Energy Efficiency Indicators: Fundamentals on Statistics

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Head – Coal, Electricity and Renewables Statistics
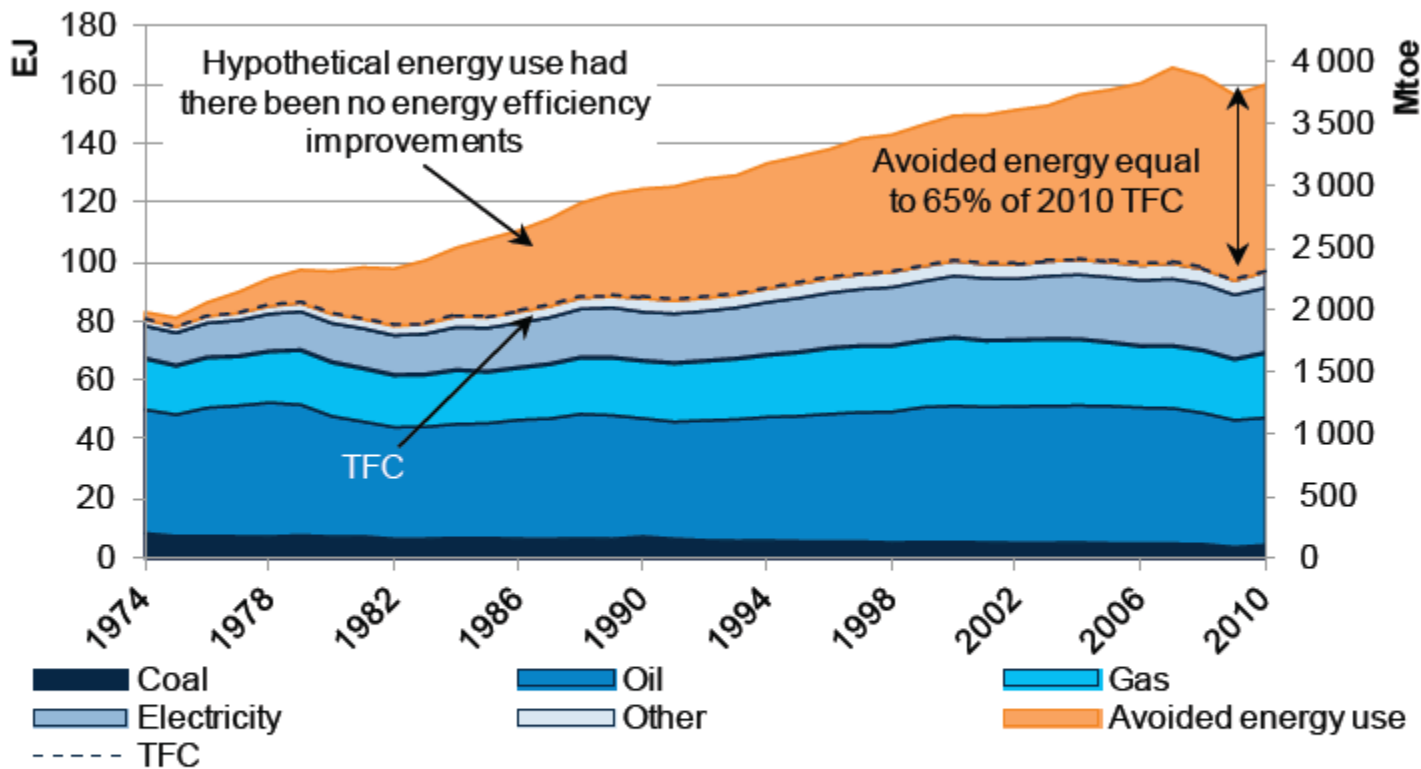
Energy Data Centre

Zvyšování energetické efektivity v průmyslu
MPO, Praha, 3 November 2015

Developing energy efficiency indicators: why?

The huge potential of energy efficiency…

Figure ES.2 The "first fuel": avoided energy use from energy efficiency in 11 IEA member countries

Notes: TFC = total final consumption. The 11 countries are Australia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, the United Kingdom and the United States, those for which sufficient data is available to undertake analysis. "Other" includes biofuels plus heat from geothermal, solar, co-generation and district heating. Co-generation refers to the combined production of heat and power.

Source: IEA indicators database.

IEA Energy Efficiency Market Report 2013

…across the world…

Energy efficiency: a huge opportunity going unrealised in emerging and developing countries

WORLD ENERGY OUTLOOK 2012

Energy efficiency potential used by sector in non-OECD countries in the New Policies Scenario
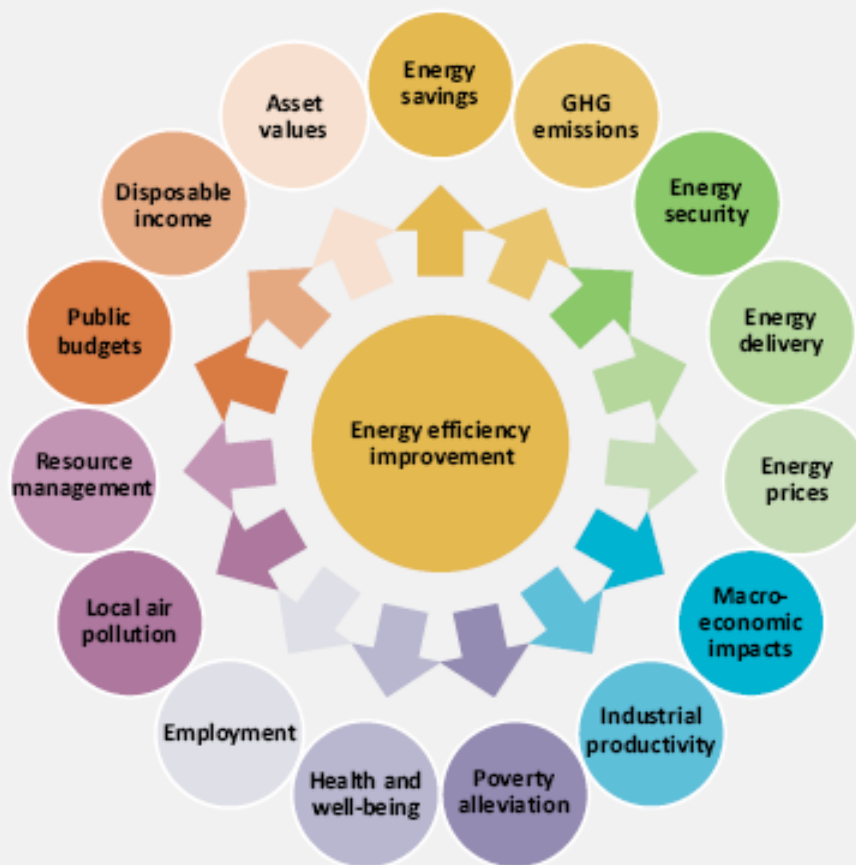

Legend:
- Unrealised energy efficiency potential
- Realised energy efficiency potential
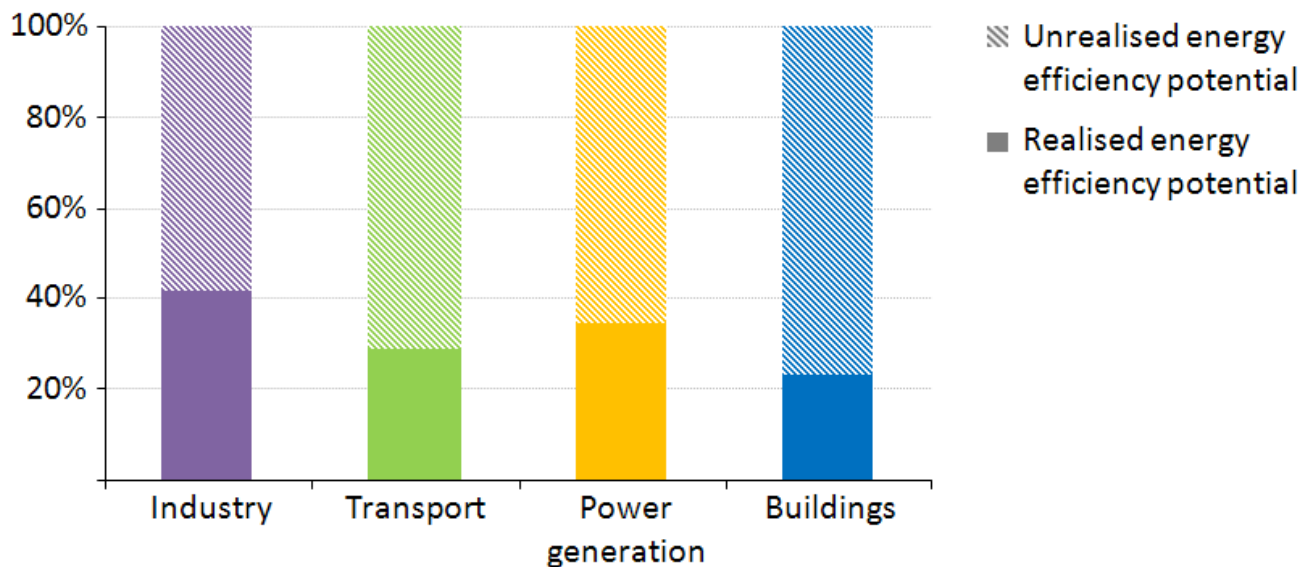
Two-thirds of the economic potential to improve energy efficiency remains untapped in the period to 2035

© OECD/IEA 2012

..and with multiple benefits

The multiple benefits of energy efficiency improvements

Note: This list is not exhaustive, but represents some of the most prominent benefits of energy efficiency identified to date.
Source: Unless otherwise noted, all material in figures and tables in this chapter derives from IEA data and analysis.

Key point A multiple benefits approach to energy efficiency reveals a broad range of potential positive impacts.

Indicators:
key to set targets and monitor impacts

Council of Australian Governments (COAG)

National Strategy
on Energy Efficiency

July 2009

ENERGY

European Commission > Energy > Energy Efficiency > Energy Efficiency Directive

Energy Efficiency

RSS

- Home

Energy Efficiency

- Energy Efficiency Directive
  - National Energy Efficiency Action Plans
  - Reporting targets
  - Guidance notes
  - Article 4 Building Renovation Strategies
  - Notifications according to Article 5
  - Article 7 notifications
  - Article 14.6 - Exemption Notifications
- Energy Efficiency Plan
- Financing Energy

Reporting targets

Under Article 24, paragraph 11, of the Energy Efficiency Directive the "Commission shall make the reports referred to in paragraphs 1 and 2 publicly available".

Reports are published on this page as soon as they are received from Member States.

EU Member State	Article 3 indicative national energy efficiency target for 2020	Absolute level energy consumption 2020 [Mtoe]	
		Primary	Final
Austria	Final energy consumption of 1100 PJ	31.5	2
Belgium	18% reduction in primary energy consumption by 2020 relative to the Primes 2007 baseline (53.3 Mtoe)	43.7	3
Bulgaria	Increase of energy efficiency by 25% until 2020 (5 Mtoe primary energy savings in 2020) and 50% energy intensity reduction by 2020 compared to 2005 levels	15.8	9.
Croatia	Increase in energy efficiency resulting in final energy consumption reduction of 19,77 PJ in 2016 and 22,76 PJ in 2020	-	9.
Cyprus	0.463 Mtoe energy savings in 2020	2.8	2.2

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ted Acts > S.C. 1992, c. 36 - Table of Contents > S.C. 1992, c. 36

Energy Efficiency Act (S.C. 1992, c. 36)

Full Document: HTML | XML [61 KB] | PDF [250 KB]
Act current to 2014-09-01 and last amended on 2009-09-21. Previous Versions

Previous Page   Next Page

Energy Efficiency Act

S.C. 1992, c. 36

Assented to 1992-06-23

An Act respecting the energy efficiency of energy-using products and the use of alternative energy sources

Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

STAATSKOERANT, 26 JUNIE 2009   No. 32342   3

GENERAL NOTICE

NOTICE 908 OF 2009

National Energy Efficiency Strategy
of the
Republic of South Africa

NRP

How to develop efficiency indicators?

Can balances help?

South Africa Balance (2012) — Millions of tonnes of oil equivalent

Production and imports (198.93 Mtoe) — Total final consumption (71.08 Mtoe)
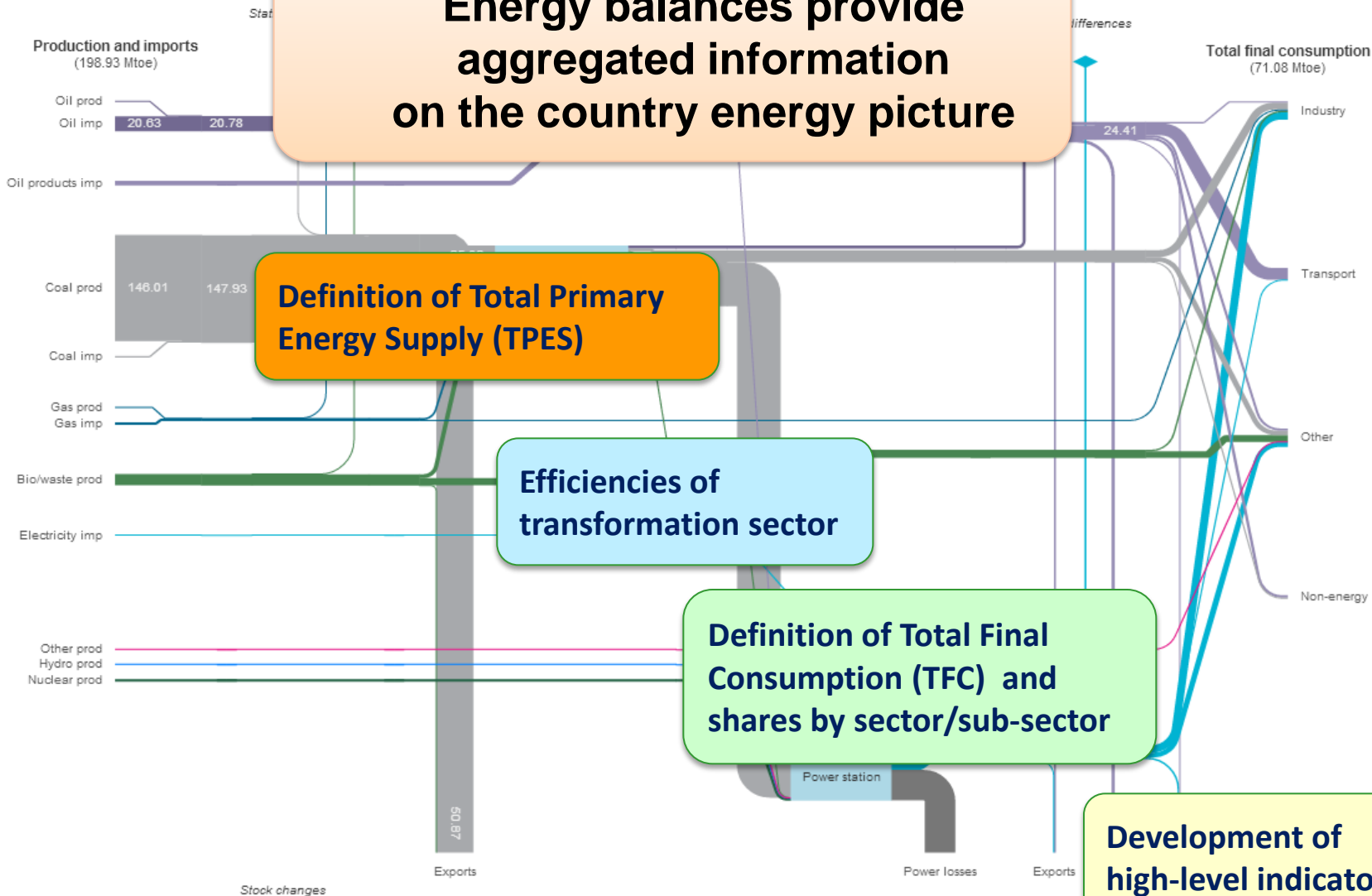
Energy balances provide aggregated information on the country energy picture

Definition of Total Primary Energy Supply (TPES)

Efficiencies of transformation sector

Definition of Total Final Consumption (TFC) and shares by sector/sub-sector

Development of high-level indicators

A variety of high-level indicators...

India: Indicators for 2012

2012 ▾ | **Indicators**

Key Indicators:		Key Indicators:	
Population (millions)	1236.69	**TPES/population** (toe/capita)	0.64
GDP (billion 2005 USD)	1389.05	**TPES/GDP** (toe/thousand 2005 USD)	0.57
GDP PPP (billion 2005 USD)	5567.13	**TPES/GDP PPP** (toe/thousand 2005 USD)	0.14
Energy production (Mtoe)	544.55	**Electricity consumption / population** (MWh/capita)	0.76
Net imports (Mtoe)	243.22	**CO2/TPES** (t CO2/toe)	2.48
TPES (Mtoe)	788.13	**CO2/population** (t CO2/capita)	1.58
Ele... (T...		CO...	1.41
C... (M...			0.35

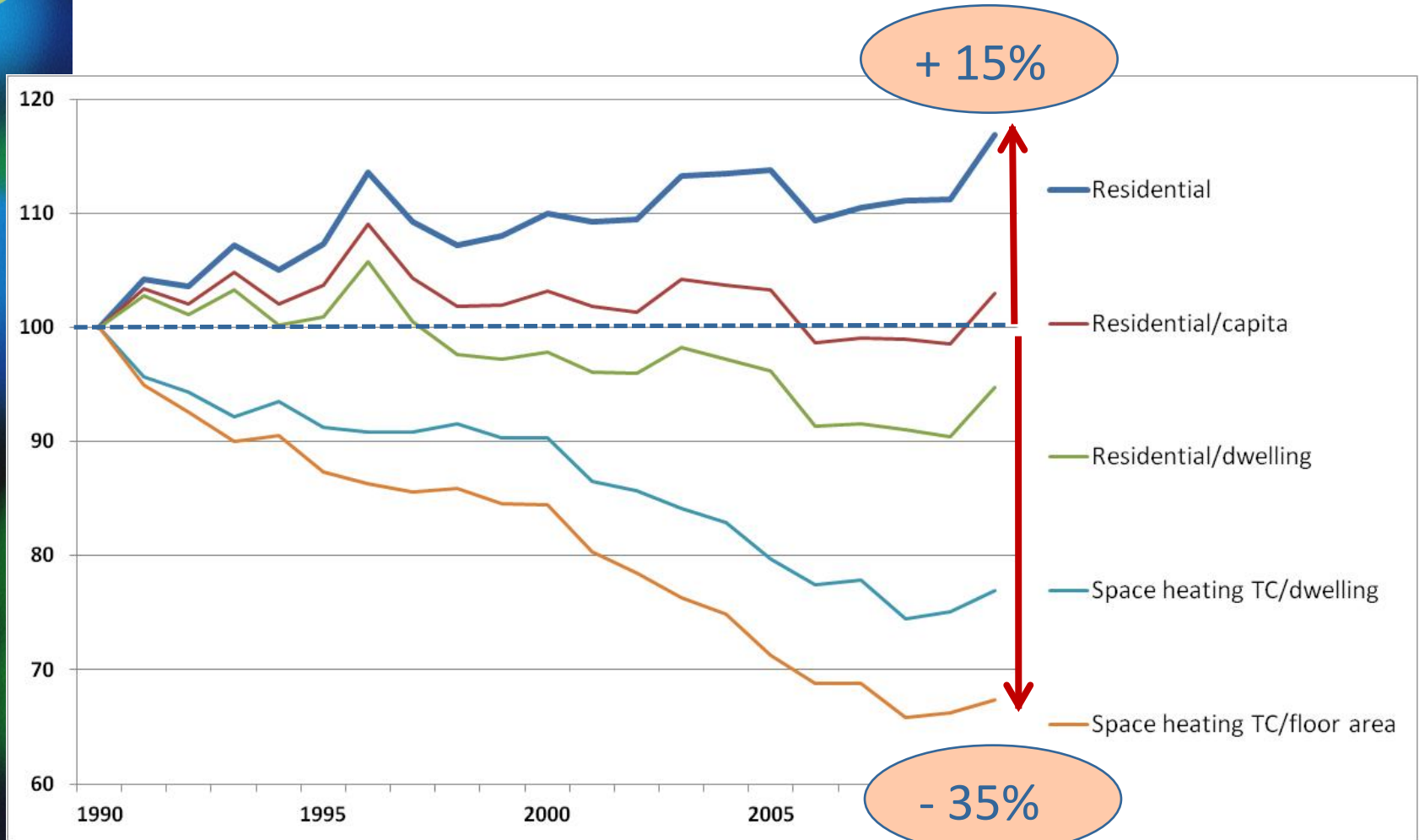**Coupling energy balances data
with various macro-economic variables**

Understanding high-level energy indicators

Legend:
- OECD
- Africa
- Latin America
- Asia
- China region
- non-OECD Eurasia
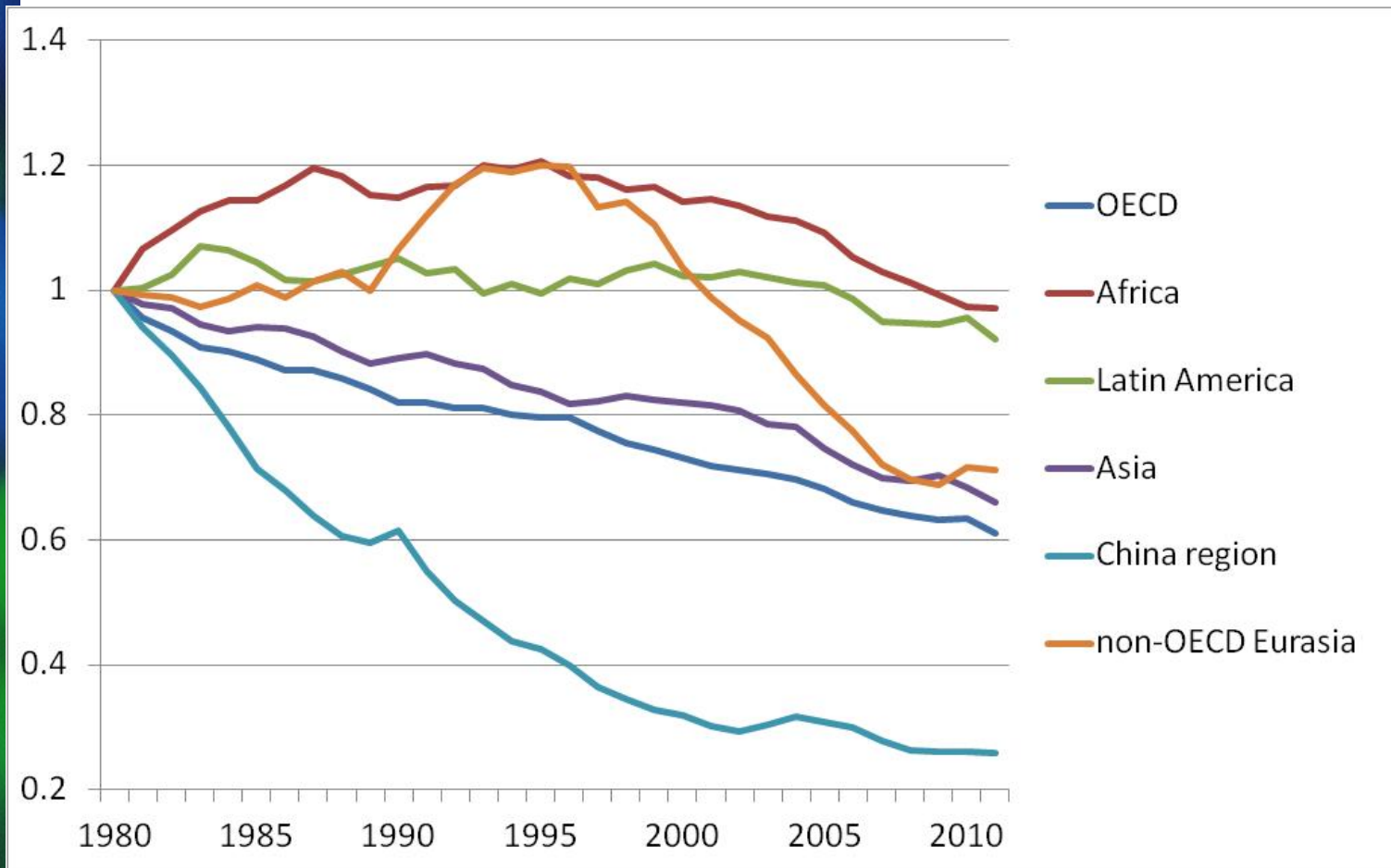
Energy intensity of the economy: TPES/GDP

Beyond balances: appropriate metrics for sound energy efficiency assessments

+ 15%

- 35%

- Residential
- Residential/capita
- Residential/dwelling
- Space heating TC/dwelling
- Space heating TC/floor area

Index: 1990=1. Data for IEA18 (Australia, Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Slovakia, Spain, Sweden, Switzerland, UK, USA). Source: IEA energy efficiency indicators database. TC: Temperature Corrected.

Russian Federation: Balances for 2011
in thousand tonnes of oil equivalent (kt...

….Energy balances do not provide enough information to monitor energy efficiency

	Coal and peat										
Production	180042										
Imports	16334										
Exports	-80572	-240...	...	...	0	0	0	0	-25...	0	......
International marine bunkers**	0	0	-2990	0	0	0	0	0	0	0	-2990
International aviation bunkers**	0	0	-6426	0	0	0	0	0	0	0	-6426
Stock changes	131	511	-522	-2797	0	0	0	-3	0	0	-2680
TPES	1...						449	7088	-1940	0	730970
Transfers							0	0	0	0	0
...ferences							0	0	0	0	-4097
						449	0	29803	0	-32935
						0	-1931	60755	69711	-106303
						0	-2562	0	82677	-9025
						0	0	0	0	0
						0	0	0	0	-8801
...on						0					
...ts											
...tion	0	0	0	-1728	0	0					
...wn	-...25	-134	-11983	-9792	0	0					
	0	-4723	0	-4931	0	0					
Total final consumption	15689	97	116161	137951	0	0					
Industry	11351	65	10119	31214	0	0					
Transport	0	0	59346	31296	0	0					
Other	4038	32	13050	42708	0	0					
Residential	1553	0	5768	39692	0	0					
Commercial and public services	2416	0	2507	2485	0	0					
Agriculture / forestry	64	14	3978	526	0	0					
Fishing	6	0	796	5	0	0					

Residential:
No breakdown by end use
  - space heating
  - space cooling
  - water heating
  - lighting
  - cooking
  - appliances

Transport:
No breakdown by segment
  - passenger / freight
 nor by vehicle type
  - Light duty vehicles / trucks, ….

Services:
No breakdown by end use

  - space heating
  - space cooling
  - water heating
  - lighting
  - other equipment

nor by category (hotels, restaurants, …)

The need to collect more disaggregated data

energy balances

TPES/GDP

TFC/Population

....

Aggregated Indicators
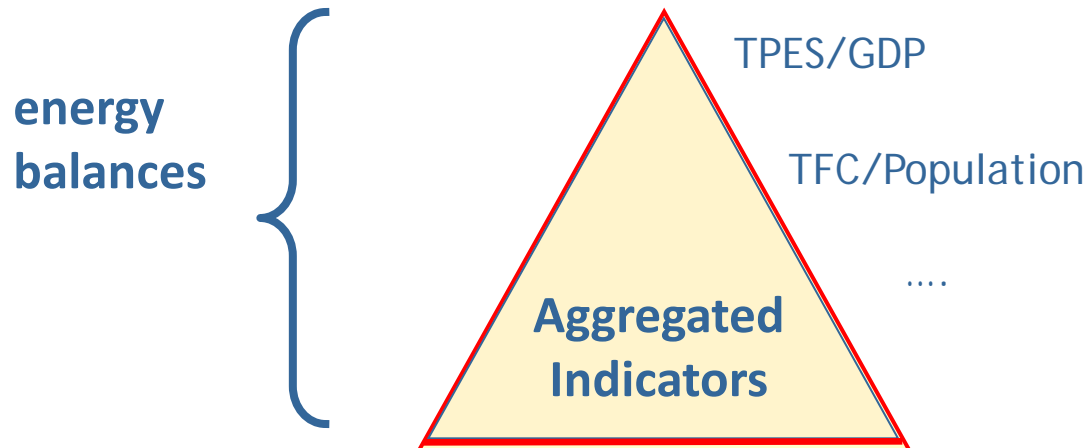
# Introducing the IEA work to monitor energy efficiency

The IEA effort towards energy efficiency monitoring: data collection

Draft Energy Efficiency Indicators Template
country name

COUNTRY DATA SECTION (to be reviewed and updated)

MACRO ECONOMIC DATA	Macro economic and activity data
COMMODITIES	Production outputs from selected energy-consuming industries
INDUSTRY	Energy consumption by ISIC categories
SERVICES	Energy consumption by end-uses in the services sector
RESIDENTIAL	Household energy consumption by end-uses and selected appliances data
TRANSPORT	Energy and activity data for passenger and freight transport

IEA DATA and AGGREGATE INDICATORS

ELECTRICITY GENERATION	Electricity generation from combustible fuels and efficiencies
BASIC INDICATORS	Predetermined set of aggregate energy and activity indicators

SUPPORT TOOLS

USER REMARKS	To incorporate comments associated to the data from the individual sheets
DATA COVERAGE	Generates a graphical summary of data coverage (completed vs. expected)
SINGLE INDICATOR GRAPHS	To generate a graph for one energy indicator
MULTIPLE INDICATORS GRAPHS	To generate a graph comparing trends from multiple indicators
CONSISTENCY CHECKS	To run the integrated consistency checks

Available online

As an answer to a request from IEA Ministers in 2009, the IEA designed a template to collect data for energy efficiency indicators.
Now starting its fifth year of collection!

The IEA effort towards energy efficiency monitoring: methodological framework

Energy Efficiency Indicators: Fundamentals on Statistics
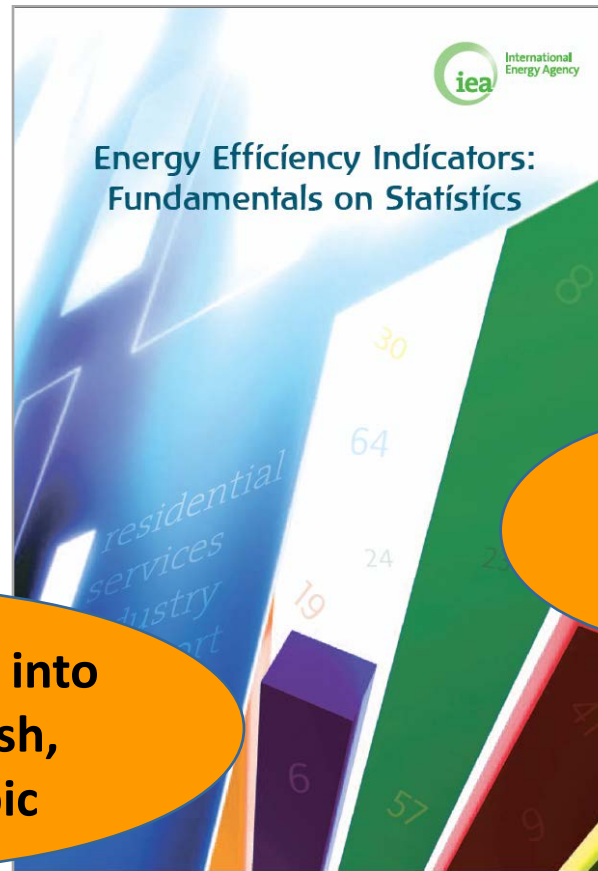
Available online

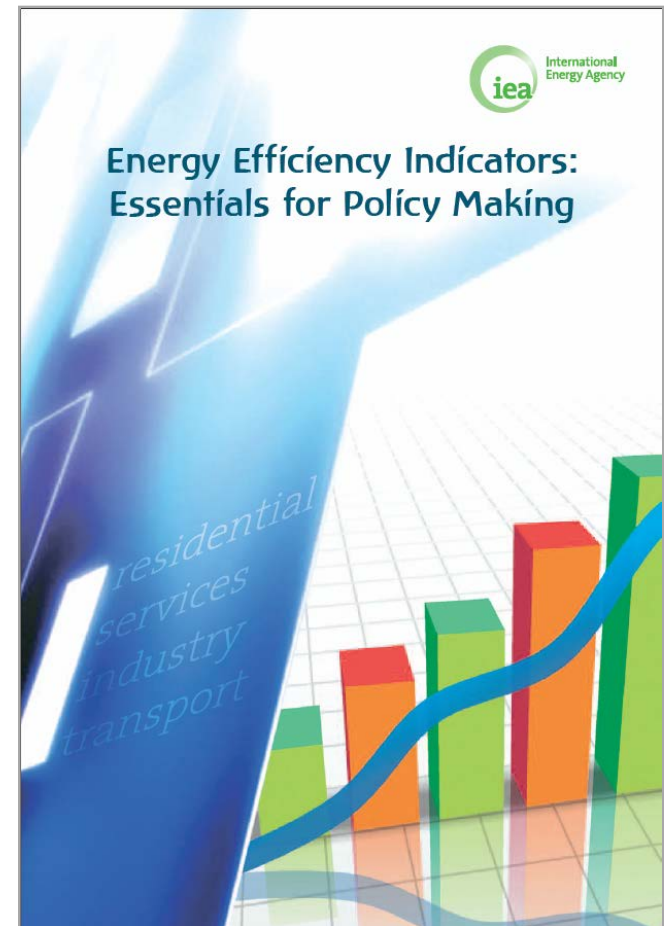**Being translated into Russian, Spanish, Chinese, Arabic**

In response to requests from countries, and in parallel with a manual on indicators analysis

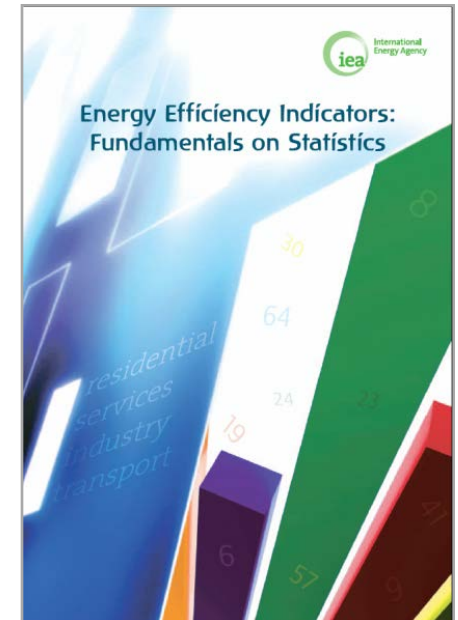# Sound data for sound analysis: download the two manuals from our website!

http://bit.ly/eei-statistics

http://bit.ly/eei-policy
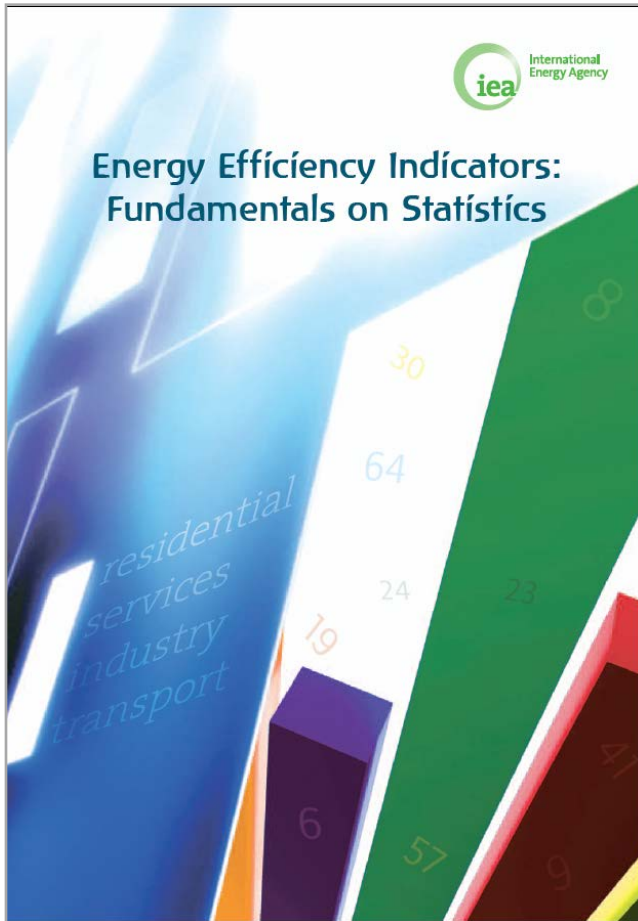
The manual on statistics for energy efficiency indicators

Providing a harmonized framework for data collection across sectors and end-uses

Table of Contents

Shares of sectors in total final consumption for the world (1973 and 2011)

- 4%
- 9%
- 8%
- 29%
- 23%
- 27%

Legend:
- Industry
- Transport
- Residential
- Services
- Other*
- Non-energy use
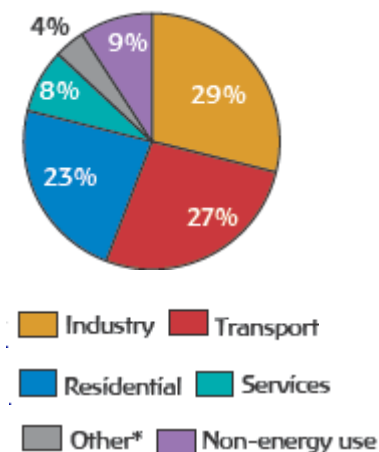
Understanding where energy is used

Total final consumption

Residential	Services	Industry	Transport		Other
			Passenger	Freight	
Space heating	Space heating	Iron and steel	Road: Passenger light-duty vehicles	Road: Freight light-duty vehicles	Mining and quarrying
Space cooling	Space cooling	Chemical and petrochemical	Powered 2- and 3-wheelers	Heavy duty vehicles	Construction
Water heating	Water heating	Non-ferrous metals	Buses	Rail: Freight trains	Water supply/waste management
Lighting	Lighting	Non-metallic minerals	Rail: Passenger trains	Air: Freight airplanes	Agriculture/forestry
Cooking	Other equipment	Transport equipment	Air: Passenger airplanes	Water: Freight ships	Fishing
Appliances	Other energy use	Food and tobacco	Water: Passenger ships		Pipeline transport
Other energy use		Wood and wood products			Non-specific other sectors
		Paper, pulp & print			Non-energy use
		Textile and leather			
		Not elsewhere specified			

Different end-uses drive sectoral consumption

Figure 4.4 • Breakdown of residential consumption by end use in 2010 for 20 selected OECD countries

Appliances (OECD 14)

OECD (20)

Televisions 20%
Clothes washers 5%
Dishwashers 6%
Refrigerators & freezers 28%
Other appliances 41%

4% 4%
5%
17%
15%
55%

Space heating
Water heating
Cooking
Appliances
Lighting
Space cooling
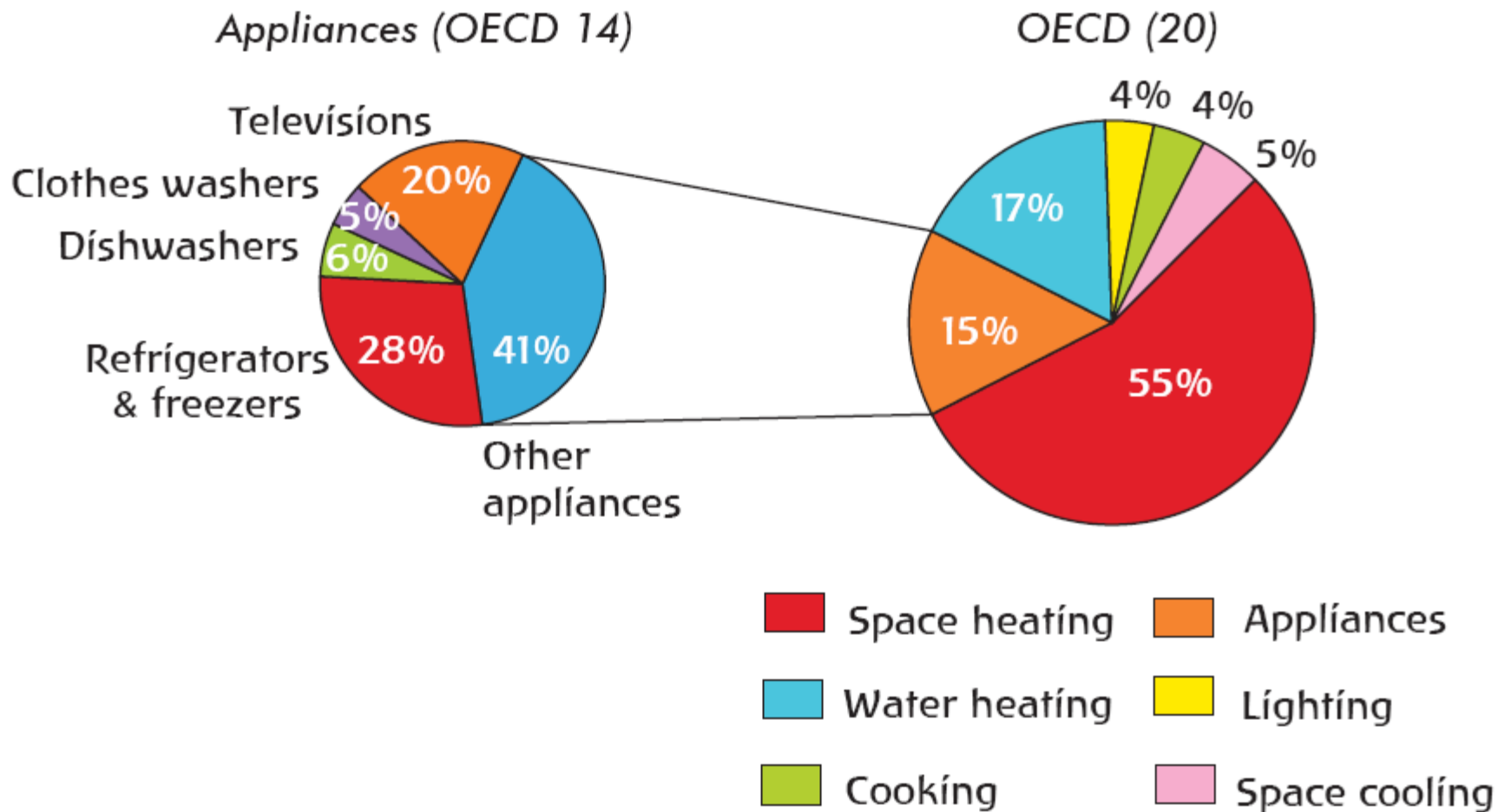
Note: The breakdown into individual appliances is available only for 14 countries.

What is an energy efficiency indicator?

generic energy efficiency indicator $=$ $\dfrac{\text{energy consumption}}{\text{activity}}$
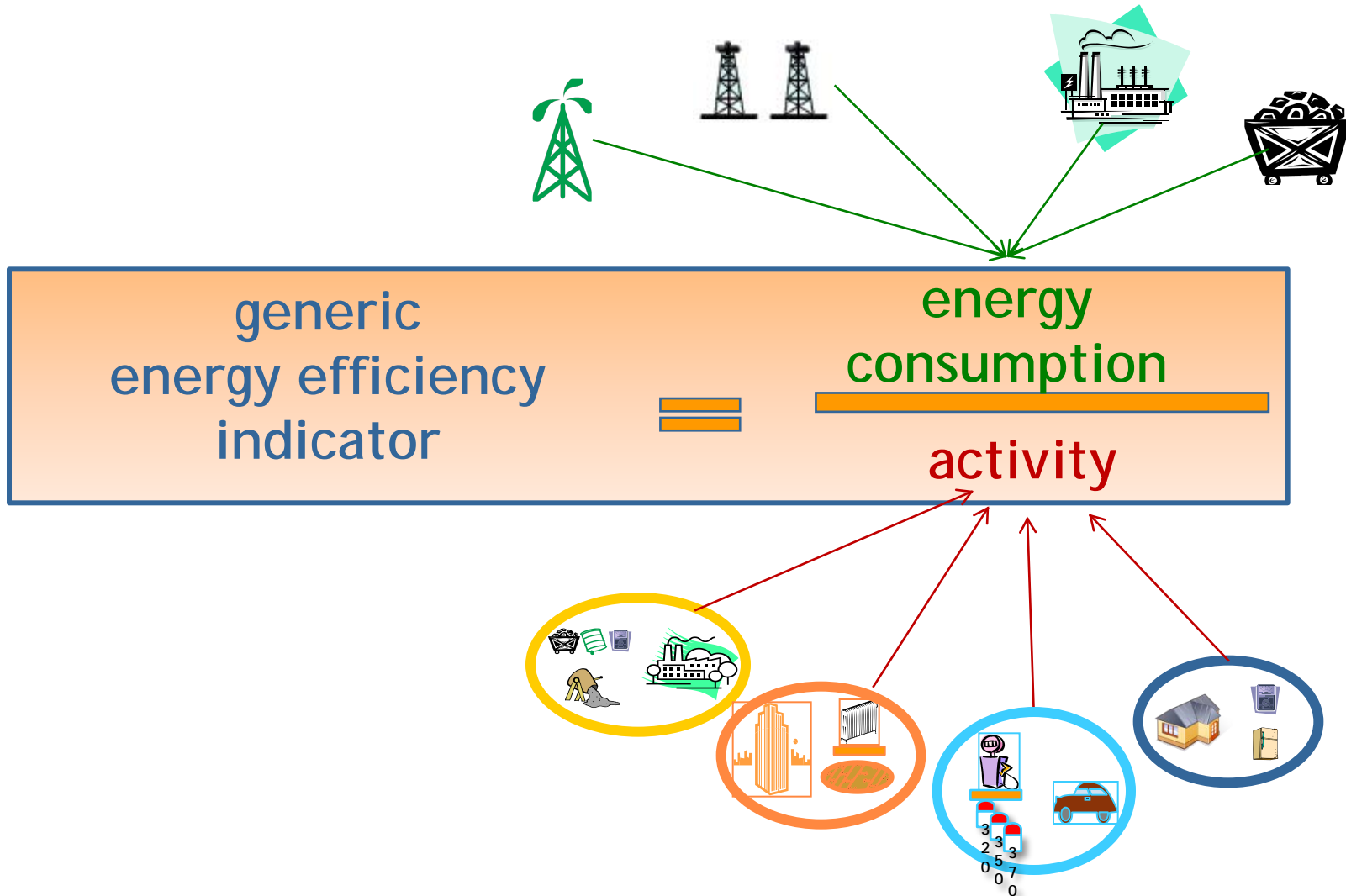
Presenting a set of indicators for each end use

For each end use:

Indicators pyramid

1 – general

2 – detailed

3 – very detailed
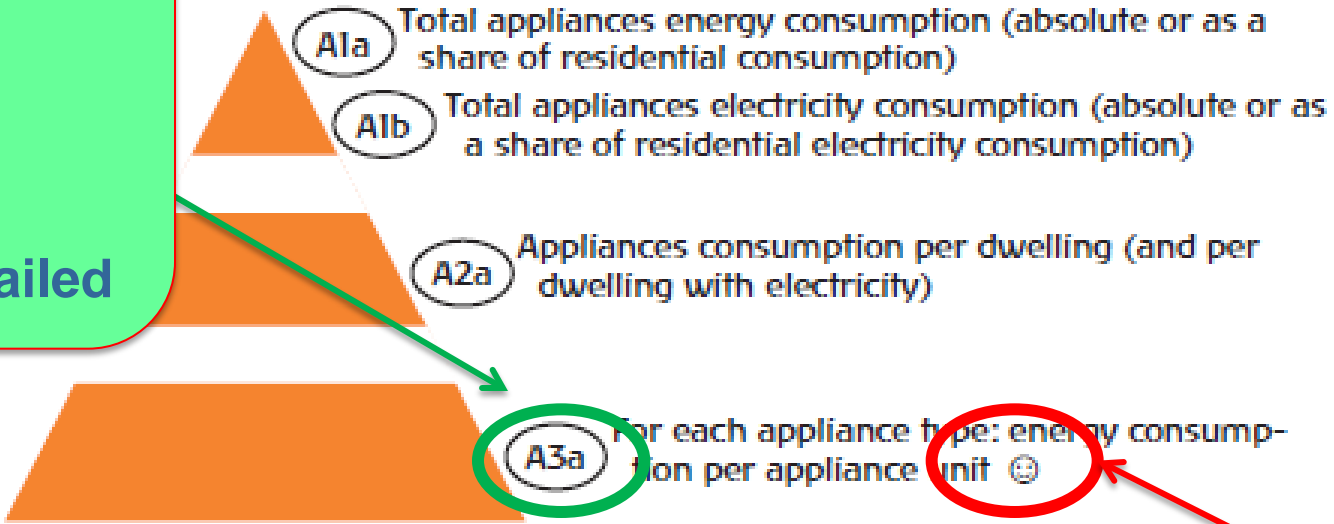
A smiley face indicates the recommended indicator

Describing common sources for data

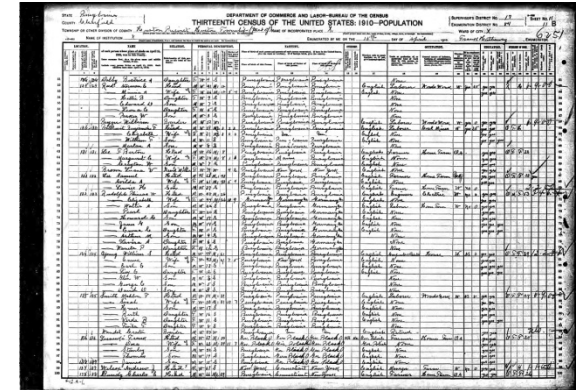**Table 7.3** ● Summary of the main data needed for transport indicators and examples of possible sources and methodologies

Data	Source	Methodology
Energy data		
Total transport consumption	National energy balance National energy statistics	Administrative sources Modelling
Consumption by sub-sector	National energy balance National energy statistics	Administrative sources Mobility surveys Modelling
Consumption by segment		Mobility surveys Modelling
Consumption by vehicle type		Mobility surveys Modelling
Activity data		
GDP, population	National statistics offices	Administrative sources
Vehicle-km (vkm)	Vehicle registers/ Roadworthiness testing services/ Inspecting organisations Municipalities/Transport authorities National and international databases Transport ministries	Measurements: odometer readings Measurements: road traffic count Administrative sources Mobility surveys Modelling
Passenger-km (pkm)	National and international databases Transport ministries	Administrative sources Mobility surveys
Tonne-km (tkm)	National and international databases Transport ministries	Administrative sources Mobility surveys, freight surveys

How do countries collect data?

Four main types of methods

Methods used to collect data for indicators

- Administrative sources

- Surveys

- Metering and measuring

- Modelling

Methods: sharing expertise from countries

Background		R/Su/01
Country	Austria	
Organisation	Statistics Austria	
Name of the survey	Household energy consumption survey	
Survey purpose	• To determine total household energy consumption • To determine household appliances energy consumption • To collect household energy expenditure • To collect dwelling physical characteristics • To collect household occupant characteristics	

Background
Institution
Purpose …

Data collection				
Sample design	Stratified random sampling approach			
Sample sources	List of addresses, list of telephone numbers, labour force survey.			
Collection methods	• Computer assisted personal interview (CAPI) • Computer assisted telephone interview (CATI)			
Sample/Population size	14 000 / 3 429 720	Response rate	55%	
Frequency	Every two years	Last time surveyed	2010	
Time to complete survey	10 minutes	Mandatory	No	
Incentive	None			
Survey respondents	Households			
Elements collected	Dwelling type, dwelling floor area, building age, household occupancy, energy-related renovations, household energy consumption and related expenditures.			
End-uses collected	Space cooling, space heating, domestic hot water, other- cooking			

Technical information:
Sample
Frequency
Data collected…

Notes and comments	
Main challenges	• Inconsistent responses • Response quality
Possible improvements	
Key best practice	A new approach to data control compared with previous surveys was taken for the first time in 2004 and continued in the follow-up survey runs. Up to and including the 2000 survey, only the individual energy sources themselves were checked for plausibility, any missing data were calculated (quantity-value pairs) and substitutions were made if necessary. Such routines of course continue to be used, with the additional step that the total of the reported energy consumption is then related to a calculated (fictitious) overall consumption. This fictitious overall consumption by the household is calculated from the data for that household, on the one hand (floor space, number of people in household) and pre-set parameters for the individual types of use (space heating, water heating, cooking, other purposes), on the other hand. Calculating the total reported energy consumption per household in this way involves some quite complicated plausibility routines, because one or more alternative quantities have to be calculated if the quantity-value pairs do not match and these alternative quantities then, when variably applied, lead to a number of different calculated overall energy consumption figures. The fictitious standard value is then used to select the quantity-value pairs that appear most probable.
Other documentation	Available: Surveying Methodology and Questionnaire

Comments:
Challenges
Tips
Documents
Links…
(e.version)

Annex D:

160 country practices presented one by one

grouped

by sector

by methodology

An online database of practices

International Energy Agency

Working together to ensure reliable, affordable and clean energy

International Energy Agency > EE Indicators Manual

Energy Efficiency Indicators Statistics: Country Practices Database

A supplement to the publication Energy Efficiency Indicators: Fundamentals on Statistics, this database presents practices on collection of data for developing efficiency in from a variety of OECD and non-OECD countries.

Practices are searchable by country, sector, methodology and type of available documentation. By sharing these experiences, we hope to help countries and organisations to their own energy efficiency indicators programmes.

| Countries	Sector	Methodology	Available content	Search by keywords
☐ Israel	☐ Industry	☐ Administrative sources	☐ methodology	
☐ Italy	☐ Residential	☐ Measuring	☐ project web site	
☐ Japan	☐ Services	☐ Modelling	☐ questionnaire	
☐ Kazakhstan	☐ Transport	☐ Surveying	☐ report	
☐ Korea, Republic of			☐ results	
☐ Mexico				

**A platform to share expertise worldwide:
practices are available in a searchable database.
Share your practice!**

An online database of EE policies
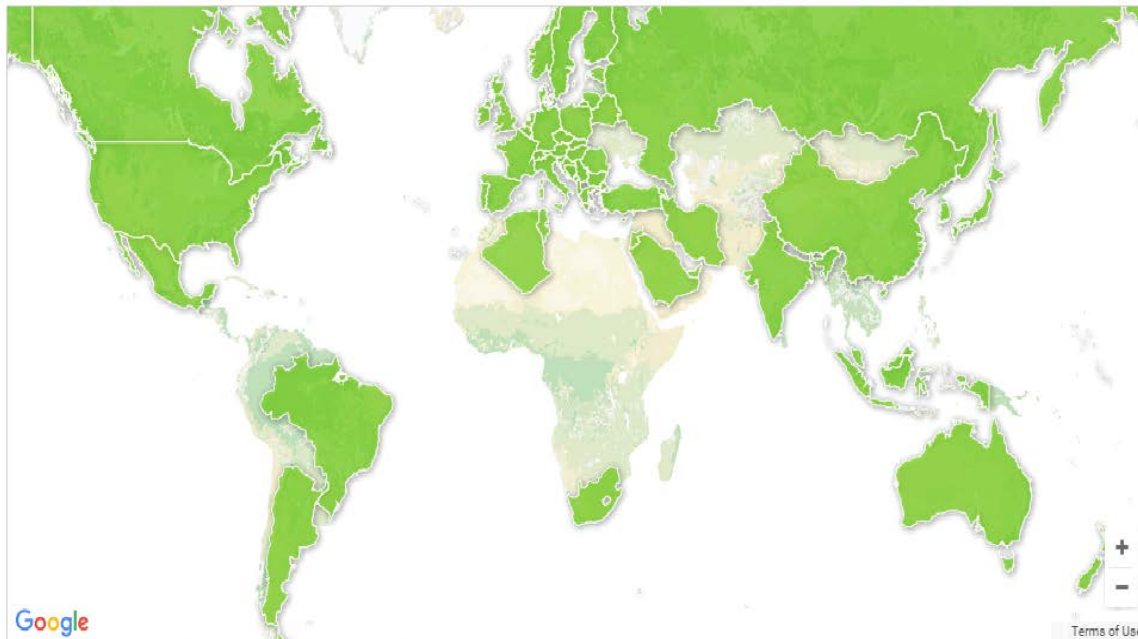
A platform to share expertise worldwide:
practices are available in a searchable database.
Share your practice!

IEA online sources and publications

- http://www.iea.org/topics/energyefficiency/
- http://www.iea.org/topics/energyefficiency/subtopics/industry/
- http://www.iea.org/publications/freepublications/publication/energy-efficiency-market-report-2015-.html
- http://www.iea.org/publications/policypathwaysseries/
- http://www.iea.org/eeindicatorsmanual/

Keys recommendations for EE in Industry

- **Energy management in Industry**
  - **ISO50001**
  - **Identification**
  - **Implementation**
  - **Publication**
- **High-efficient industrial equipment and systems**
- **EE in SME sector**
- **Additional support**
  - **Foster energy performance contracting market**
  - **Risk sharing and loan guarantees**
  - **Technical and knowledge support**

Thank you

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