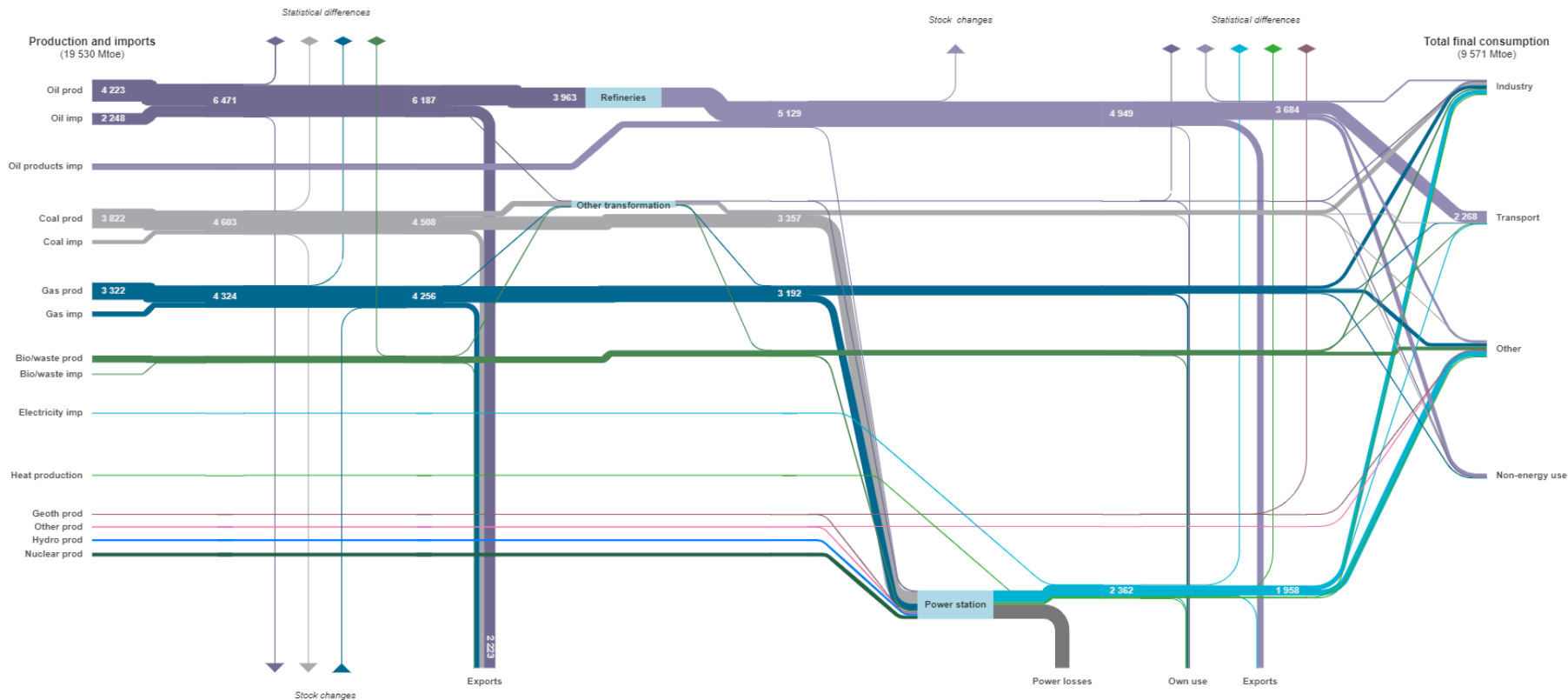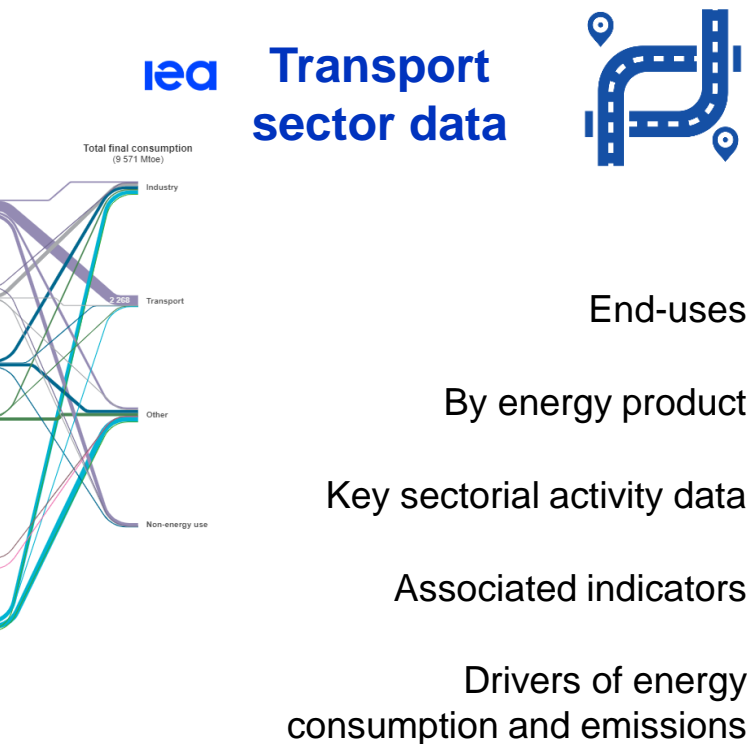
The emissions data lie at the end of an internal data stream, starting with submissions and other energy data.

The IEA databases end-uses, products and flows

World
BALANCE (2020)

Millions of tonnes of oil equivalent ▾

The IEA databases end-uses, products and flows

iea

Transport sector data

Total final consumption
(9 571 Mtoe)

Industry

Transport

Other

Non-energy use

End-uses

By energy product

Key sectorial activity data

Associated indicators

Drivers of energy
consumption and emissions

World Energy Balances

7 *Road transport*

24 *Biodiesel, biogases*

-

-

- -

**Energy End-uses and
Efficiency Indicators**

14 *Freight trucks*

9 *Diesel, biofuels*

4 *Vkm, pkm/tkm, stock*

11 *Load factor, energy p. vkm*

4 **4**

Freight vs Passenger

The IEA data validation process

Collected data (questionnaire submissions, official publications, desk research...)

Analysis of **long-term trends** of each time series, for unexpected variations and breaks

Comparison to **international benchmarks** with similar properties or circumstances

Internal consistency checks, including between submissions and with other sources

Indicators checks, comparing trends of energy and related activity data for breaks in efficiency

To ensure the robustness of collected data, their trends are analysed and checked, compared with benchmarks; internal consistency is ensured, and indicators are computed and checked too.

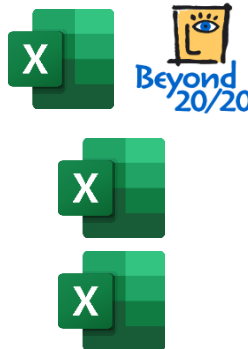# The IEA Energy End-uses and Efficiency Indicators database
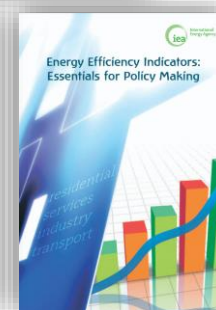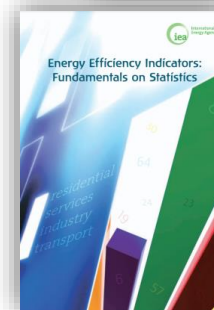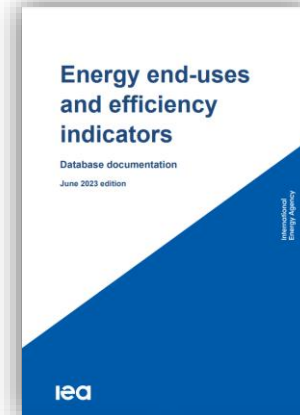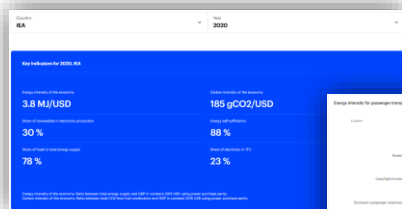
The EEI database is available in full in Excel and Beyond 20/20 format, as well as two free samples in Excel and a web platform to browse the data.

Emissions methodology

Emissions from energy consumption

$$\textbf{emissions} \;=\; \textbf{energy} \;\times\; \textbf{emission factor}$$

Harmonised, consistent and
detailed data collections
by vehicle type and fuel

Tier-1 factors for
CO_2, CH_4 and N_2O
from the IPCC

Transport data split by fuels[1] and modes[2].
Refinements using split by segment[3] and vehicle types[4]
(for road transport at least).

Factors are **not** time- or country-dependent
CH_4 and N_2O ones **are sector-dependent**
(CO_2 ones are not)

Only tank-to-wheel emissions (fuel combustion)

[1]: gasoline, diesel, LPG, HFO, jet fuel, gas, electricity, coal
[2]: road, rail, air, water, pipeline – [3]: passenger, freight
[4]: e.g. cars, motorcycles, buses; or light commercial vehicles, trucks

The key to robust emissions data are robust energy consumption data.

Accounting for biofuels

Total GHG emissions from fuel combustion per product, Switzerland, 1971-2022

Sum of (all gases) emissions from non-renewable waste and non-CO_2 (CH_4 and N_2O) emissions from biofuels and renewable waste

Coal, peat and oil shale   Natural gas   Oil   Biofuels and waste

As biofuels emerge in transport, careful methodology must be used to ensure comparability.

Accounting for biofuels

Total GHG emissions from fuel combustion per product, Switzerland, 1971-2022

Coal, peat and oil shale   Natural gas   Oil   Biofuels and waste
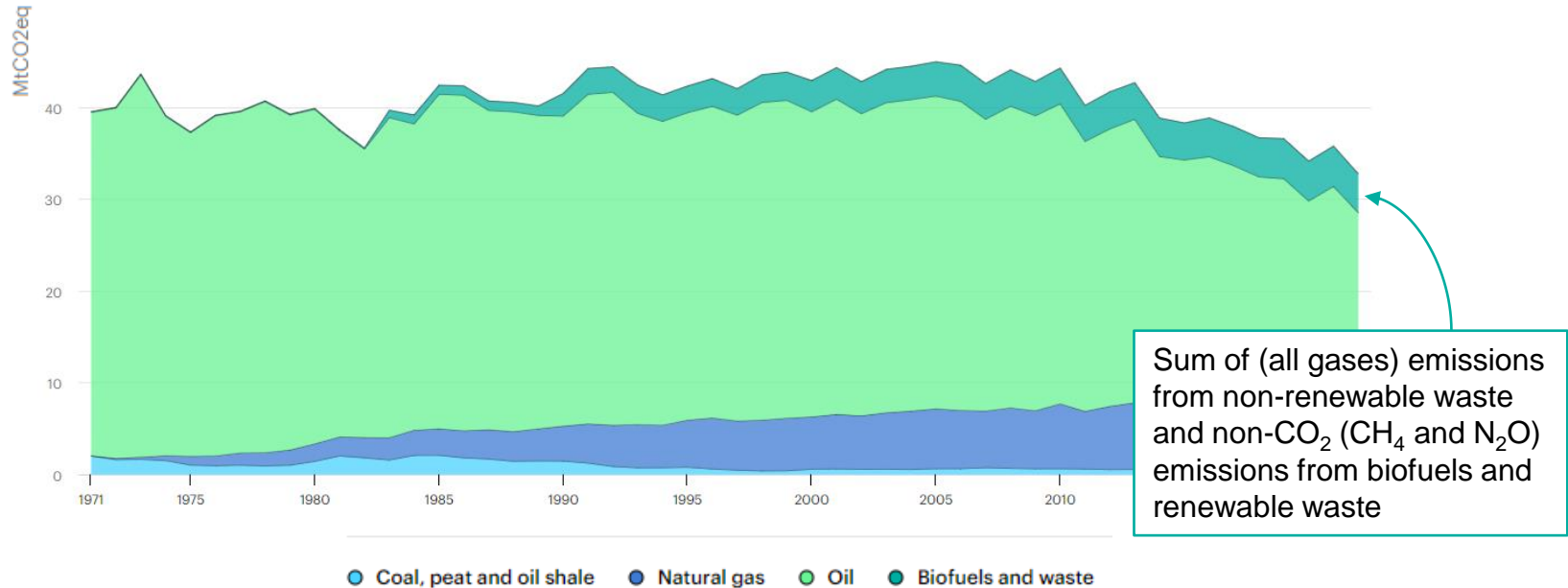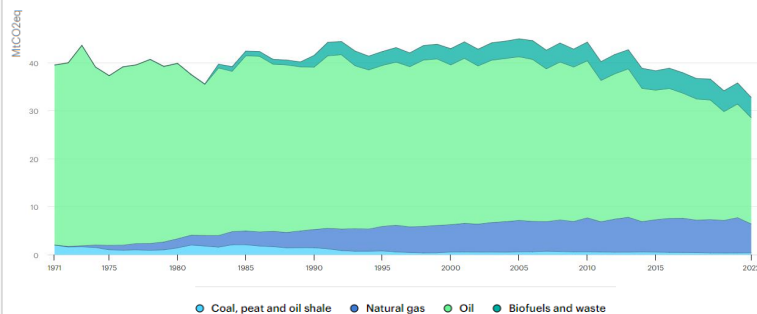
	Coal	Oil	Natural gas	Non-renewable waste	Biofuels and renewable wastes	Total
Carbon Dioxide	371	23206	7340	3917	*9007*	34833
Methane	2	103	14	37	279	435
Nitrous Oxide	2	302	5	43	125	477
Carbon Dioxide Equivalent	374	23611	7358	3997	9411	35744

As biofuels emerge in transport, careful methodology must be used to ensure comparability.

Accounting for electricity and heat – Sectoral point of view

CO_2 emissions from fuel combustion by sector with electricity and heat separated, Switzerland, 2010-2021

Electricity emissions are accounted for in the national inventories, but not necessarily in the sectoral view.
For the transport sector, the difference is minimal as electricity use is currently limited in most countries.

Accounting for electricity and heat – Sectoral point of view

CO_2 emissions from fuel combustion by sector with electricity and heat **reallocated**, Switzerland, 2010-2021

14 717 ktCO$_2$

Legend: ● Buildings ● Industry ● Others ● Transport ● Electricity and heat generation

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What is next for transport data?

Trainings, capacity building and workshops
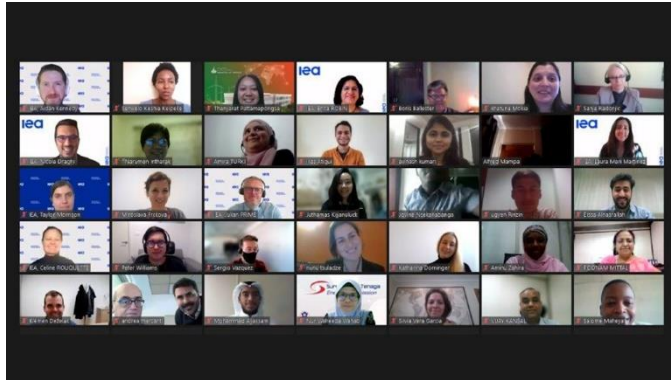
IEA Energy statistics training week
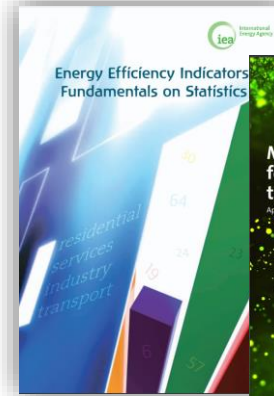
Manuals

The strength of the IEA data lies in shared methodology and longstanding collaborations: we are always investing in trainings and workshops, as well as actively participating in numerous collaborations, to sustain the data flow.

Data collection extensions: hydrogen, vehicle type split and beyond

New hydrogen and synthetic fuels questionnaire

Hydrogen

Tracks hydrogen from all sources, under many forms, for all end-uses

eurostat

asean

VOLUNTARY SUBMISSION

Further vehicle type split in EEI questionnaire

Energy End-uses and Efficiency Indicators

VOLUNTARY SUBMISSION

New data collections with third-party

E-mobility and other soft mobility

Road, cycling and rail infrastructures

Charging infrastructures

THIRD-PARTY COMPILATION

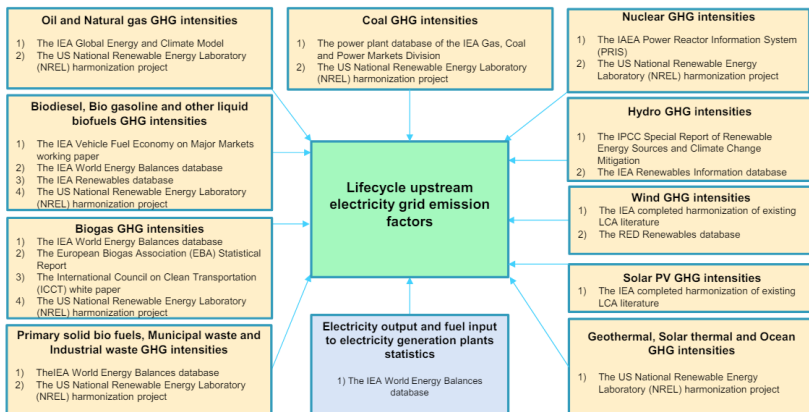**As more and more countries develop robust data management systems, and to keep increasing data coverage, the IEA develops or extends questionnaires thanks to international collaborations.**

Tools development: wind and solar LCA, demand-side toolkit…

FREE

Life Cycle Upstream Emission Factors (Pilot Edition)

Free pilot database including life cycle emission factors corresponding to national electricity grids

Oil and Natural gas GHG intensities
1) The IEA Global Energy and Climate Model
2) The US National Renewable Energy Laboratory (NREL) harmonization project

Coal GHG intensities
1) The power plant database of the IEA Gas, Coal and Power Markets Division
2) The US National Renewable Energy Laboratory (NREL) harmonization project

Nuclear GHG intensities
1) The IAEA Power Reactor Information System (PRIS)
2) The US National Renewable Energy Laboratory (NREL) harmonization project

Biodiesel, Bio gasoline and other liquid biofuels GHG intensities
1) The IEA Vehicle Fuel Economy on Major Markets working paper
2) The IEA World Energy Balances database
3) The IEA Renewables database
4) The US National Renewable Energy Laboratory (NREL) harmonization project

Hydro GHG intensities
1) The IPCC Special Report of Renewable Energy Sources and Climate Change Mitigation
2) The IEA Renewables Information database

Wind GHG intensities
1) The IEA completed harmonization of existing LCA literature
2) The RED Renewables database

Biogas GHG intensities
1) The IEA World Energy Balances database
2) The European Biogas Association (EBA) Statistical Report
3) The International Council on Clean Transportation (ICCT) white paper
4) The US National Renewable Energy Laboratory (NREL) harmonization project

Solar PV GHG intensities
1) The IEA completed harmonization of existing LCA literature

Primary solid bio fuels, Municipal waste and Industrial waste GHG intensities
1) TheIEA World Energy Balances database
2) The US National Renewable Energy Laboratory (NREL) harmonization project

Geothermal, Solar thermal and Ocean GHG intensities
1) The US National Renewable Energy Laboratory (NREL) harmonization project

Lifecycle upstream electricity grid emission factors

Electricity output and fuel input to electricity generation plants statistics
1) The IEA World Energy Balances database

https://www.iea.org/data-and-statistics/data-product/
life-cycle-upstream-emission-factors-pilot-edition

UNDER DEVELOPMENT

End-use toolkit

Free tool for estimate modelling of demand-side data from aggregated balances, related activity data and third-party proxies.

Under development – Test phase on residential and transport sectors

Detailed methodology and emission factors for upstream emissions, as well as estimating tools for disaggregated energy consumption, are being developed to accurately track emissions.

Thank you for your attention

Any question? EnergyIndicators@iea.org and Emissions@iea.org

ANNEX
IEA support tools

An experience database to foster dialogue with other countries

A searchable database, gathering data collection practices from a variety of countries, to share expertise worldwide.

The IEA guide to designing a data collection roadmap

Demand-side data and energy efficiency indicators
A guide to designing a national roadmap

International Energy Agency

Diagram (clockwise cycle):
- Identify data gaps
- Set up the institutional framework
- Allocate resources
- Look for good practices
- Roll out the data collection
- Gather the results
- Validate the data
- Identify lessons learnt
- Disseminate
- Use data for policy monitoring and planning

International frameworks based on real experiences foster capacity building on disaggregated data collections.
https://www.iea.org/reports/demand-side-data-and-energy-efficiency-indicators

Practical Toolkit to derive indicators from various sources

The IEA is developing a **toolkit** which will serve for countries to **model the end-use data** bridging the gap from raw data to the end use data. The countries will be trained to use them, building capacity to produce end-use data on their own.

WORK IN PROGRESS

Country balances data
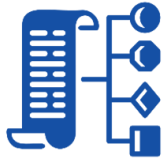
Ad hoc surveys

Third party surveys

Toolkit

Model (Excel file) where to insert the input data and calculate the end-use data using some default (or tailored) assumptions. Word file with guidelines with the explanation of the assumptions to take and for the use of the tool

End-use and efficiency indicators data