ENERGY INDICATORS

# IEA Caspian Energy Policy Dialogue and Training

## Astana, 3 July 2012

# IEA Energy Efficiency Indicators Overview

Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

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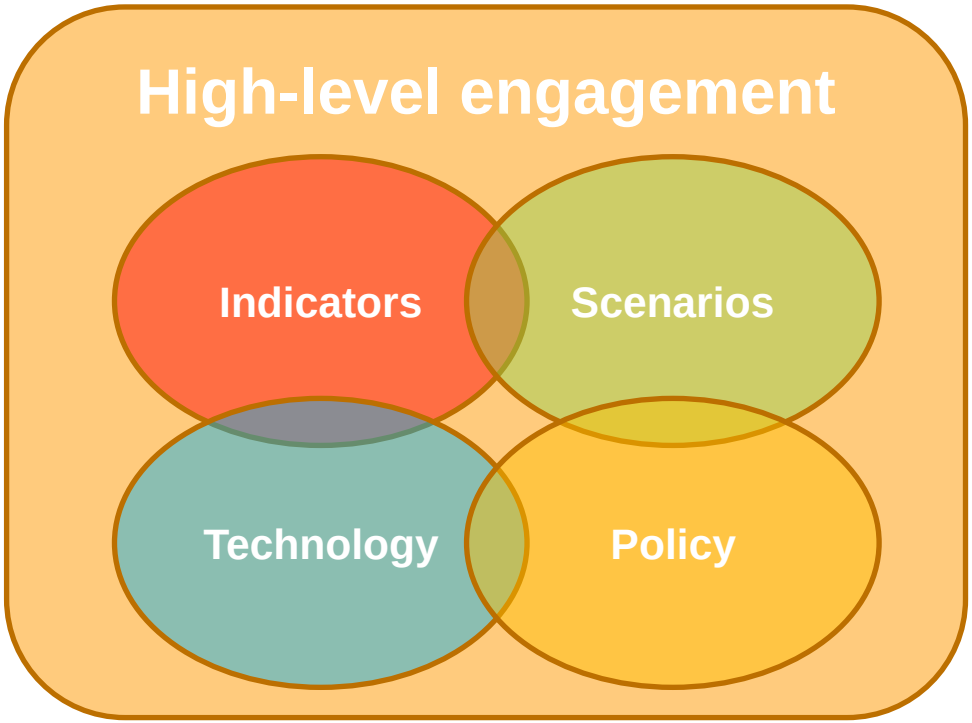
**Energy Technology Policy Division**

# The IEA has a broad range of activities to help countries exploit cost-effective energy efficiency potentials

Develop more detailed indicators

Sector roadmap development

National roadmap




Enhance regional / technology detail

Evaluate progress on EE recommendations

ENERGY INDICATORS

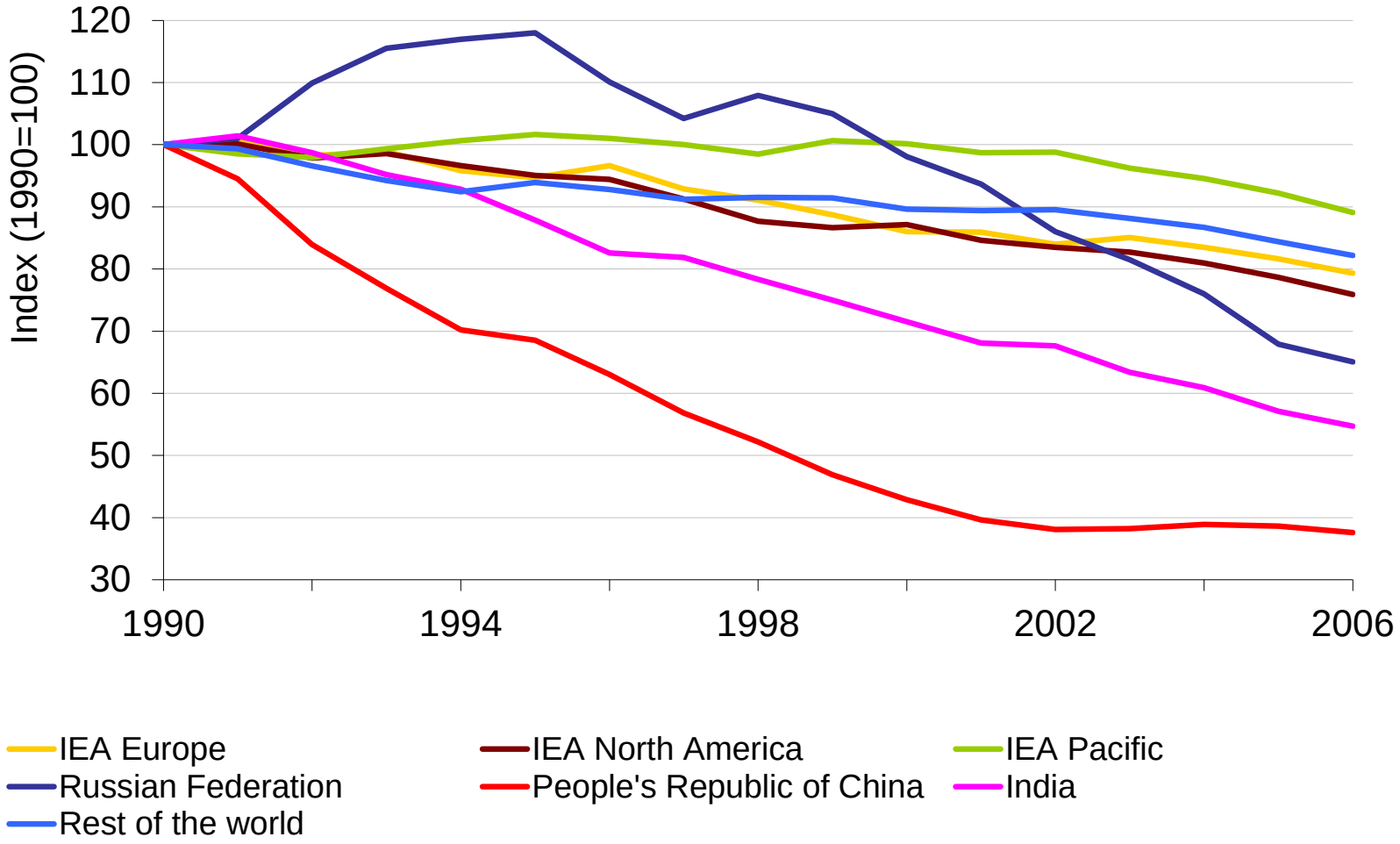
Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# What are energy indicators?

- Any data or information which "indicates" an energy situation or an evolution in the energy situation
  - E.g. oil production, growth in imports, etc.
- However, people usually call energy indicators a ratio between an energy consumption divided by "something"
  - Population, GDP, floor area, etc.
- The most often used energy indicators are:
  - Energy consumption per capita
  - Energy consumption per unit of GDP

# Energy consumption per unit of GDP




*All countries and regions experienced a decrease in their energy use per GDP*



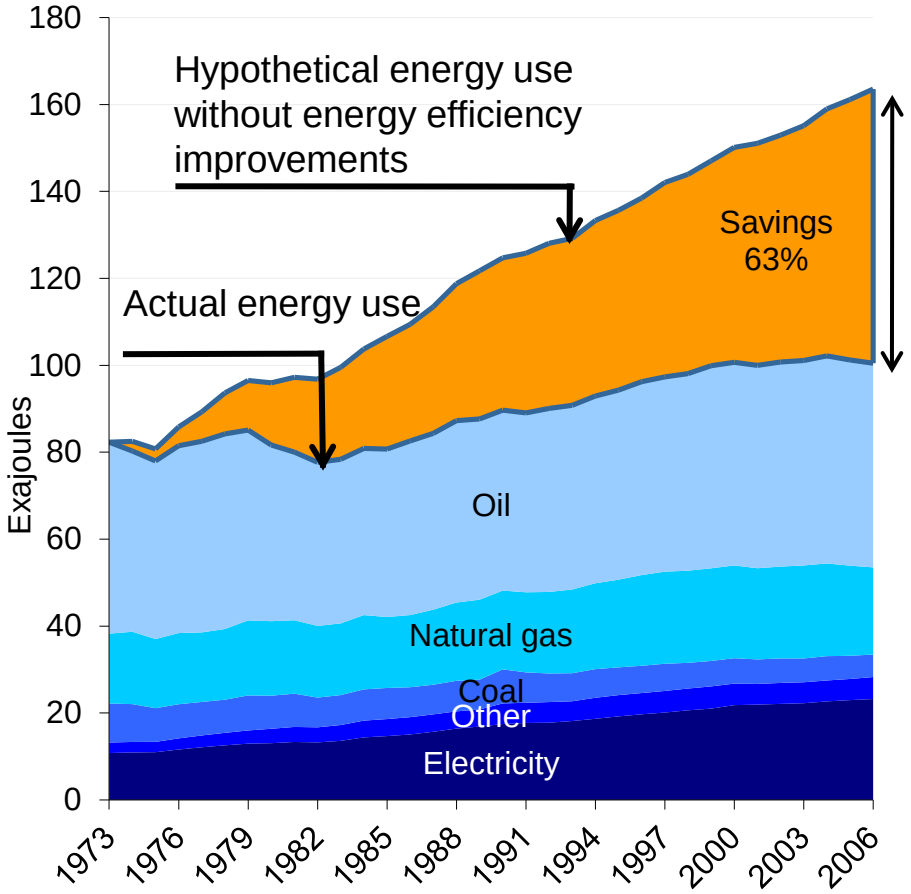
**Worldwide Trends in Energy Use and Efficiency**

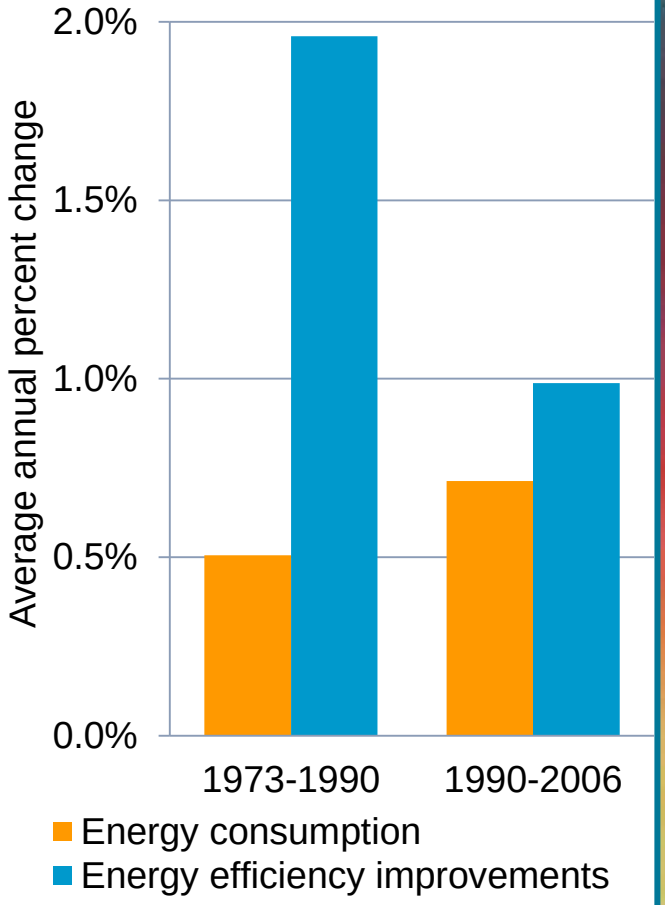
***Key Insights from IEA Indicator Analysis***

# What are energy efficiency indicators?

- Tools: based on detailed statistics to analyse energy use and efficiency trends.
- Examine impacts of economic activity and structure, income, prices, policies, etc.
- Support national policy-making and are used to shape priorities for future action and to monitor progress.
- Used for estimating $CO_2$ savings, so a key element of environment policy tool.

# Highlights energy efficiency




*Policy changes in response to the oil price shocks did more to restrain growth in global energy consumption than policies implemented since the 1990s*

ENERGY INDICATORS

**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

# Overview of IEA indicators work

- Establish a harmonised framework for data collection and analysis
  - Harmonisation => Comparability
  - Comparability => Understanding of global trends and drivers
- Produce meaningful cross-country analysis to provide guidance to policy-makers on:
  - Underlying drivers (economic activity & structure, income, prices…)
  - Trends in energy use and $CO_2$ emissions
  - Energy efficiency opportunities and progress
  - Policy effectiveness

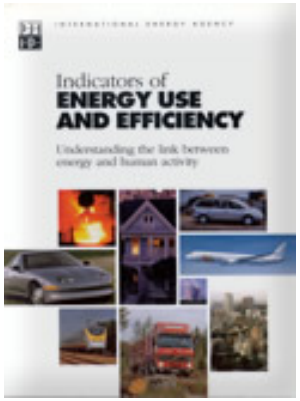


Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# The early days….

- Data for only 11 IEA countries
- Long lags in data availability
- Minimal country involvement
- Low profile in IEA and non-IEA member countries
- Little political support



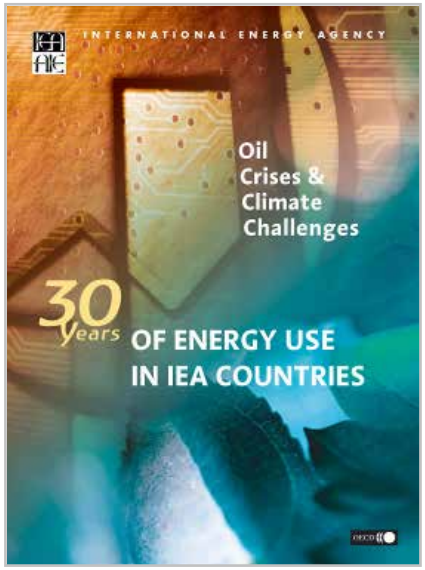



Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# From 2000….growing interest!

- Increase in countries to 14
- Still long lags in data availability
- Countries more involved, links with ODYSSEE
- 30 years is IEA best-seller
- Growing political interest

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Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# Now....everyone's a fan

- Data for over 20 IEA countries, start to include others
- Lags in data availability reduced
- Significant country involvement and strong co-operation with ODYSSEE
- Key IEA activity – many reports
- Significant political support at highest levels


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**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

# Progress has been achieved through co-operation

- Member and non-Member countries
- ODYSSEE network
- APEC
- Industrial associations
- WBCSD
- ISO/IEC
- World Bank
- United Nations
- Asia Pacific Partnership

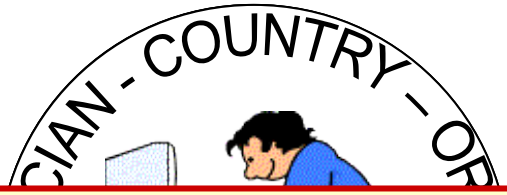


Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# The importance of collaboration

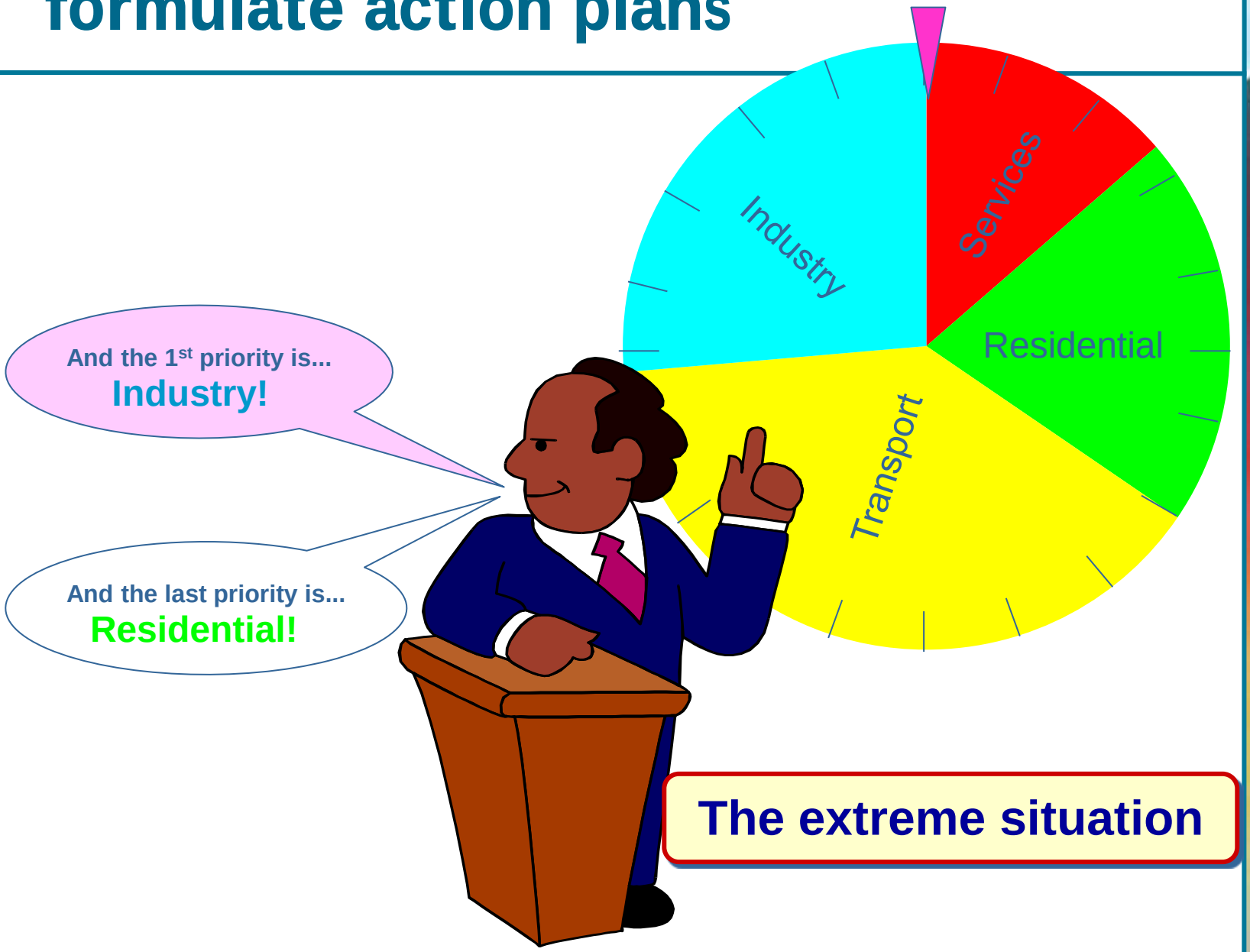

**Collect, process, release the necessary detailed statistics**




**Importance of a dialogue between the three parties for having a better understanding of the needs, expectations as well as problems and issues of the other parties**

# Indicators are needed to formulate action plans






**The extreme situation**

# Limit the data collection to what is necessary

## But what is necessary?

Modelling

Census

Data quality / timeliness

Appliances

Energy data

Residential

Industry

End uses

Process

ISIC: 2, 3, or 4 digits

**Priorities depend on many elements: climate (heating vs. cooling), structure of the economy (industry vs. services) size of the country (transport, domestic aviation), energy mix (biomass), electrification rate, GDP/capita, …**

Surveys

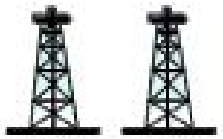
Transport

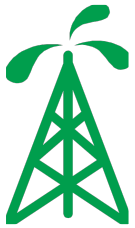


Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# Most countries collect basic energy statistics…





ENERGY INDICATORS

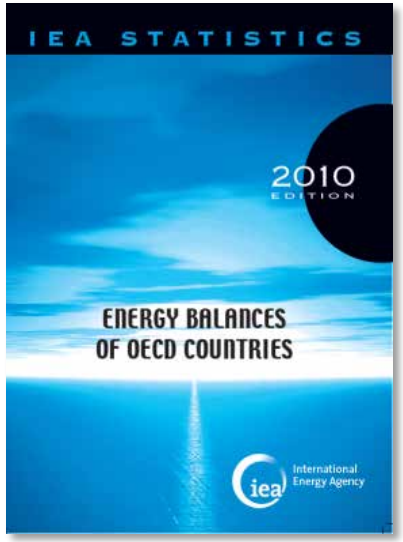
**Worldwide Trends in Energy Use and Efficiency**

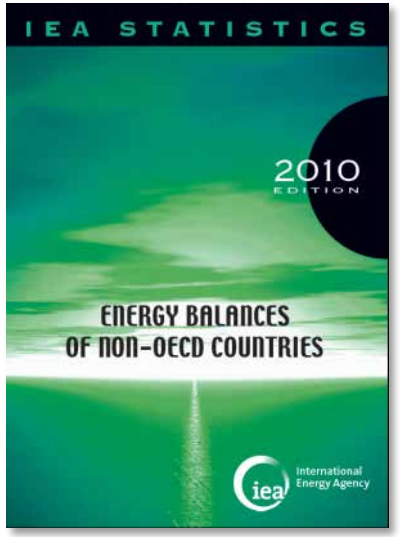
***Key Insights from IEA Indicator Analysis***

# ...which can be combined to build energy balances






ENERGY INDICATORS

**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

# The importance of energy balances...



Supply

Transformation

Final consumption

## WORLD ENERGY BALANCE

2008

Million tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal & peat | Crude oil | Oil products | Gas | Nuclear | Hydro | Geotherm. solar etc. | Combust. renew. & waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 3415.66 | 4041.34 | - | 2608.17 | 712.18 | 275.88 | 89.35 | 1225.49 | - | 0.89 | 12368.95 |
| Imports | 691.76 | 2332.71 | 995.62 | 782.77 | . | . | . | 8.49 | 52.84 | . | 4764.20 |
| Exports | -651.03 | -2200.43 | -1074.56 | -777.77 | - | - | - | -9.32 | -52.99 | -0.01 | -4746.11 |
| Stock changes | -62.21 | -28.78 | -6.72 | -22.10 | - | - | - | 0.15 | - | - | -119.66 |
| **TPES** | **3314.18** | **4144.84** | **-85.65** | **2591.07** | **712.18** | **275.88** | **89.35** | **1224.81** | **-0.15** | **0.88** | **12267.38** |
| Transfers | - | -133.75 | 153.95 | - | - | - | - | 0.08 | - | - | 20.28 |
| Statistical differences | -6.00 | -23.21 | -13.25 | -3.22 | - | - | -0.32 | -0.02 | 0.72 | 0.06 | -45.25 |
| Electricity plants | -1891.00 | -24.29 | -213.08 | -630.36 | -705.66 | -275.88 | -72.86 | -60.19 | 1564.35 | -0.37 | -2299.34 |
| CHP plants | -181.07 | -0.01 | -21.85 | -296.04 | -6.52 | - | -1.06 | -28.55 | 171.23 | 145.14 | -218.71 |
| Heat plants | -96.27 | -0.73 | -11.52 | -88.83 | . | . | -0.17 | -7.78 | -0.33 | 170.64 | -34.99 |
| Blast furnaces | -157.09 | - | -1.21 | -0.11 | - | - | - | - | - | - | -158.41 |
| Gas works | -12.85 | - | -3.28 | 9.03 | - | - | - | -0.01 | - | - | -7.12 |
| Coke/pat.fuel/BKB plants | -43.46 | - | -2.01 | -0.04 | - | - | - | - | - | - | -45.52 |
| Oil refineries | - | -3967.04 | 3929.15 | -0.57 | - | - | - | - | - | - | -38.47 |
| Petrochemical plants | - | 29.90 | -30.21 | - | - | - | - | - | - | - | -0.31 |
| Liquefaction plants | -19.93 | 9.01 | - | -6.73 | - | - | - | - | - | - | -17.64 |
| Other transformation | - | 0.19 | -0.92 | -2.06 | - | - | - | -54.17 | - | -0.33 | -57.28 |
| Energy industry own use | -81.30 | -10.89 | -217.66 | -232.59 | - | - | - | -13.70 | -147.23 | -35.59 | -738.95 |
| Losses | -2.13 | -3.91 | -0.39 | -26.14 | . | . | -0.14 | -0.21 | -142.46 | -21.89 | -197.27 |
| **TFC** | **823.09** | **20.10** | **3402.66** | **1313.42** | **-** | **-** | **14.79** | **1070.27** | **1446.13** | **258.55** | **8428.41** |
| **INDUSTRY** | **645.80** | **5.74** | **326.18** | **460.24** | **-** | **-** | **0.42** | **190.76** | **602.69** | **113.23** | **2345.07** |
| Iron and steel | 230.50 | 0.01 | 13.36 | 54.05 | . | . | - | 6.65 | 80.53 | 12.22 | 396.33 |
| Chemical and petrochemical | 61.76 | 0.76 | 54.53 | 113.39 | . | . | - | 2.39 | 91.86 | 38.96 | 363.66 |
| Non-ferrous metals | 14.63 | - | 7.47 | 18.10 | - | - | - | 0.11 | 67.85 | 2.62 | 110.77 |
| Non-metallic minerals | 172.06 | 0.01 | 38.92 | 54.94 | . | . | . | 7.41 | 38.13 | 2.73 | 314.20 |
| Transport equipment | 4.27 | - | 3.24 | 11.15 | - | - | - | 0.01 | 16.36 | 3.83 | 38.88 |
| Machinery | 12.92 | 0.01 | 10.99 | 23.86 | - | - | - | 0.07 | 60.50 | 5.58 | 113.93 |
| Mining and quarrying | 8.02 | . | 16.86 | 12.58 | . | . | . | 0.02 | 24.02 | 1.83 | 63.32 |
| Food and tobacco | 22.55 | 0.04 | 27.08 | 35.11 | - | - | - | 31.57 | 33.02 | 10.30 | 159.69 |
| Paper pulp and printing | 22.02 | - | 11.40 | 24.79 | - | - | 0.14 | 52.68 | 42.03 | 10.30 | 163.37 |
| Wood and wood products | 2.50 | - | 4.47 | 3.21 | - | - | - | 10.78 | 7.97 | 2.30 | 31.23 |
| Construction | 6.07 | 0.03 | 27.03 | 5.51 | - | - | - | 0.12 | 6.91 | 1.12 | 46.79 |
| Textile and leather | 13.87 | 0.02 | 6.30 | 6.94 | - | - | - | 0.21 | 21.42 | 6.82 | 55.57 |
| Non-specified | 74.64 | 4.86 | 104.51 | 96.60 | . | . | 0.28 | 79.76 | 112.07 | 14.62 | 487.33 |
| **TRANSPORT** | **3.45** | **0.02** | **2149.82** | **77.41** | **-** | **-** | **-** | **45.45** | **23.12** | **0.10** | **2299.37** |
| World aviation bunkers | - | - | 153.42 | - | - | - | - | - | - | - | 153.42 |
| Domestic aviation | - | - | 100.38 | - | - | - | - | - | - | - | 100.38 |
| Road | - | - | 1630.45 | 15.18 | - | - | - | 45.45 | - | - | 1691.07 |
| Rail | 3.33 | - | 30.84 | - | - | - | - | - | 16.89 | - | 51.06 |
| Pipeline transport | - | 0.02 | 7.34 | 61.67 | - | - | - | - | 3.05 | - | 72.07 |
| World marine bunkers | - | . | 181.36 | . | . | . | . | . | . | . | 181.36 |
| Domestic navigation | 0.10 | . | 41.37 | . | . | . | . | . | . | . | 41.48 |
| Non-specified | 0.01 | - | 4.66 | 0.57 | - | - | - | - | 3.18 | 0.10 | 8.53 |
| **OTHER** | **136.42** | **0.23** | **452.87** | **633.44** | **-** | **-** | **14.37** | **834.05** | **820.32** | **145.22** | **3036.92** |
| Residential | 76.58 | - | 222.89 | 418.55 | - | - | 6.98 | 805.42 | 395.81 | 97.97 | 2024.19 |
| Comm. and publ. services | 23.30 | . | 107.32 | 173.79 | . | . | 1.15 | 16.33 | 338.31 | 32.47 | 692.67 |
| Agriculture/forestry | 9.57 | 0.02 | 102.97 | 5.58 | - | - | 0.16 | 7.02 | 36.20 | 3.36 | 164.88 |
| Fishing | 0.01 | - | 5.69 | 0.02 | - | - | 0.03 | - | 0.36 | 0.06 | 6.17 |
| Non-specified | 26.96 | 0.21 | 14.00 | 35.51 | . | . | 6.05 | 5.28 | 49.64 | 11.36 | 149.01 |
| **NON-ENERGY USE** | **37.42** | **14.11** | **553.19** | **142.32** | **-** | **-** | **-** | **-** | **-** | **-** | **747.05** |
| in industry/transf./energy | 36.73 | 14.11 | 544.15 | 142.32 | . | . | . | . | . | . | 737.31 |
| *of which: feedstocks* | *2.43* | *14.03* | *344.55* | *139.38* | - | - | - | - | - | - | *500.40* |
| in transport | - | - | 5.09 | - | - | - | - | - | - | - | 5.10 |
| in other | 0.70 | . | 3.94 | . | . | . | . | . | . | . | 4.64 |
| **Electricity and Heat Output** | | | | | | | | | | | |
| **Electr. Generated - GWh** | **8262523** | **35222** | **1076089** | **4300963** | **2730823** | **3207867** | **299201** | **267083** | **-** | **1380** | **20181151** |
| *Electricity plants* | *7626920* | *35198* | *987212* | *3161343* | *2707776* | *3207867* | *296828* | *165525* | *-* | *710* | *18189379* |
| *CHP plants* | *635603* | *24* | *88877* | *1139620* | *23047* | *-* | *2373* | *101558* | *-* | *670* | *1991772* |
| **Heat Generated - TJ** | **5002816** | **26576** | **750097** | **6428582** | **21327** | **-** | **352787** | **620379** | **6867** | **51454** | **13260885** |
| *CHP plants* | *1964671* | *230* | *335530* | *3378730* | *21327* | *-* | *10114* | *365026* | *191* | *18134* | *6093953* |
| *Heat plants* | *3038145* | *26346* | *414567* | *3049852* | *-* | *-* | *342673* | *255353* | *6676* | *33320* | *7166932* |

**Energy dependency**

**Efficiency of the energy sector**

**Shares of energy consumption by sector**

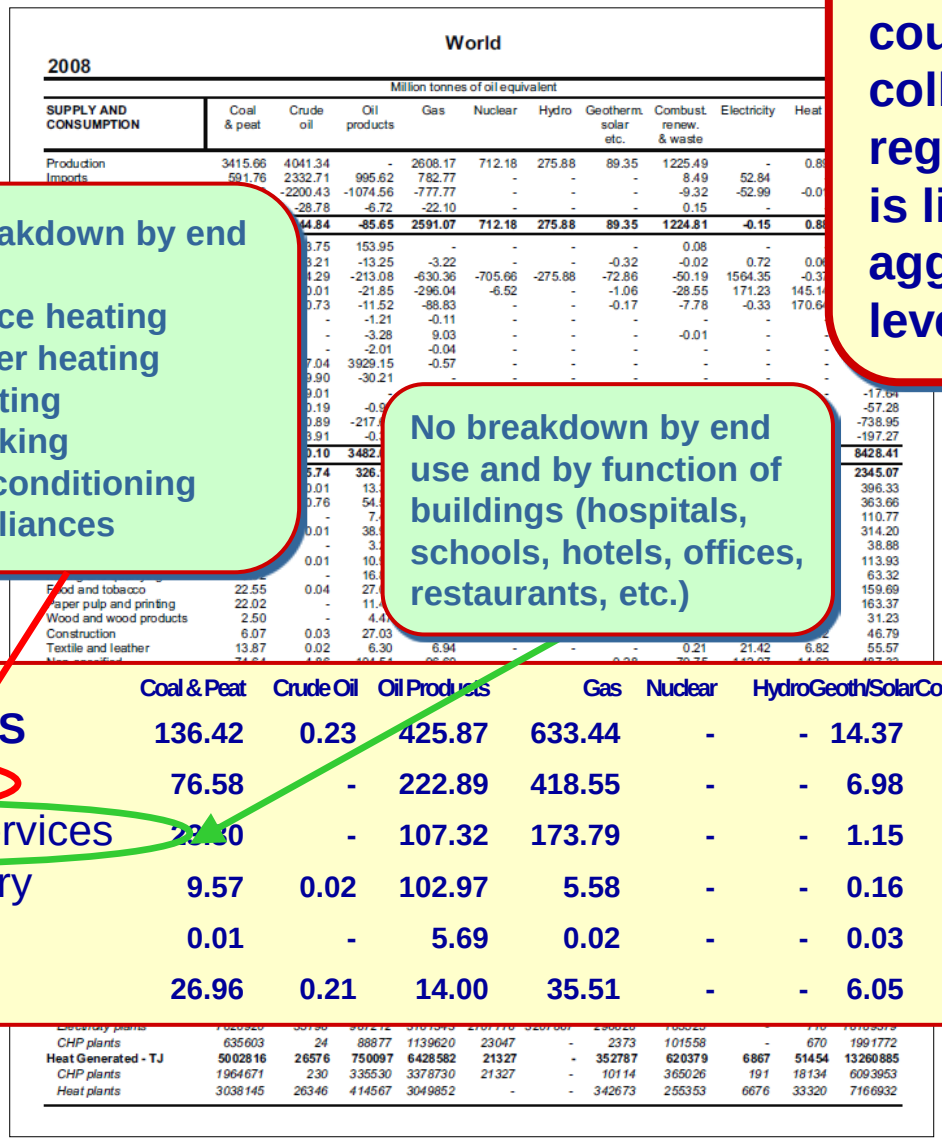
**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

# … and its limits



## WORLD ENERGY BALANCE



World

2008

Million tonnes of oil equivalent

| SUPPLY AND CONSUMPTION | Coal & peat | Crude oil | Oil products | Gas | Nuclear | Hydro | Geotherm. solar etc. | Combust. renew. & waste | Electricity | Heat | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | 3415.66 | 4041.34 | - | 2608.17 | 712.18 | 275.88 | 89.35 | 1225.49 | - | 0.8 | |
| Imports | 591.76 | 2332.71 | 995.62 | 782.77 | - | - | - | 8.49 | 52.84 | | |
| | | -2200.43 | -1074.56 | -777.77 | - | - | - | -9.32 | -52.99 | -0.0 | |
| | | -28.78 | -6.72 | -22.10 | - | - | - | 0.15 | - | | |
| | | **4.84** | **-85.65** | **2591.07** | **712.18** | **275.88** | **89.35** | **1224.81** | **-0.15** | **0.8** | |
| | | 3.75 | 153.95 | - | - | - | - | 0.08 | - | | |
| | | 3.21 | -13.25 | -3.22 | - | - | -0.32 | -0.02 | 0.72 | 0.0 | |
| | | 4.29 | -213.08 | -630.36 | -705.66 | -275.88 | -72.86 | -50.19 | 1564.35 | -0.3 | |
| | | 0.01 | -21.85 | -296.04 | -6.52 | - | -1.06 | -28.55 | 171.23 | 145.1 | |
| | | 0.73 | -11.52 | -88.83 | - | - | -0.17 | -7.78 | -0.33 | 170.6 | |
| | | - | -1.21 | -0.11 | - | - | - | - | - | | |
| | | - | -3.28 | 9.03 | - | - | - | -0.01 | - | | |
| | | - | -2.01 | -0.04 | - | - | - | - | - | | |
| | | 7.04 | 3929.15 | -0.57 | - | - | - | - | - | | |
| | | 9.90 | -30.21 | - | - | - | - | - | - | | |
| | | 9.01 | - | - | - | - | - | - | - | | -17.64 |
| | | 0.19 | -0.9 | | | | | | | | -57.28 |
| | | 0.89 | -217. | | | | | | | | -738.95 |
| | | 3.91 | -0. | | | | | | | | -197.27 |
| | | **0.10** | **3482.** | | | | | | | | **8428.41** |
| | | **5.74** | **326.** | | | | | | | | **2345.07** |
| | | 0.01 | 13. | | | | | | | | 396.33 |
| | | 0.76 | 54. | | | | | | | | 363.66 |
| | | - | 7. | | | | | | | | 110.77 |
| | | 0.01 | 38. | | | | | | | | 314.20 |
| | | - | 3. | | | | | | | | 38.88 |
| | | 0.01 | 10. | | | | | | | | 113.93 |
| | | - | 16. | | | | | | | | 63.32 |
| Food and tobacco | 22.55 | 0.04 | 27. | | | | | | | | 159.69 |
| Paper pulp and printing | 22.02 | - | 11. | | | | | | | | 163.37 |
| Wood and wood products | 2.50 | - | 4.4 | | | | | | | | 31.23 |
| Construction | 6.07 | 0.03 | 27.03 | | | | | | | | 46.79 |
| Textile and leather | 13.87 | 0.02 | 6.30 | 6.94 | - | - | - | 0.21 | 21.42 | 6.82 | 55.57 |
| *CHP plants* | *635603* | *24* | *88877* | *1139620* | *23047* | *-* | *2373* | *101558* | *-* | *670* | *1991772* |
| **Heat Generated - TJ** | **5002816** | **26576** | **750097** | **6428582** | **21327** | **-** | **352787** | **620379** | **6867** | **51454** | **13260885** |
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| *Heat plants* | *3038145* | *26346* | *414567* | *3049852* | *-* | *-* | *342673* | *255353* | *6676* | *33320* | *7166932* |

**What most countries collect on a regular basis is limited to aggregated levels**

**No breakdown by end use:**
- **space heating**
- **water heating**
- **lighting**
- **cooking**
- **air conditioning**
- **appliances**

**No breakdown by end use and by function of buildings (hospitals, schools, hotels, offices, restaurants, etc.)**

| | Coal & Peat | Crude Oil | Oil Products | Gas | Nuclear | Hydro | Geoth/Solar | Comb. Ren.&Waste | Electricity | Heat | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **OTHER SECTORS** | **136.42** | **0.23** | **425.87** | **633.44** | **-** | **-** | **14.37** | **834.05** | **820.32** | **145.22** | **3036.92** |
| Residential | **76.58** | **-** | **222.89** | **418.55** | **-** | **-** | **6.98** | **805.42** | **395.81** | **97.97** | **2024.19** |
| Comm. & Pub. Services | **28.30** | **-** | **107.32** | **173.79** | **-** | **-** | **1.15** | **16.33** | **338.31** | **32.47** | **692.67** |
| Agriculture/Forestry | **9.57** | **0.02** | **102.97** | **5.58** | **-** | **-** | **0.16** | **7.02** | **36.20** | **3.36** | **164.88** |
| Fishing | **0.01** | **-** | **5.69** | **0.02** | **-** | **-** | **0.03** | **-** | **0.36** | **0.06** | **6.17** |
| Non-specified | **26.96** | **0.21** | **14.00** | **35.51** | **-** | **-** | **6.05** | **5.28** | **49.64** | **11.36** | **149.01** |

*from*
*Analysis*

Worldwide Trends in Energy Use and Efficiency

ENERGY INDICATORS

Worldwide Trends in Energy Use and Efficiency

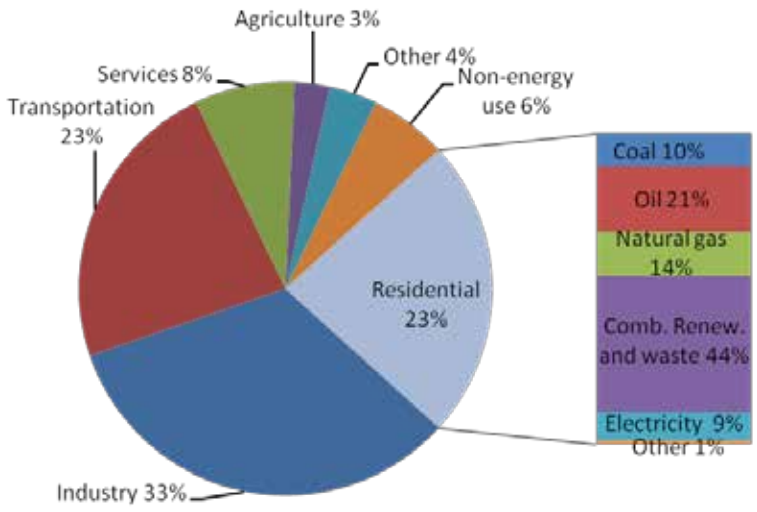
*Key Insights from IEA Indicator Analysis*

# The residential sector

# What can we learn from the energy balance?

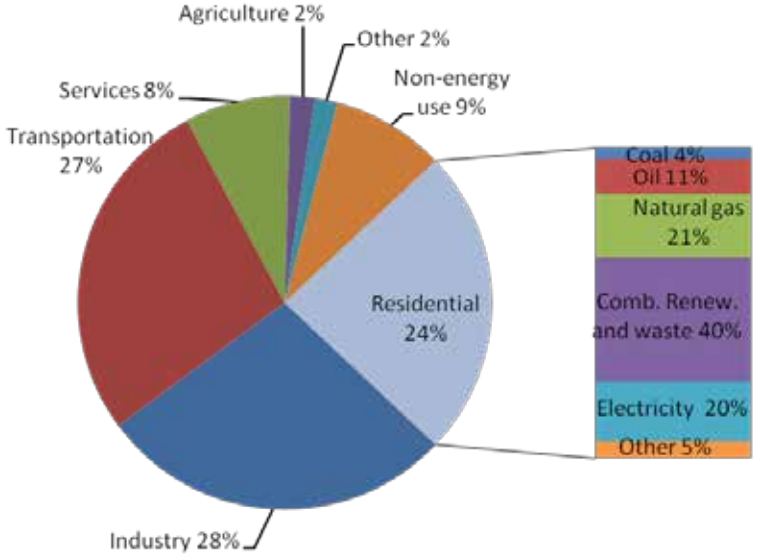


**1973**




**World: 4 676 Mtoe**

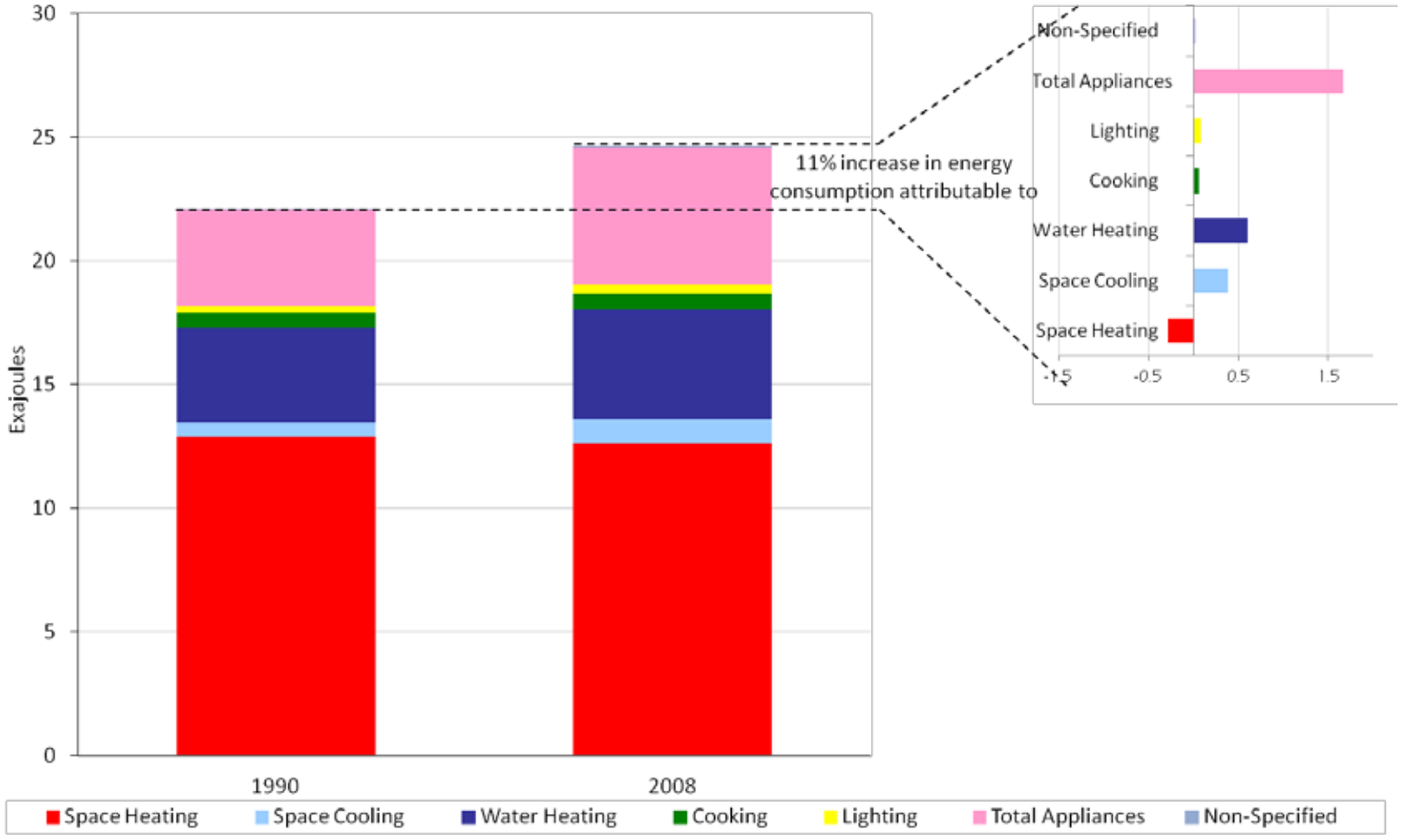
**2008**




**World: 8 428 Mtoe**

***Electricity and natural gas account for 41% of global residential energy consumption in 2008; up from 23% in 1973***

# More information is required to:
# 1) understand how energy is used




***Most of the growth in residential energy consumption in 18 IEA member countries is attributable to appliances and electronics***



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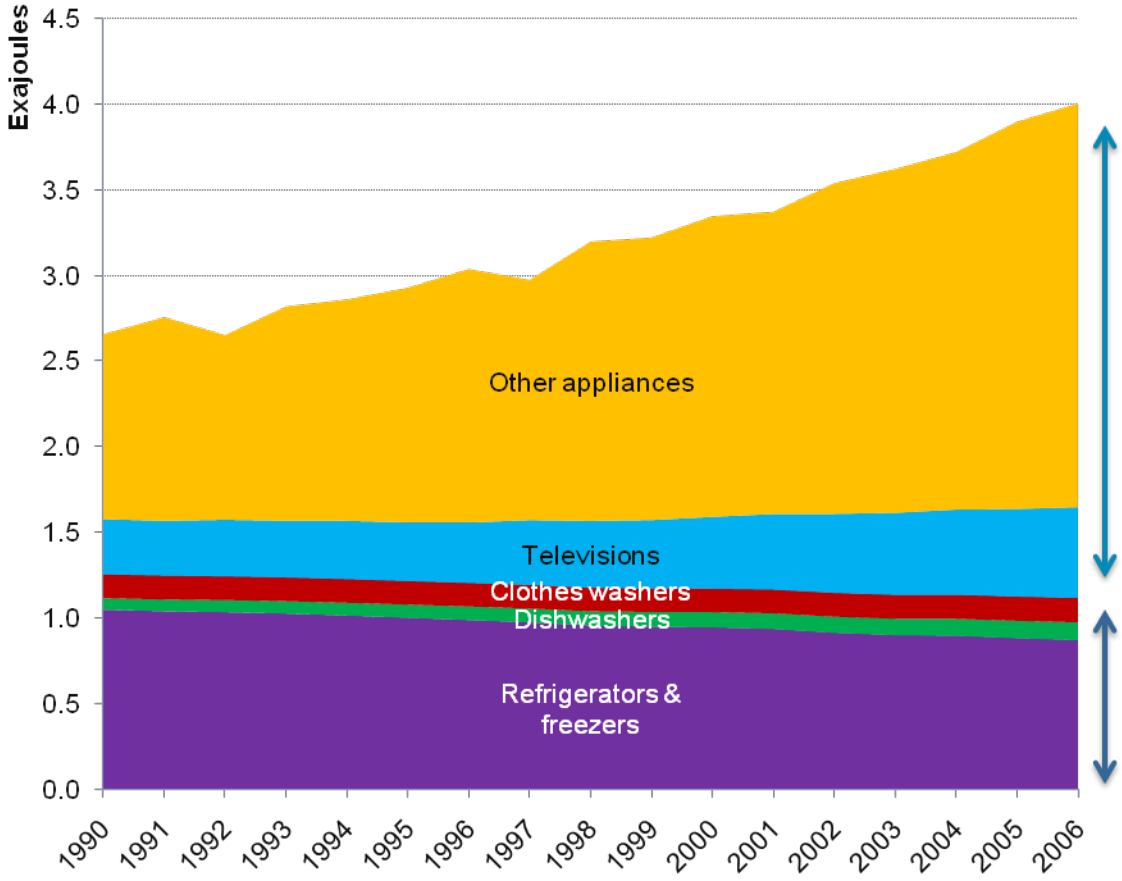
# But more information is required to:

# 2) evaluate the impact of existing energy policies and programmes

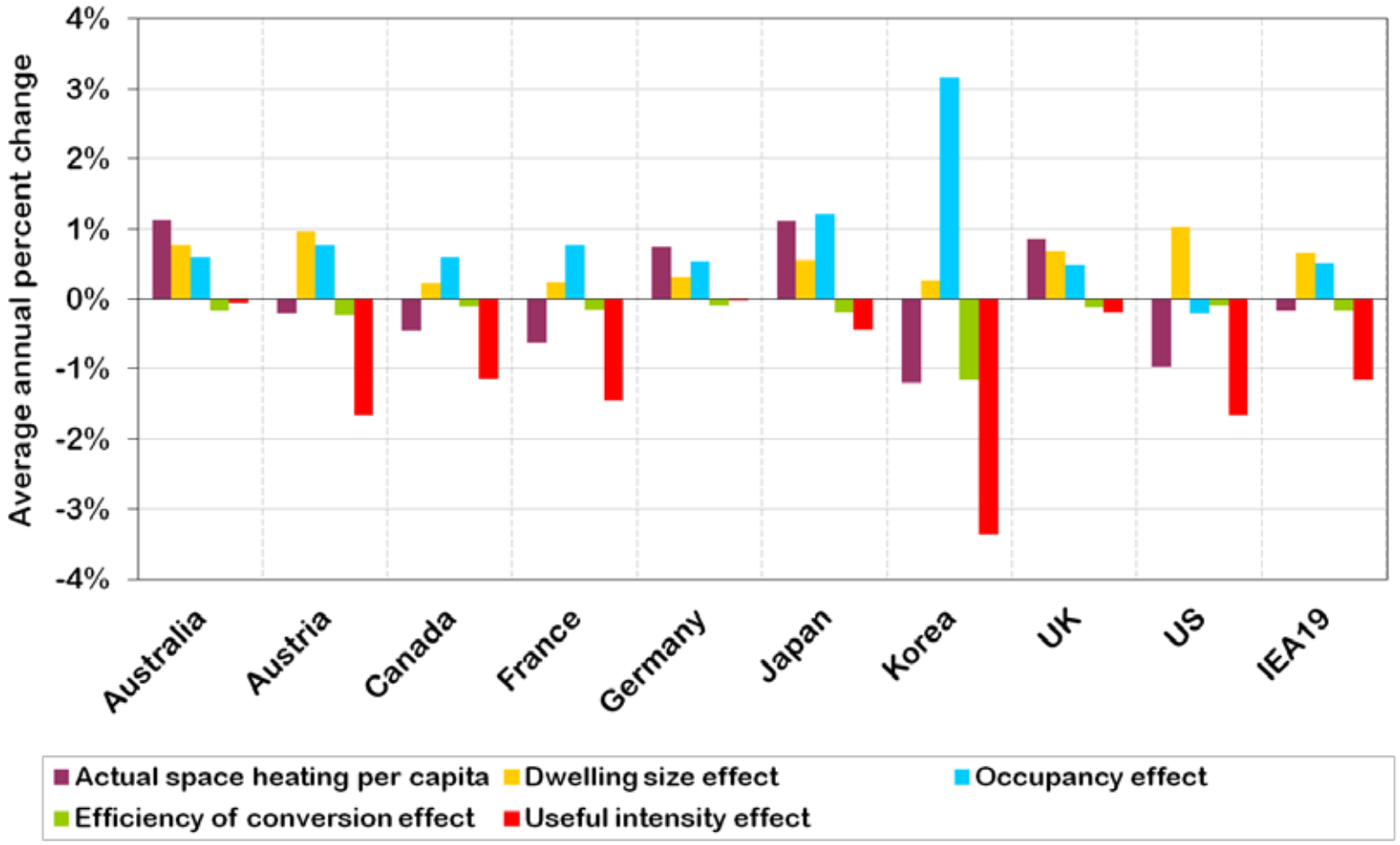



The increase is entirely due to small appliances… but little detailed information exist for this category

Energy consumption from large appliances decreased by 11%

***Despite growth in population and stock per capita, the policies resulted in reduction in energy consumption***

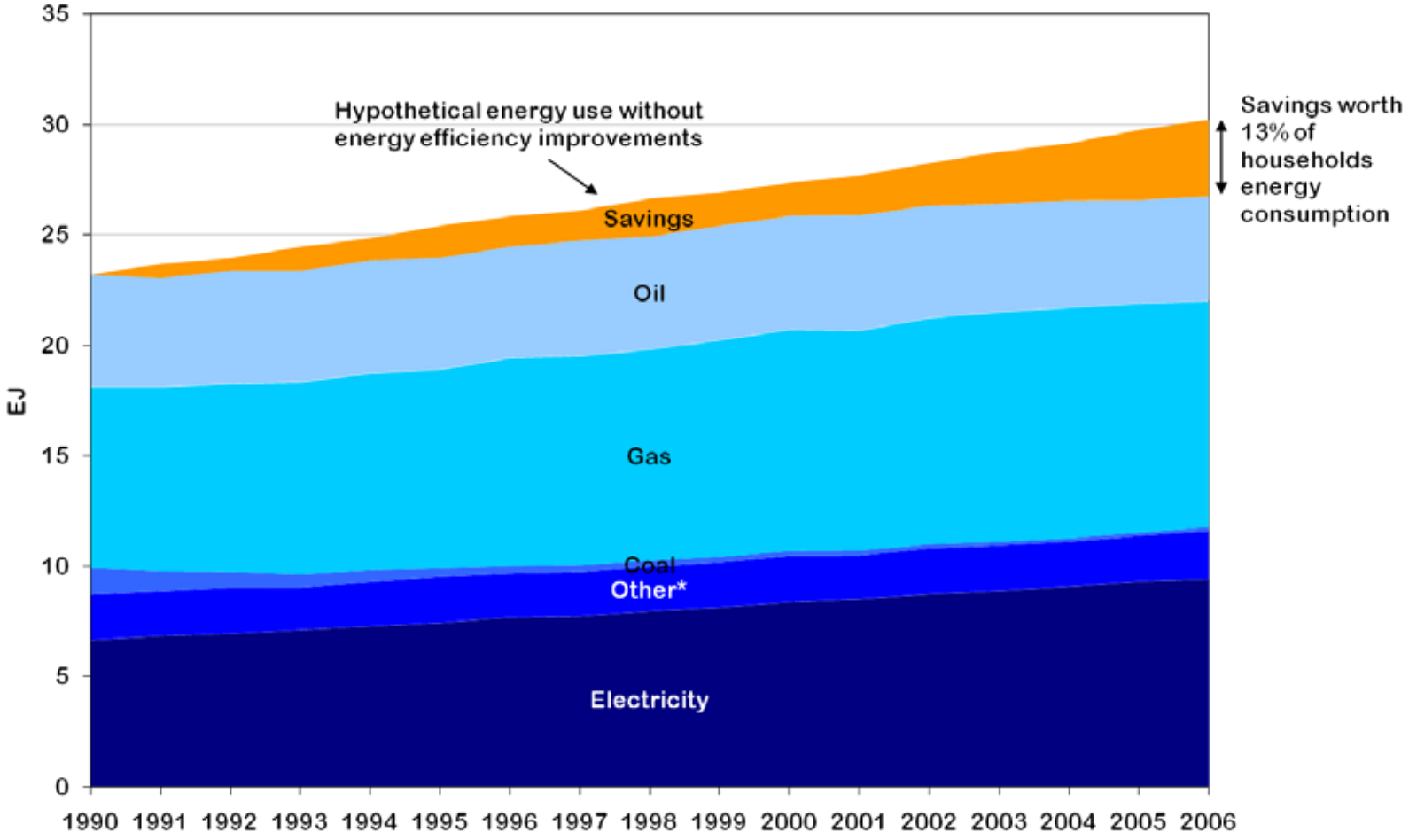
# But more information is required to:
# 3) provide insights on the main factors influencing the trends in energy consumption




***In general, higher per capita space heating energy demand – caused by fewer occupants and larger homes – was offset by an improvement in energy efficiency***

# But more information is required to:

# 4) evaluate the role energy efficiency played in restraining the growth in energy consumption




***Without savings from energy efficiency, energy consumption in IEA 19 would have been 13% higher in 2006***

# The challenges in collecting residential data

- Difficulty in obtaining consumption information at the end-use level
- Difficulty in obtaining a better representation of the appliance end-use
- Distinction between rural and urban area is important for some countries
- Quantification of collected/purchased combustible renewables
- Necessity to correct for climate variations

ENERGY INDICATORS

Worldwide Trends in Energy Use and Efficiency

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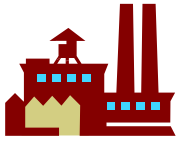
# Analysis of the industrial sector

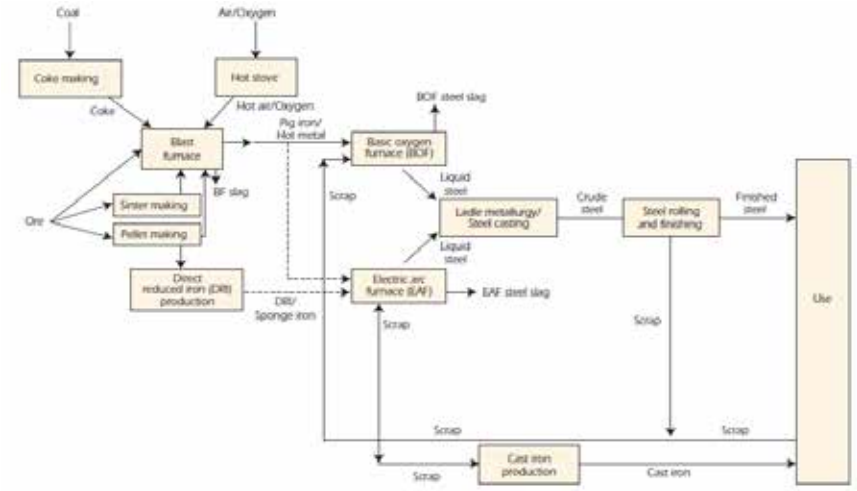
# Defining the industrial sector

*The industry sector covers the manufacturing sector (the manufacture of finished goods and products), construction and mining and quarrying of raw materials.*

## Different type of industries



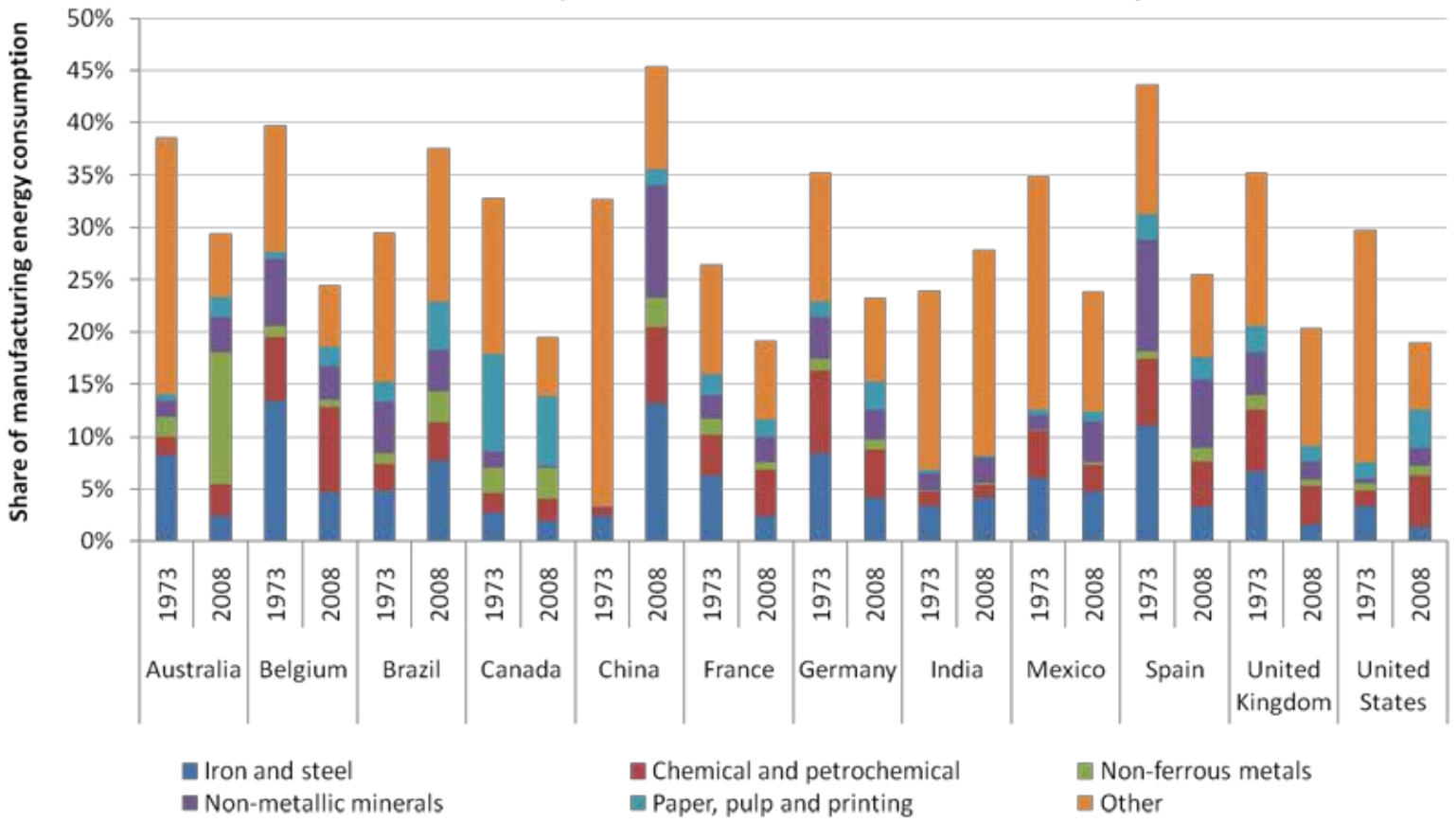
## Industry boundaries




**It does <u>not</u> include transport-related energy consumption and refineries**

# Insights from the energy balance – the manufacturing sector






***The industry mix identifies the largest energy consumers within the manufacturing sector***

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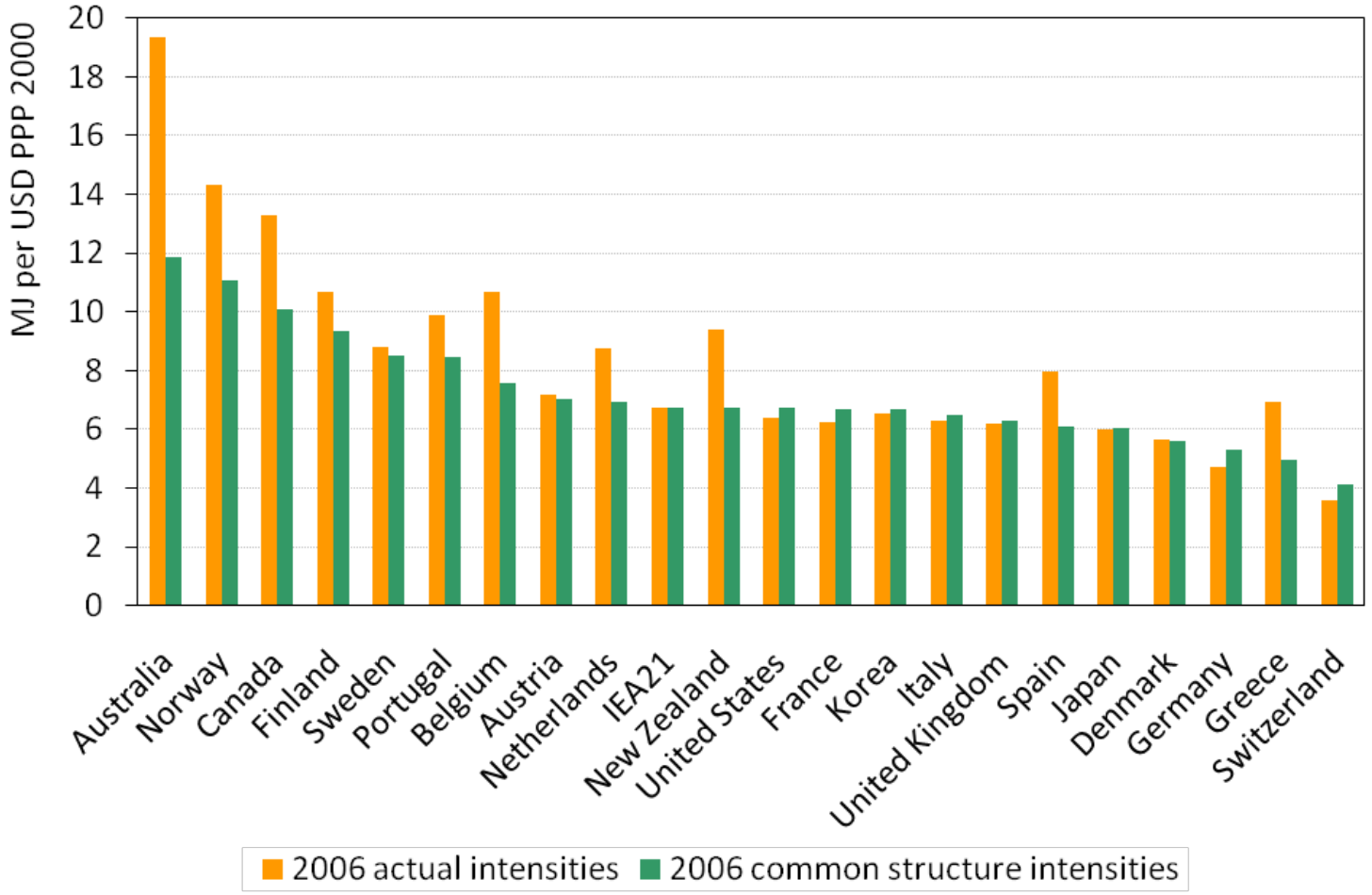
***Key Insights from IEA Indicator Analysis***

# Energy consumption is only one element of the story

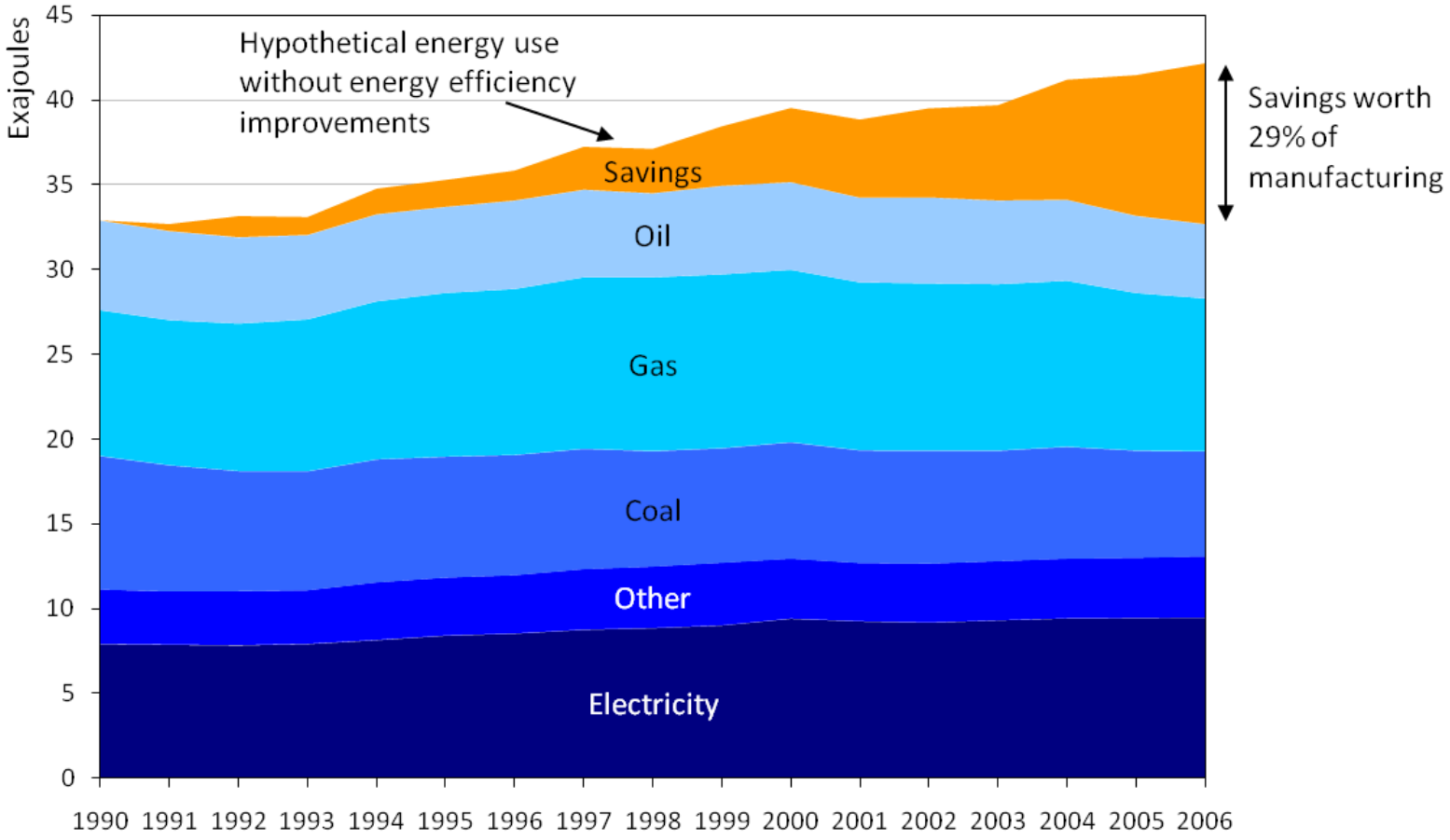
- Energy Balances provides energy consumption
  - By energy source
  - By industry
- Supplementary information are required…
  - Value-added by industry
  - Production level by commodity type
- … and greater details provide even better indicators
  - Age profile of plant
  - Process type information
  - Specific consumption by process step
  - Primary versus secondary production

# Aggregate indicators may be misleading




***High intensities of some countries result from the structure of their manufacturing sector***

# So is the role energy efficiency played in restraining the growth in energy consumption




***The savings from energy efficiency accelerated in the last decade***



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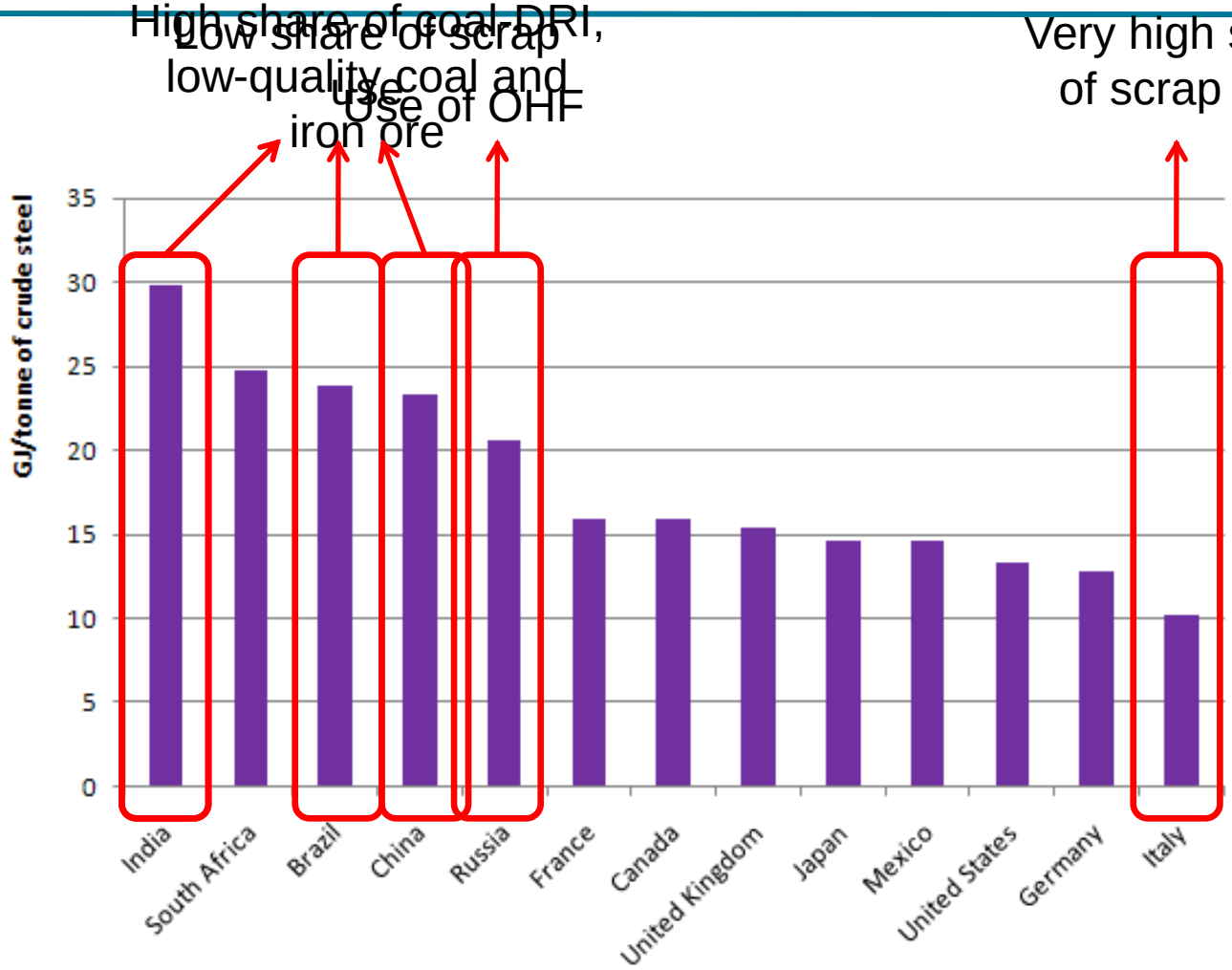
***Key Insights from IEA Indicator Analysis***

# Again, these indicators hide important information




***Specificities of a country/an industry can explain large variations in energy intensity***



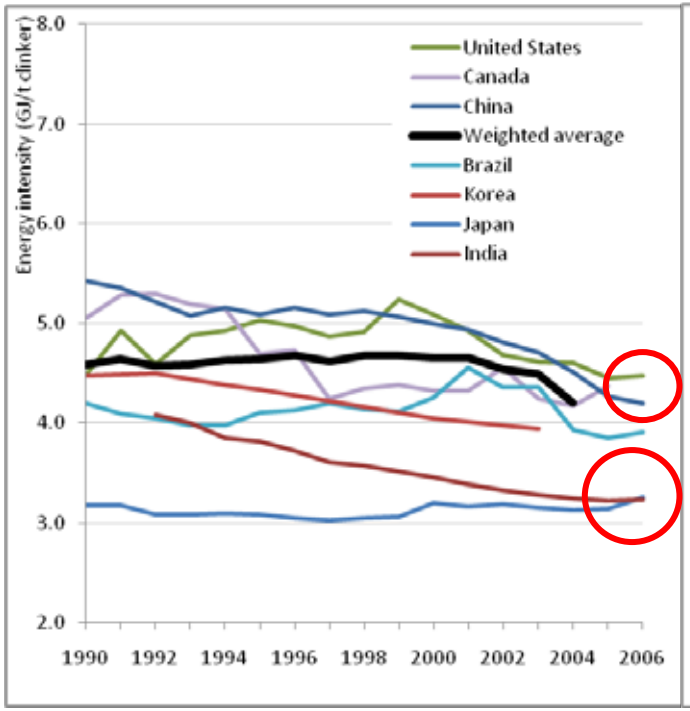
**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

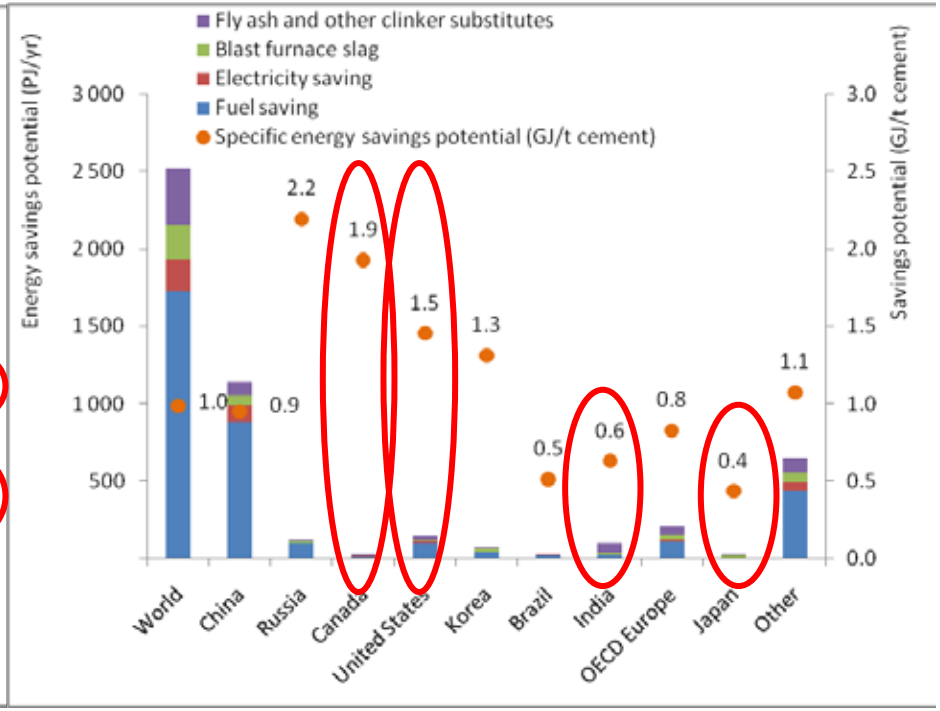
# The IEA developed new disaggregated indicators for energy intensive industries



## Thermal energy consumption by tonne of clinker



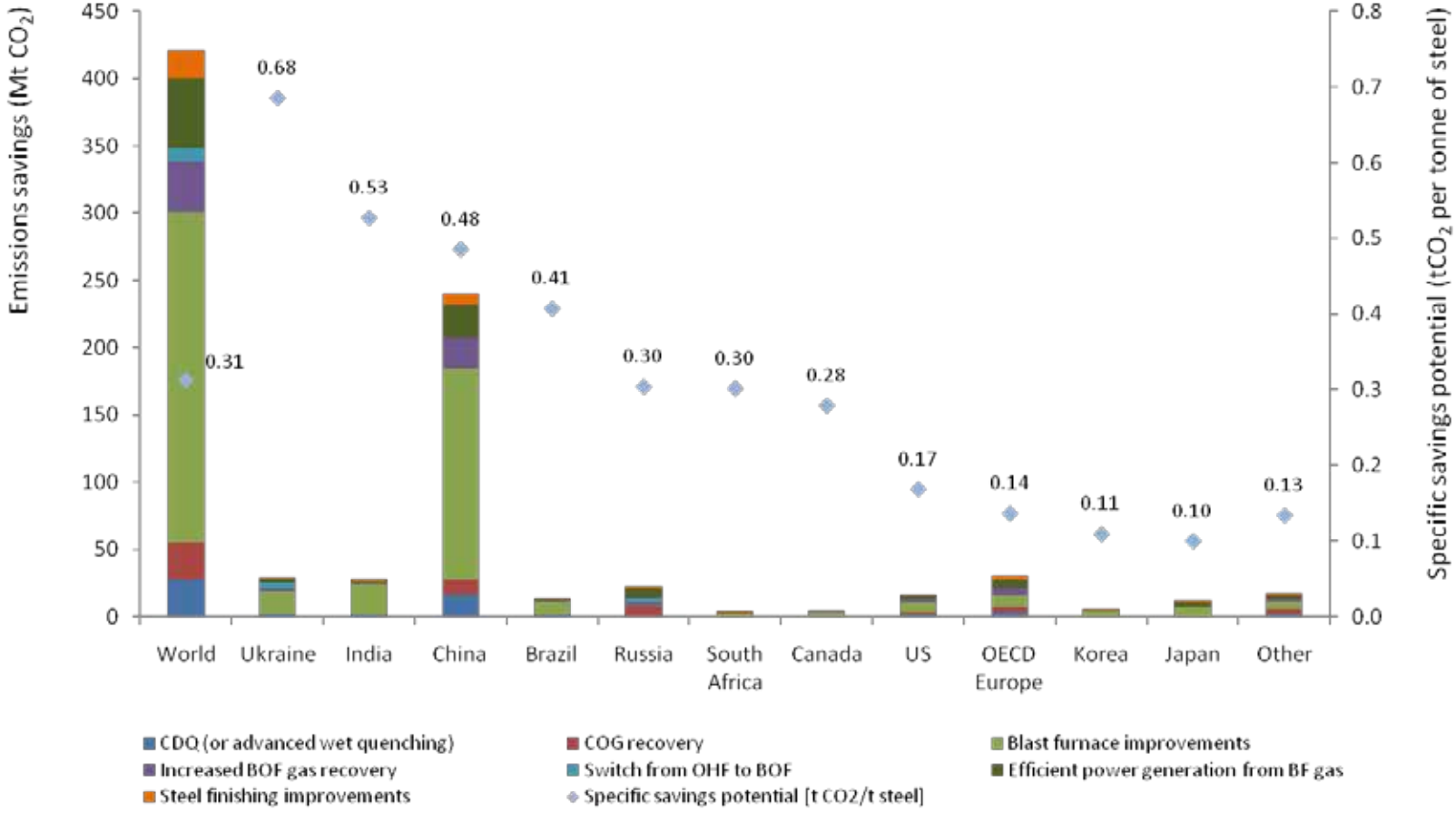

## Energy savings potential based on best available technology




**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

# Detailed indicators also provide insights on emission savings potential




***Over 400 Mt $CO_2$ can be saved by applying best available technology in the iron and steel sector***

# There are many issues with data collection, even at the aggregate level

- Different countries using different boundaries and definitions
- Difficulty in detangling the energy used within, and outside, the industry boundaries
- Difficulty in separating fuel used for combustion from fuel used as feedstock
- Difficulty in obtaining data for small plants (e.g. mini paper mills)
- Measurement of combine heat and power (CHP)
- Confidentiality of the information

**Data availability and consistency need to be improved in all manufacturing sectors**

ENERGY INDICATORS

Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# Energy efficiency indicators – three useful IEA tools

# Statistics for energy efficiency indicators – context

- The IEA Ministerial meeting
  - Acknowledge the importance of developing meaningful indicators to support policy development
  - Commit to report data supporting the development of indicators annually through the IEA template

- Requests from member and non-member countries to provide guidance on:
  - What indicators to use
  - How to build these indicators
  - What data are needed to support the development of these indicators

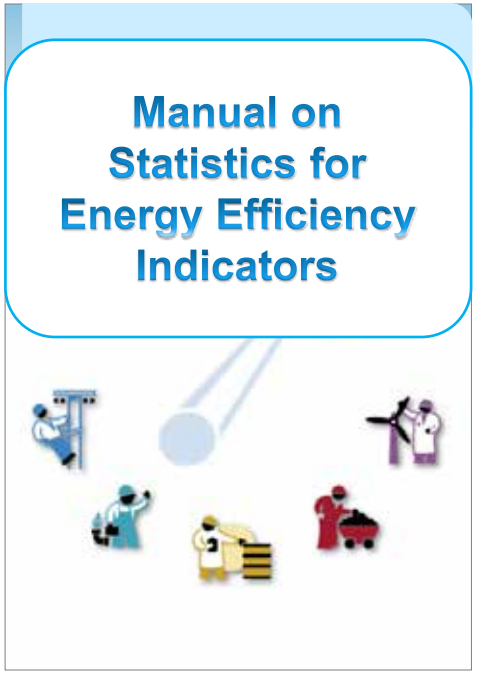
**But how to collect the data?**

# How to gather this information?



## Manual on Statistics for Energy Efficiency Indicators

- Will offer a large menu of practices already existing worldwide
- Each practice will be summarised, highlighting the main elements of the methodology used
- Four main category of methods (survey, metering/measuring, modelling, administrative sources)
- Will cover the residential, industry, transport and services sector



# Manual on Statistics for Energy Efficiency Indicators



## Content of the manual

- Why a manual
- Energy efficiency indicators: what are they?
- The data behind the indicators: how to collect them?
- Collecting what and how for the
  - Residential sector
  - Services sector
  - Industry sector
  - Transport sector
- Validating and disseminating
- Annexes

Worldwide Trends in Energy Use and Efficiency

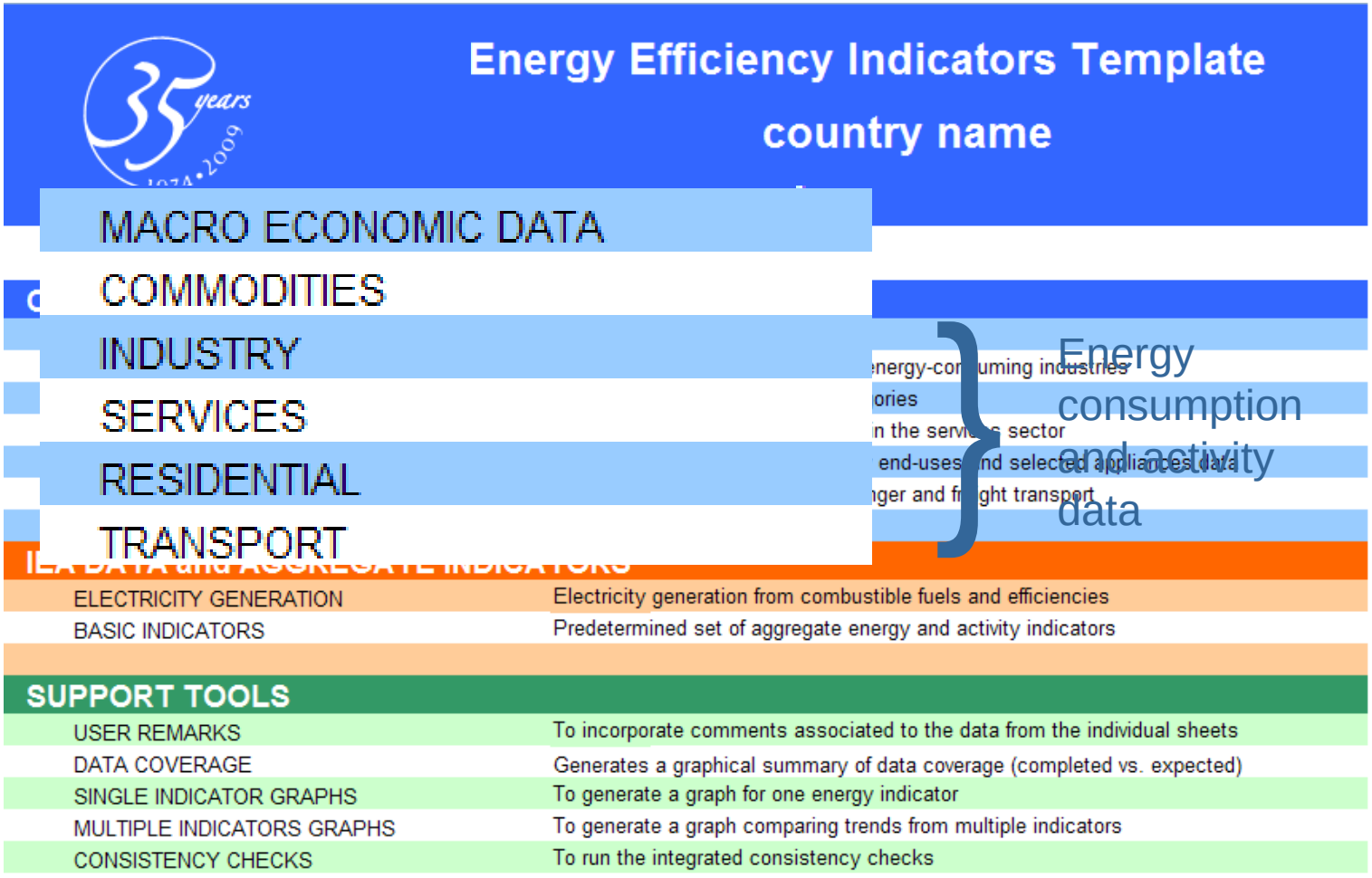
*Key Insights from IEA Indicator Analysis*

# Manual on Statistics for Energy Efficiency Indicators

## Content of sectors' chapter

- Definition of the sector
- Importance of the sector in term of energy consumption
- Key drivers of energy consumption within each sector
- How to collect the data
- Country examples

# The IEA energy efficiency indicators template




ENERGY INDICATORS

**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

# The IEA template:
# 1) provides a starting point for collecting important data

| | B | D | L | M | N | O | P | Q | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | units | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| 5 | | | | | | | | | | | | | | |
| 6 | **Total Energy Use in Residential Sector** | | | | | | | | | | | | | |
| | **Oil & Petroleum Products** | PJ | 309.42 | 323.61 | 288.04 | 294.10 | 286.82 | 286.66 | 292.16 | 294.44 | 273.65 | 274.13 | 300.58 | 304.07 |
| | **Natural Gas** | PJ | 21.59 | 19.77 | 19.88 | 20.98 | 22.47 | 24.89 | 28.45 | 30.39 | 30.35 | 29.61 | 31.02 | 30.71 |
| 0 | **Combus. Renewables & Waste** | PJ | 281.18 | 282.33 | 283.59 | 284.98 | 267.09 | 266.24 | 267.03 | 266.65 | 266.43 | 264.60 | 263.24 | 262.05 |
| 2 | **Electricity** | PJ | 106.72 | 114.08 | 120.14 | 130.06 | 138.04 | 140.52 | 143.50 | 146.64 | 153.11 | 160.03 | 165.01 | 170.82 |
| 3 | **Other** | PJ | 0.73 | 0.82 | 0.91 | 1.04 | 1.24 | 1.38 | 1.59 | 1.77 | 2.02 | 2.25 | 2.60 | 3.20 |
| 4 | **Total** | PJ | 719.63 | 740.61 | 712.56 | 731.15 | 715.67 | 719.68 | 732.73 | 739.89 | 725.55 | 730.62 | 762.44 | 770.86 |
| 8 | | | | | | | | | | | | | | |
| 9 | **Space Heating** | | | | | | | | | | | | | |
| 0 | Oil & Petroleum Products | PJ | 0 | 0 | 0 | 0 | 0 | 4.01 | 3.38 | 2.72 | 2.27 | 2.26 | 3.18 | 3.82 |
| 1 | Natural Gas | PJ | 0 | 0 | 0 | 0 | 0 | 0.20 | 0.19 | 0.17 | 0.10 | 0.10 | 0.13 | 0.15 |
| 3 | Combus. Renewables & Waste | PJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | Electricity | PJ | 0 | 0 | 0 | 0 | 0 | 2.05 | 2.21 | 2.36 | 1.67 | 2.25 | 1.14 | 1.06 |
| 7 | **Total** | PJ | 0 | 0 | 0 | 0 | 0 | 6.26 | 5.78 | 5.25 | 4.04 | 4.61 | 4.45 | 5.04 |
| 8 | Total (climate corrected for 1990-2007) | PJ | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 9 | | | | | | | | | | | | | | |
| 0 | **Space Cooling** | | | | | | | | | | | | | |
| 6 | Electricity | PJ | 0 | 0 | 0 | 0 | 0 | 8.82 | 8.71 | 8.62 | 13.00 | 11.02 | 14.85 | 18.76 |
| 8 | **Total** | PJ | 0 | 0 | 0 | 0 | 0 | 8.82 | 8.71 | 8.62 | 13.00 | 11.02 | 14.85 | 18.76 |
| 9 | Total (climate corrected for 1990-2007) | PJ | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 0 | | | | | | | | | | | | | | |
| 1 | **Water Heating** | | | | | | | | | | | | | |
| 2 | Oil & Petroleum Products | PJ | 0 | 0 | 0 | 0 | 0 | 174.51 | 179.14 | 181.81 | 169.37 | 170.32 | 197.76 | 209.65 |
| 3 | Natural Gas | PJ | 0 | 0 | 0 | 0 | 0 | 15.17 | 17.47 | 18.76 | 18.79 | 18.41 | 20.46 | 21.26 |
| 9 | **Total** | PJ | 0 | 0 | 0 | 0 | 0 | 189.68 | 196.61 | 200.57 | 188.16 | 188.74 | 218.23 | 230.91 |
| 0 | | | | | | | | | | | | | | |
| 1 | **Cooking** | | | | | | | | | | | | | |
| 2 | Oil & Petroleum Products | PJ | 0 | 0 | 0 | 0 | 0 | 108.14 | 109.64 | 109.92 | 102.01 | 101.55 | 99.64 | 90.60 |
| 3 | Natural Gas | PJ | 0 | 0 | 0 | 0 | 0 | 9.52 | 10.79 | 11.47 | 11.45 | 11.09 | 10.43 | 9.30 |
| 5 | Combus. Renewables & Waste | PJ | 0 | 0 | 0 | 0 | 0 | 266.24 | 267.03 | 266.65 | 266.43 | 264.60 | 263.24 | 262.05 |
| 7 | Electricity | PJ | 0 | 0 | 0 | 0 | 0 | 0.20 | 0.22 | 0.25 | 0.42 | 0.51 | 0.26 | 0 |
| 9 | **Total** | PJ | 0 | 0 | 0 | 0 | 0 | 384.10 | 387.68 | 388.28 | 380.31 | 377.76 | 373.57 | 361.95 |
| 0 | | | | | | | | | | | | | | |
| 1 | **Lighting** | | | | | | | | | | | | | |
| 2 | Electricity | PJ | 0 | 0 | 0 | 0 | 0 | 41.17 | 42.24 | 43.34 | 43.67 | 45.61 | 46.26 | 46.83 |
| 6 | **Total** | PJ | 0 | 0 | 0 | 0 | 0 | 41.17 | 42.24 | 43.34 | 43.67 | 45.61 | 46.26 | 46.83 |

ENERGY INDICATORS

**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

# The IEA template:
# 2) helps identifying data gaps and issues

| | A | B | D | L | M | N | O | P | Q | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | units | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| 84 | | Refrigerator/Freezer Combinations | | | | | | | | | | | | | |
| 87 | ☑ | **Total** | **PJ** | **0** | **0** | **0** | **0** | **0** | **55.07** | **55.96** | **56.92** | **57.84** | **61.15** | **63.15** | **65.08** |
| 88 | | Diffusion | unit/dw | 0 | 0 | 0 | 0 | 0 | 0.78 | 0.77 | 0.76 | 0.77 | 0.82 | 0.83 | 0.84 |
| 89 | | Stock | $10^6$ | 0 | 0 | 0 | 0 | 0 | 19.14 | 19.31 | 19.48 | 19.91 | 21.79 | 22.14 | 22.49 |
| 90 | | Unit energy consumption | kWh/unit | 0 | 0 | 0 | 0 | 0 | 0.80 | 0.80 | 0.81 | 0.81 | 0.78 | 0.79 | 0.80 |
| 91 | | Total (calculated as stock * UEC) | PJ | #N/A | #N/A | #N/A | #N/A | #N/A | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| 92 | | | | | | | | | | | | | | | |
| 102 | ☑ | Clothes Washers | | | | | | | | | | | | | |
| 105 | ☑ | **Total** | **PJ** | **0** | **0** | **0** | **0** | **0** | **5.06** | **5.26** | **5.47** | **5.65** | **6.01** | **5.46** | **4.89** |
| 106 | | Diffusion | unit/dw | 0 | 0 | 0 | 0 | 0 | 0.58 | 0.59 | 0.60 | 0.62 | 0.66 | 0.59 | 0.52 |
| 107 | | Stock | $10^6$ | 0 | 0 | 0 | 0 | 0 | 14.22 | 14.75 | 15.29 | 15.98 | 17.59 | 15.80 | 14.02 |
| 108 | | Unit energy consumption | kWh/unit | 0 | 0 | 0 | 0 | 0 | 0.10 | 0.10 | 0.10 | 0.10 | 0.09 | 0.10 | 0.10 |
| 109 | | Total (calculated as stock * UEC) | PJ | #N/A | #N/A | #N/A | #N/A | #N/A | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 |
| 110 | | | | | | | | | | | | | | | |
| 111 | ☑ | Television/Home entertainment | | | | | | | | | | | | | |
| 114 | ☑ | **Total** | **PJ** | **0** | **0** | **0** | **0** | **0** | **12.64** | **13.07** | **13.50** | **14.17** | **15.37** | **15.84** | **16.30** |
| 115 | | Diffusion | unit/dw | 0 | 0 | 0 | 0 | 0 | 1.91 | 2.00 | 2.10 | 2.27 | 2.50 | 2.49 | 2.48 |
| 116 | | Stock | $10^6$ | 0 | 0 | 0 | 0 | 0 | 46.78 | 50.26 | 53.74 | 58.40 | 66.25 | 66.32 | 66.40 |
| 117 | | Unit energy consumption | kWh/unit | 0 | 0 | 0 | 0 | 0 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 |
| 118 | | Total (calculated as stock * UEC) | PJ | #N/A | #N/A | #N/A | #N/A | #N/A | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 |
| 119 | | | | | | | | | | | | | | | |
| 120 | | PC/Information & communication technology | | | | | | | | | | | | | |
| 123 | ☑ | **Total** | **PJ** | **0** | **0** | **0** | **0** | **0** | **0.33** | **0.37** | **0.41** | **0.44** | **0.48** | **0.54** | **0.59** |
| 124 | | Diffusion | unit/dw | 0 | 0 | 0 | 0 | 0 | 0.22 | 0.31 | 0.40 | 0.45 | 0.50 | 0.46 | 0.43 |
| 125 | | Stock | $10^6$ | 0 | 0 | 0 | 0 | 0 | 5.49 | 7.89 | 10.29 | 11.70 | 13.27 | 12.37 | 11.47 |
| 126 | | Unit energy consumption | kWh/unit | 0 | 0 | 0 | 0 | 0 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| 127 | | Total (calculated as stock * UEC) | PJ | #N/A | #N/A | #N/A | #N/A | #N/A | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 128 | | | | | | | | | | | | | | | |
| 129 | | Other Appliances | | | | | | | | | | | | | |
| 132 | ☑ | **Total** | **PJ** | **0** | **0** | **0** | **0** | **0** | **15.18** | **15.47** | **15.77** | **16.25** | **17.62** | **17.49** | **17.32** |
| 133 | | | | | | | | | | | | | | | |
| 134 | | Total Appliances | | | | | | | | | | | | | |
| 137 | | **Total** | **PJ** | **0** | **0** | **0** | **0** | **0** | **88.27** | **90.12** | **92.06** | **94.36** | **100.63** | **102.49** | **104.17** |
| 138 | | | | | | | | | | | | | | | |
| 139 | | Other Energy Use in Residential Sector | | | | | | | | | | | | | |
| 140 | | Oil & Petroleum Products | PJ | 309.42 | 323.61 | 288.04 | 294.10 | 286.82 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141 | | Natural Gas | PJ | 21.59 | 19.77 | 19.88 | 20.98 | 22.47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 142 | | Coal & Coal Products | PJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 143 | | Combus. Renewables & Waste | PJ | 281.18 | 282.33 | 283.59 | 284.98 | 267.09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 144 | | Heat | PJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145 | | Electricity | PJ | 106.72 | 114.08 | 120.14 | 130.06 | 138.04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 146 | | Other | PJ | 0.73 | 0.82 | 0.91 | 1.04 | 1.24 | 1.38 | 1.59 | 1.77 | 2.02 | 2.25 | 2.60 | 3.20 |
| 147 | ☑ | **Total** | **PJ** | **719.63** | **740.61** | **712.56** | **731.15** | **715.67** | **1.38** | **1.59** | **1.77** | **2.02** | **2.25** | **2.60** | **3.20** |

ENERGY INDICATORS

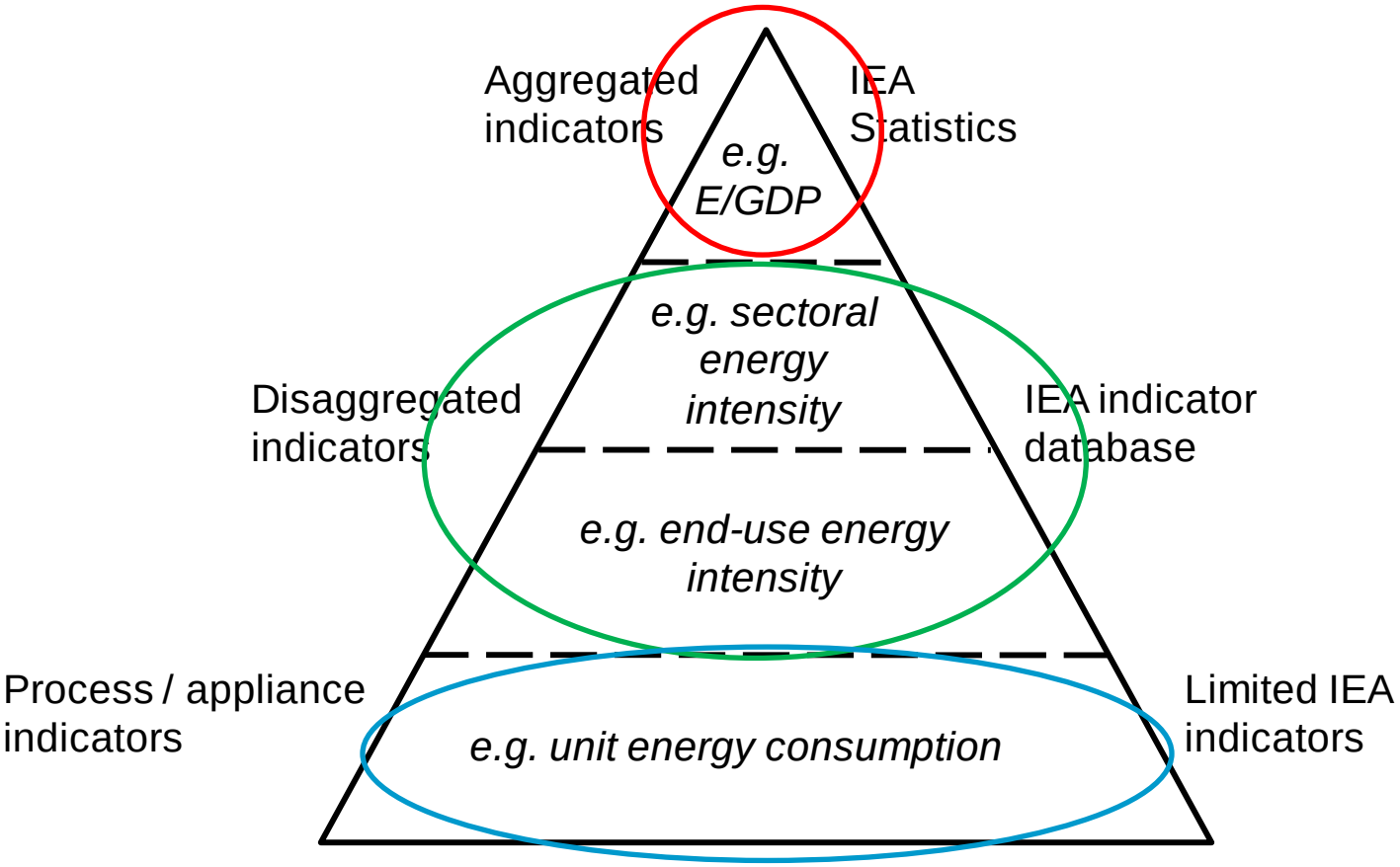
**Worldwide Trends in Energy Use and Efficiency**

***Key Insights from IEA Indicator Analysis***

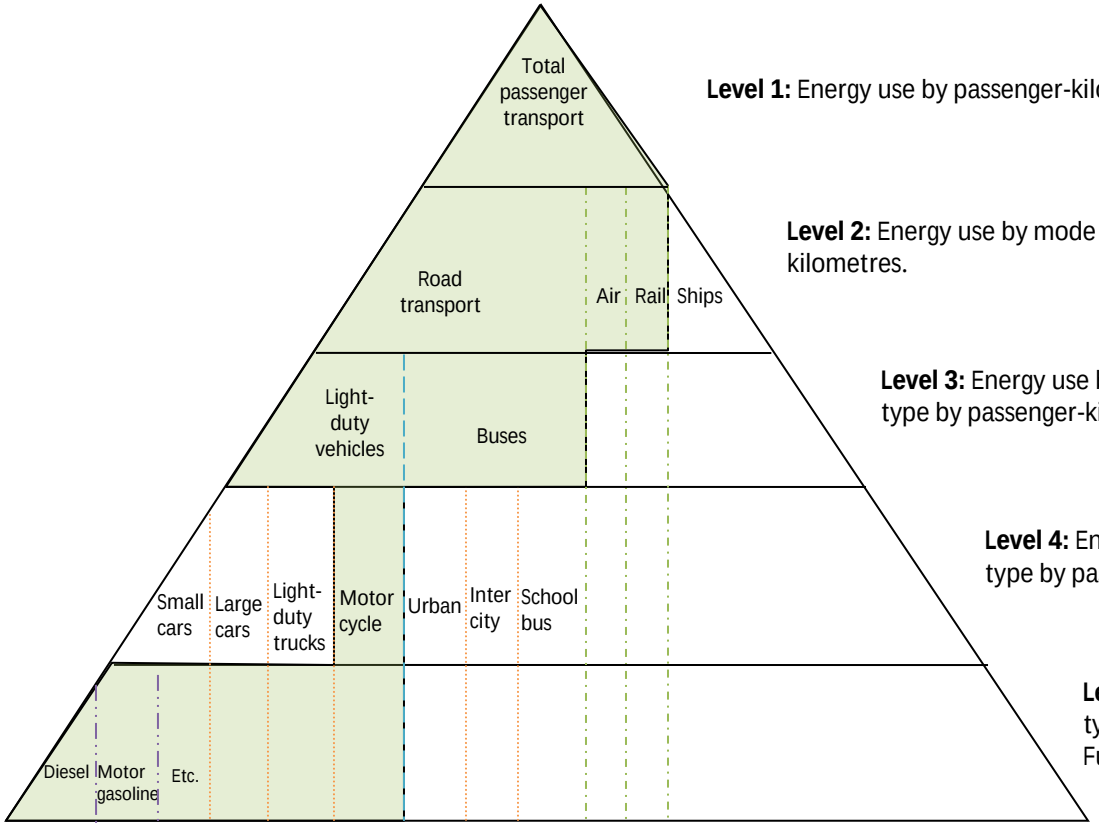
# The IEA template:
# 3) helps developing recommendations for data collection and indicators development

- As a starting point, country should collect the information requested in the template
- *"Development of Energy Efficiency Indicators in Russia"* provides detailed indicators that can be build with these data
- Development of such indicators help assessing the priority areas for further development
- But more information is required to better support the development of energy policies

# The pyramid approach helps countries defining their data collection strategies



# The pyramid approach for the passenger transport segment




**Level 1:** Energy use by passenger-kilometres.

**Level 2:** Energy use by mode by passenger-kilometres.

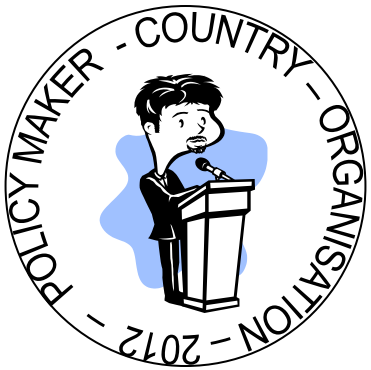
**Level 3:** Energy use by vehicle type by passenger-kilometres.

**Level 4:** Energy use by LDV type by passenger-kilometres.

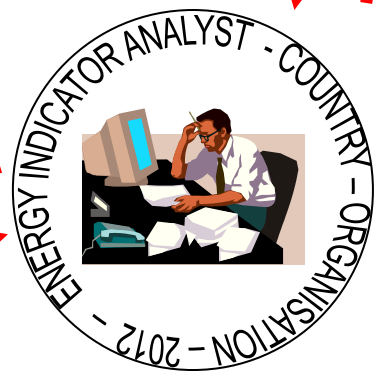
**Level 5:** Energy use by fuel type by passenger-kilometres Fuel economy per vehicle.

***The structure of the pyramids depends on countries specificities...***

# A common understanding




- Why it is important for policy makers to have relevant indicators
- Which indicators analysts should build and use
- How to collect the proper end-use energy and activity data
- Gaps, barriers and solutions
- Benefits of harmonisation and role of organisations

# Key messages from IEA indicators work

- **Energy efficiency can contribute to all the main goals of energy policy**
  - Economic growth
  - Energy security
  - Environmental protection

- **Energy efficiency has shown sustained improvement over many years**
  - Results are often not visible, as offset by other factors
  - Rate of improvement needs to be substantially increased

- **Energy efficiency is the single most important option to reduce $CO_2$ emissions in the future**
  - Often low cost and relatively quick to implement
  - Can buy time for less mature technologies to be developed
  - Barriers remain, but these can be overcome by effective policies
  - Requires Worldwide Implementation Now

ENERGY INDICATORS

Worldwide Trends in Energy Use and Efficiency

*Key Insights from IEA Indicator Analysis*

# You can contact our indicators team for more information

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