

Energy Efficiency Policies in ASEAN Region

Jakarta, 18-20 October 2011

Energy Efficiency Indicators - Overview

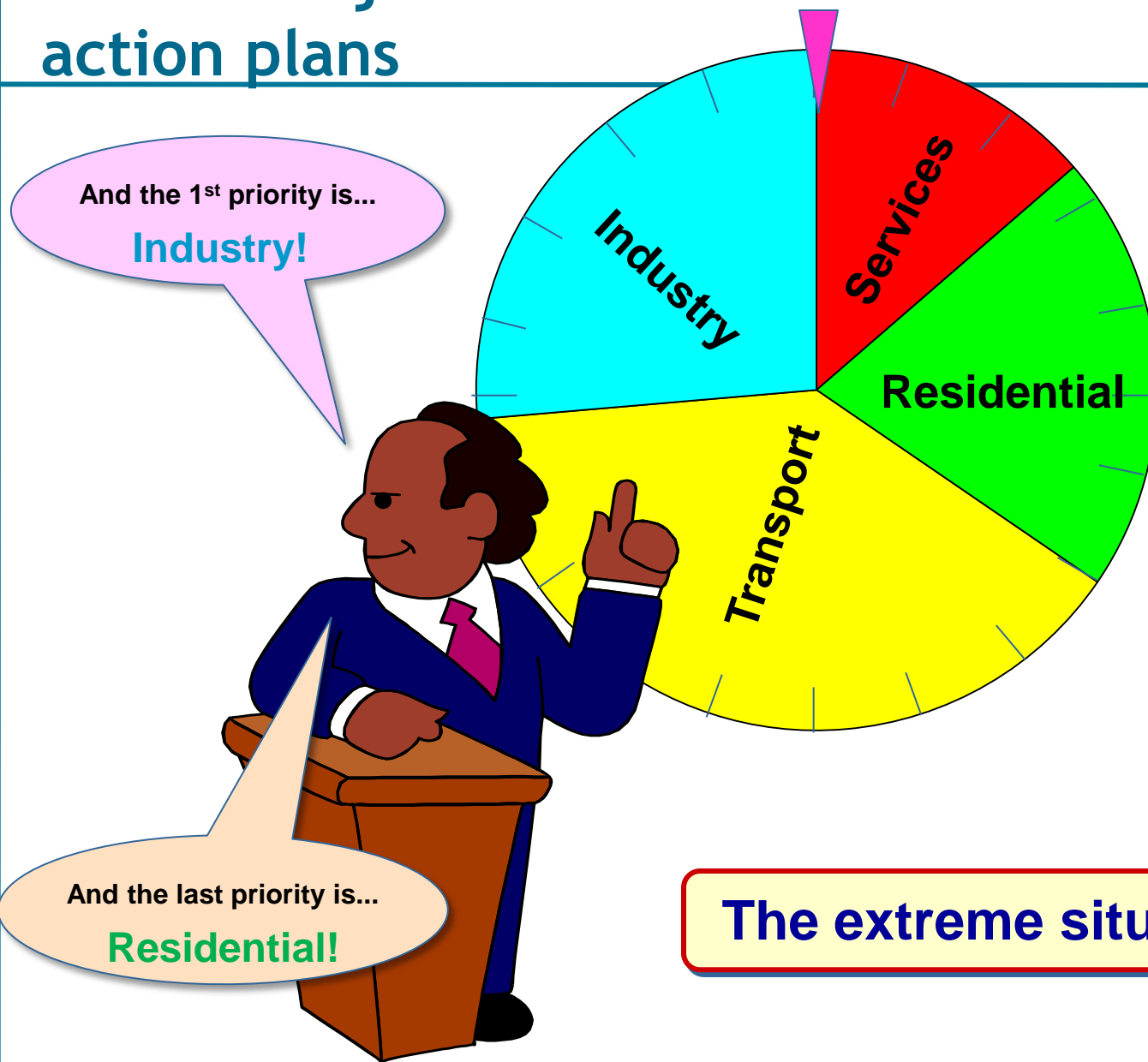
*Key Insights from
IEA Indicator Analysis*

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Why collecting energy statistics

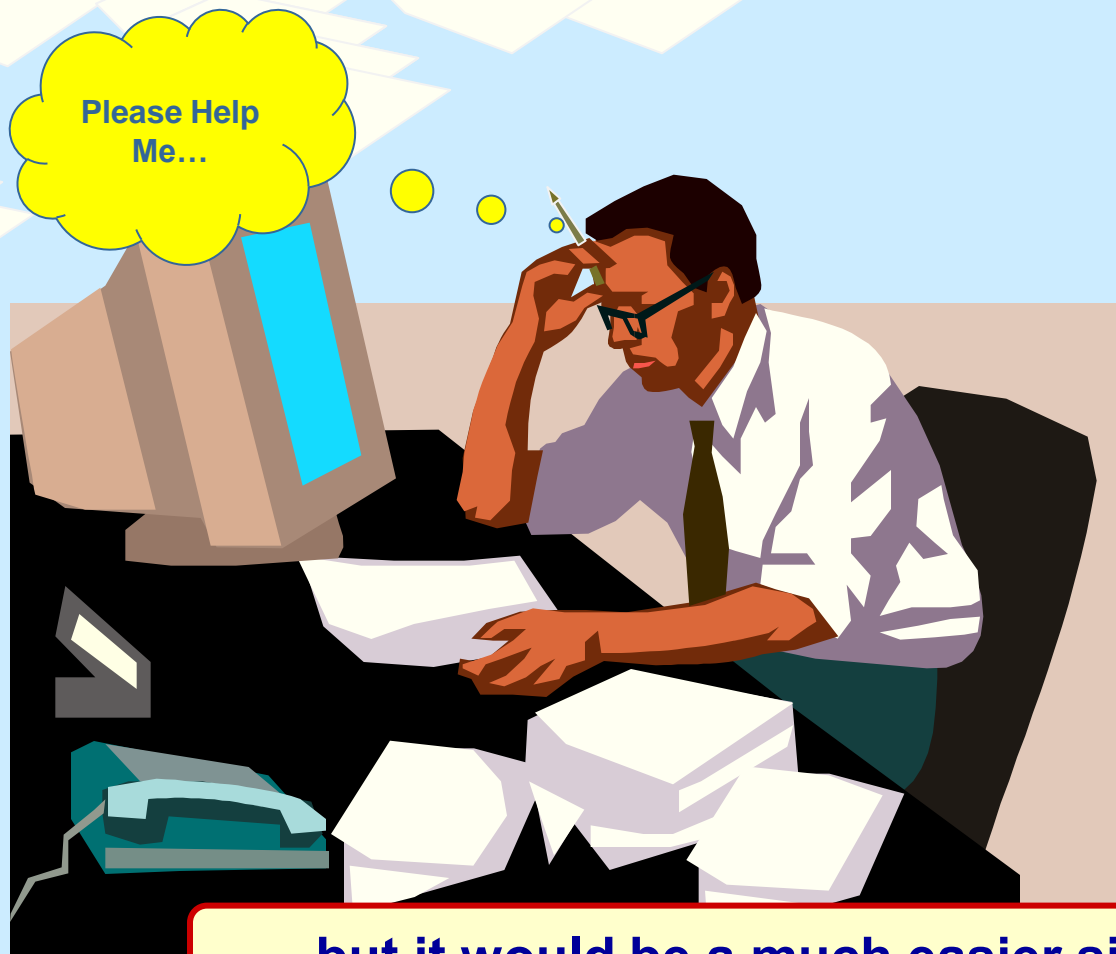
- Any sound energy policy relies on detailed, reliable and up-to-date statistics. So, the importance of energy statistics.
- However, collecting any statistics has a cost
- But not having proper information could lead to higher costs
- So, limit the collecting to what is necessary
- What is necessary depends on your needs

Lack of proper data and indicators could lead to major uncertainties for formulating action plans



The extreme situation

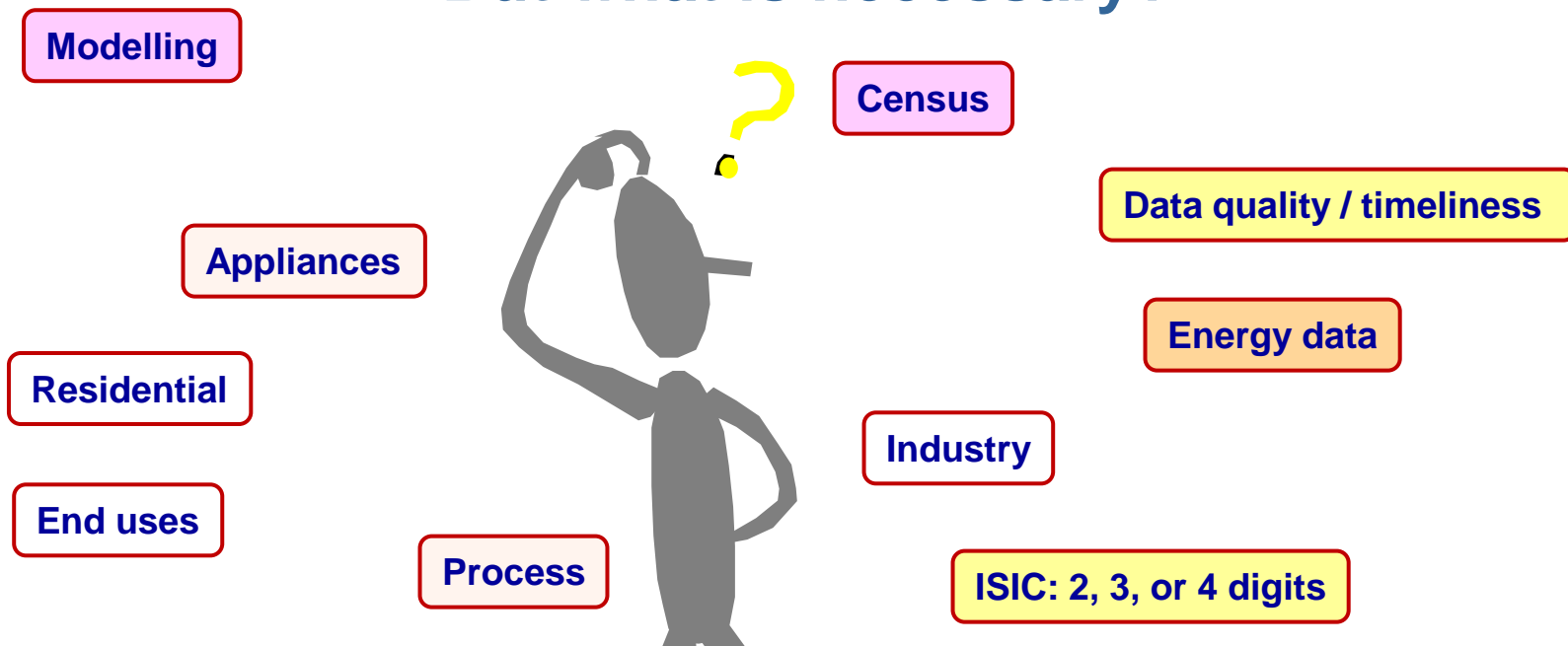
The other extreme would be to have too much data...



... but it would be a much easier situation!

What should be collected: Collecting any statistics has a cost. As a consequence, one should limit the collecting to what is necessary...

But what is necessary?



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, ...

The energy balance - an important starting point...

Supply

Transformation

Final
consumption

WORLD ENERGY BALANCE

2008

SUPPLY AND CONSUMPTION	Million tonnes of oil equivalent										Total
	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	-	0.89	12368.95
Imports	591.76	2332.71	995.62	782.77	-	-	-	8.49	52.84	-	4764.20
Exports	-631.03	-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	-	-	-	-0.02	0.72	0.06	-45.25
Electricity plants	-189.100	-24.29	-213.08	-630.36	-705.06	-275.88	-72.86	-50.19	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/pet.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	3482.06	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	-	-	-	5.65	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	16.38	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	79.75	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	-	4.68	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/transport/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	28576	7506097	6428582	21327	352787	620379	6867	51454	1326086	1326086
CHP plants	1964671	230	335530	3378730	21327	-	10114	365026	191	18134	6093063
Heat plants	3038145	26346	414567	3049852	-	-	342673	255353	6676	33320	7166932

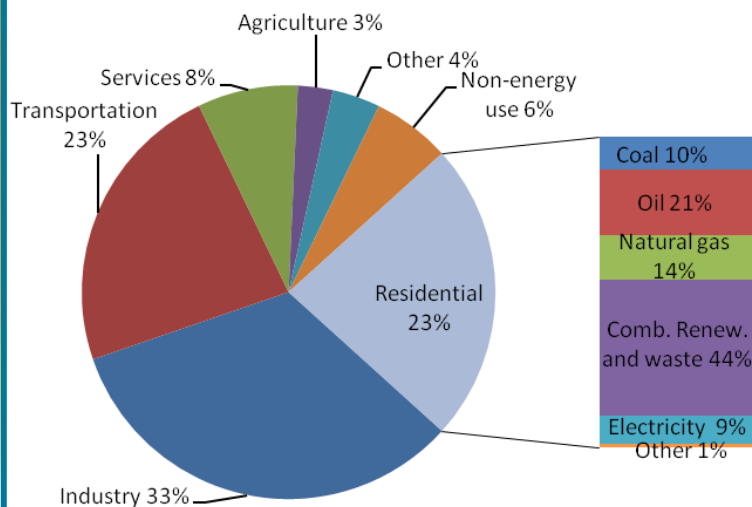
Energy
dependency

Efficiency

Who consumes
whatKey Insights from
IEA Indicator Analysis

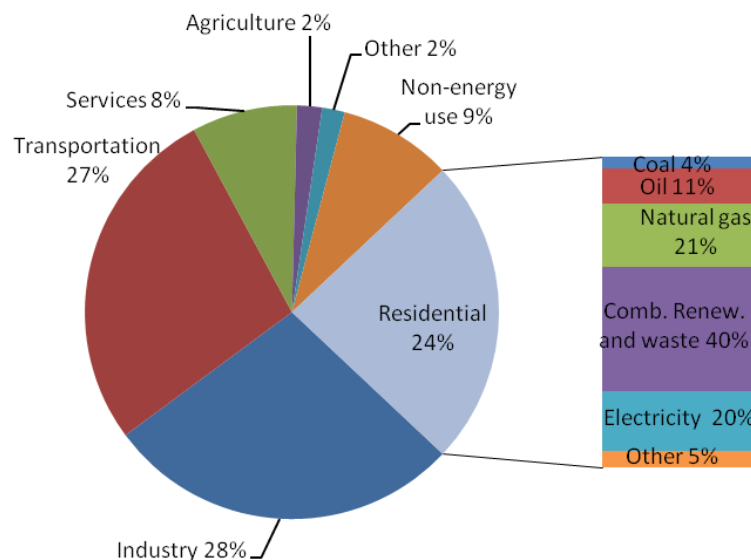
...which provides useful insights

1973



World: 4676 Mtoe

2008



World: 8428 Mtoe

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

But the balance has limitations

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

Energy Balance

Thousand tonnes of oil equivalent / Milliers de tonnes d'équivalent pétrole

SUPPLY AND CONSUMPTION

PROVISIONNEMENT ET DEMANDE

Coal	Crude Petroleum	Gas	Nuclear	Hydro	Geotherm.	Combust.	Electricity	Heat	Total
Charbon	Pétrole brut	Produits pétroliers	Gaz	Nucléaire	Hydro	Géotherm. solaire	Comb. ren. & déchets	Chaleur	Total
181427	41493	42621	13835	34143	-	223561	-	-	1640944
126817	-8067	-16722	-2484	-	-	-	431	-	183634
-7642	-	-	-	-	-	-	-963	-	-83514
788	288	-	-	-	-	-	-	-	-7642
300965	17417	40137	13835	34143	-	223561	-532	-	1717153
-74	88	-	-	-	-	-	-	-	13
-1328	917	-1137	-	-	-	-	-	-	5570
-213	-15059	-2637	-13835	-34143	-	-861	214780	-	-379565
-3	-2672	-1938	-	-	-	-503	-	54660	-21545
-290405	-144	4841	-	-	-	-	-	-	-1943
-50	-	-	-	-	-	-	-	-	-6966
39	25	-	-	-	-	-	-	-	-69485
83	112532	-	-	-	-	-	-	-	-114690
53	475761	-	-	-	-	-	-	-	-16009
67	132263	-	-	-	-	-	-	-	83
99	73550	-	-	-	-	-	-	-	53
11	24947	-	-	-	-	-	-	-	67
49	109054	-	-	-	-	-	-	-	99
25	7956	-	-	-	-	-	-	-	11
9117	29091	-	-	-	-	-	-	-	49
3628	9644	-	-	-	-	-	-	-	25
11818	19714	-	-	-	-	-	-	-	9117
8551	15768	-	-	-	-	-	-	-	3628
1870	3392	-	-	-	-	-	-	-	11818
-	268	14	-	-	-	-	1114	2373	1870
Transport Equipment	3226	-	-	-	-	-	-	-	3226
Machinery	9117	-	-	-	-	-	-	-	9117
Mining and Quarrying	3628	-	-	-	-	-	-	-	3628
Food and Tobacco	11818	-	-	-	-	-	-	-	11818
Paper Pulp and Printing	8551	-	-	-	-	-	-	-	8551
Wood and Wood Products	1870	-	-	-	-	-	-	-	1870

No breakdown by end use:

- heating
- DHW
- lighting
- cooking
- air conditioning
- appliances

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

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OTHER SECTORS

Residential

Comm. & Pub. Services

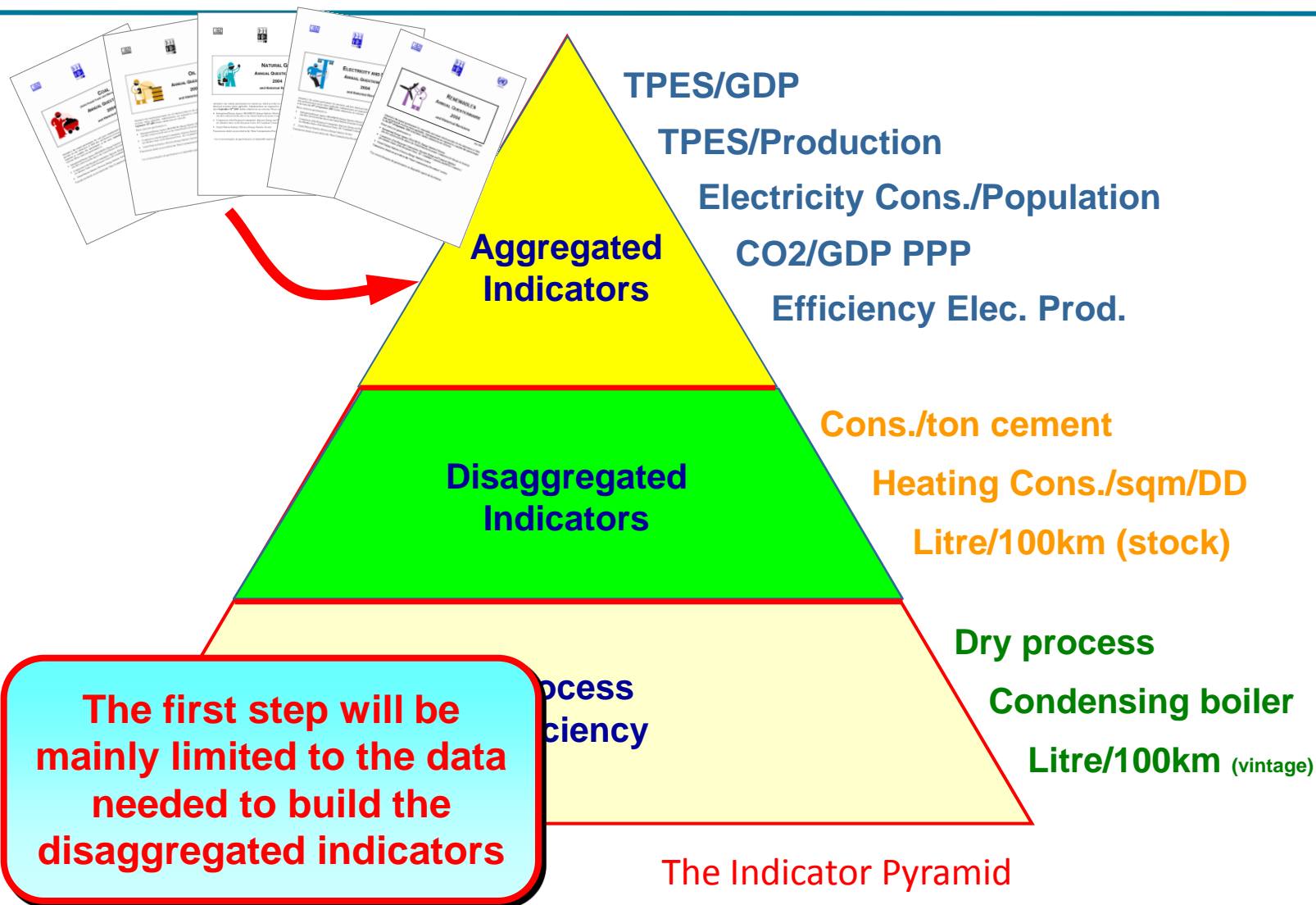
Agriculture/Forestry

Fishing

Non-specified

67380	238	61076	12071	-	-	-
222197	53401	14230	188090	-	-	-
46162	-	17598	8895	-	-	222197
24293	12356	156840	-	-	-	-
5190	-	22302	3177	-	-	-
10040	867	11931	-	-	-	-
12155	-	21175	-	-	-	-
7536	18	14286	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
3872	238	-	-	-	-	-
11532	988	5033	-	-	-	-

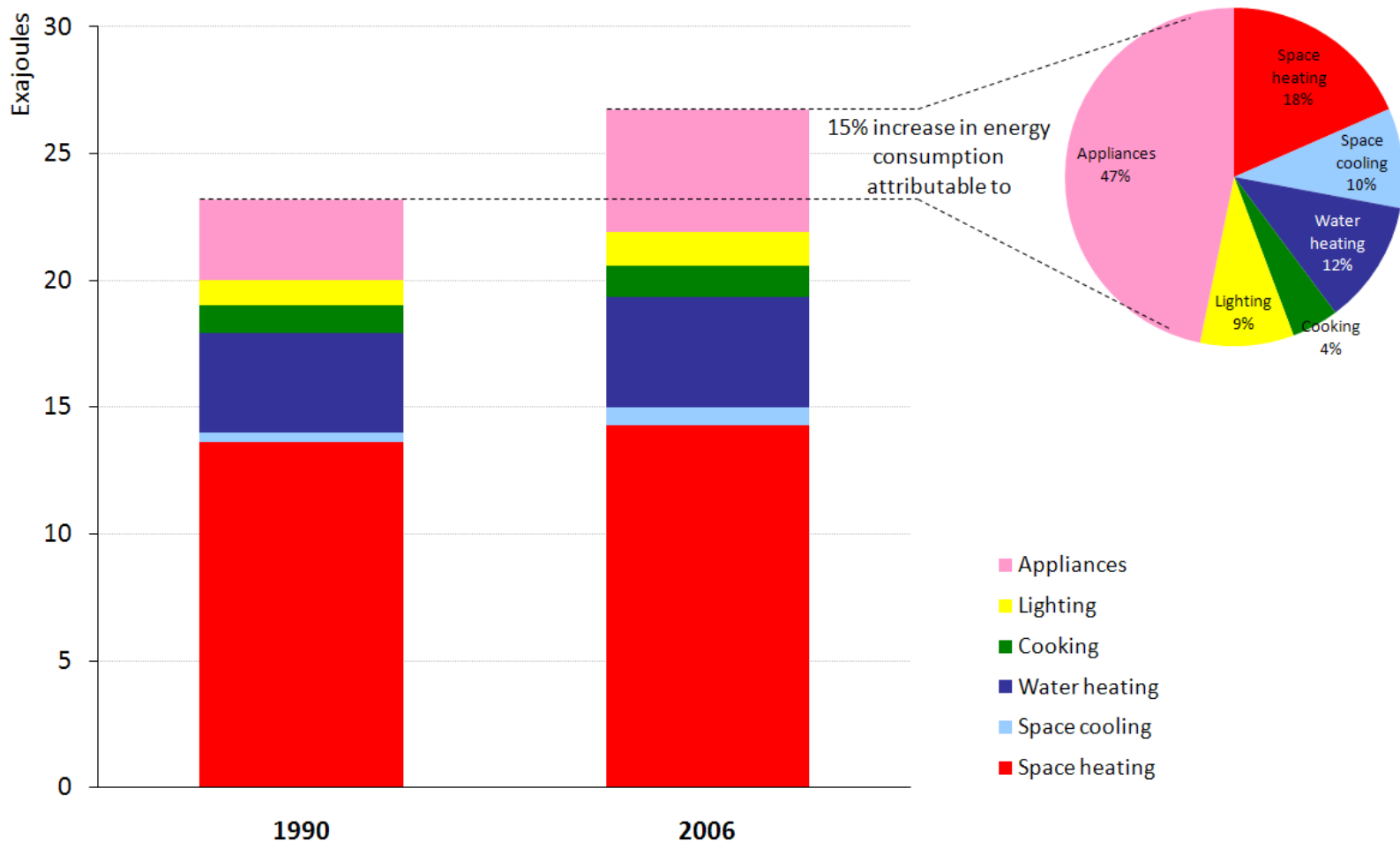
What data are needed?



Key Insights from
IEA Indicator Analysis

What can we learn from more detailed data and indicators?

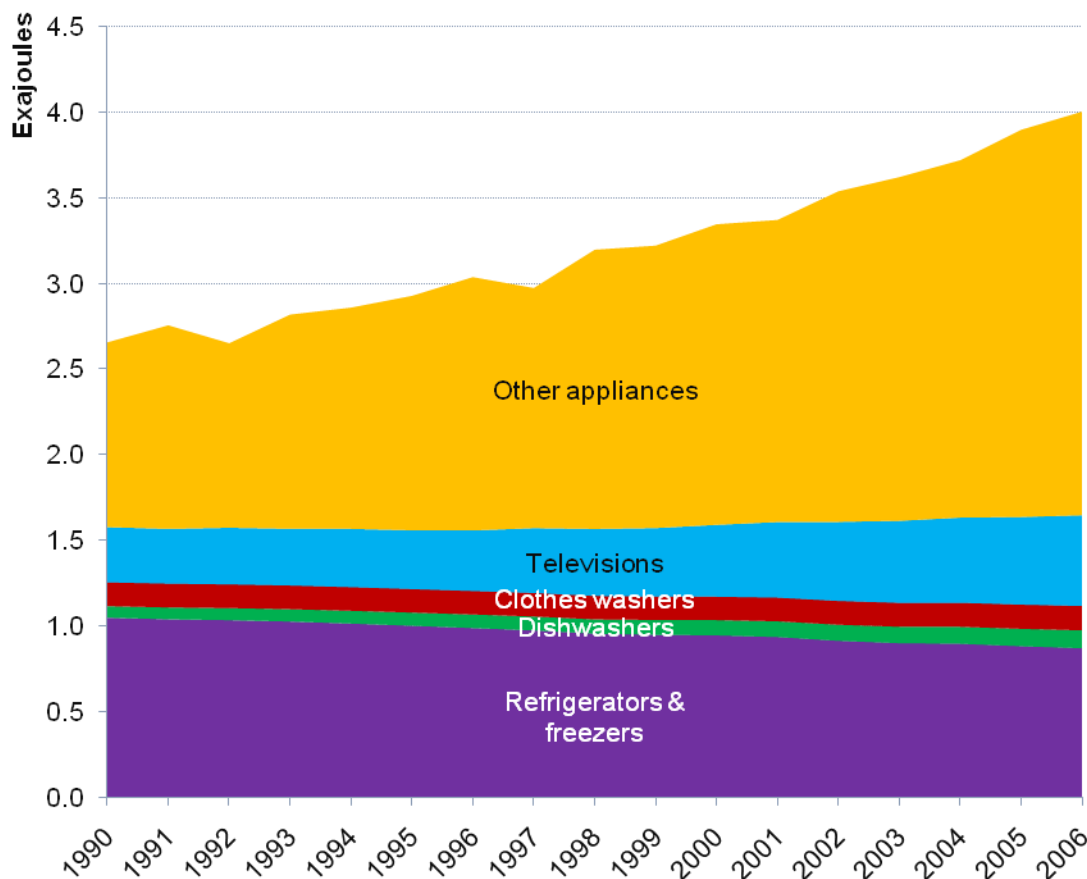
How energy is used within a sector...



47% of the growth in residential energy consumption in 19 IEA member countries is attributable to appliances and electronics

What can we learn from more detailed data and indicators?

...and the link between energy and policy

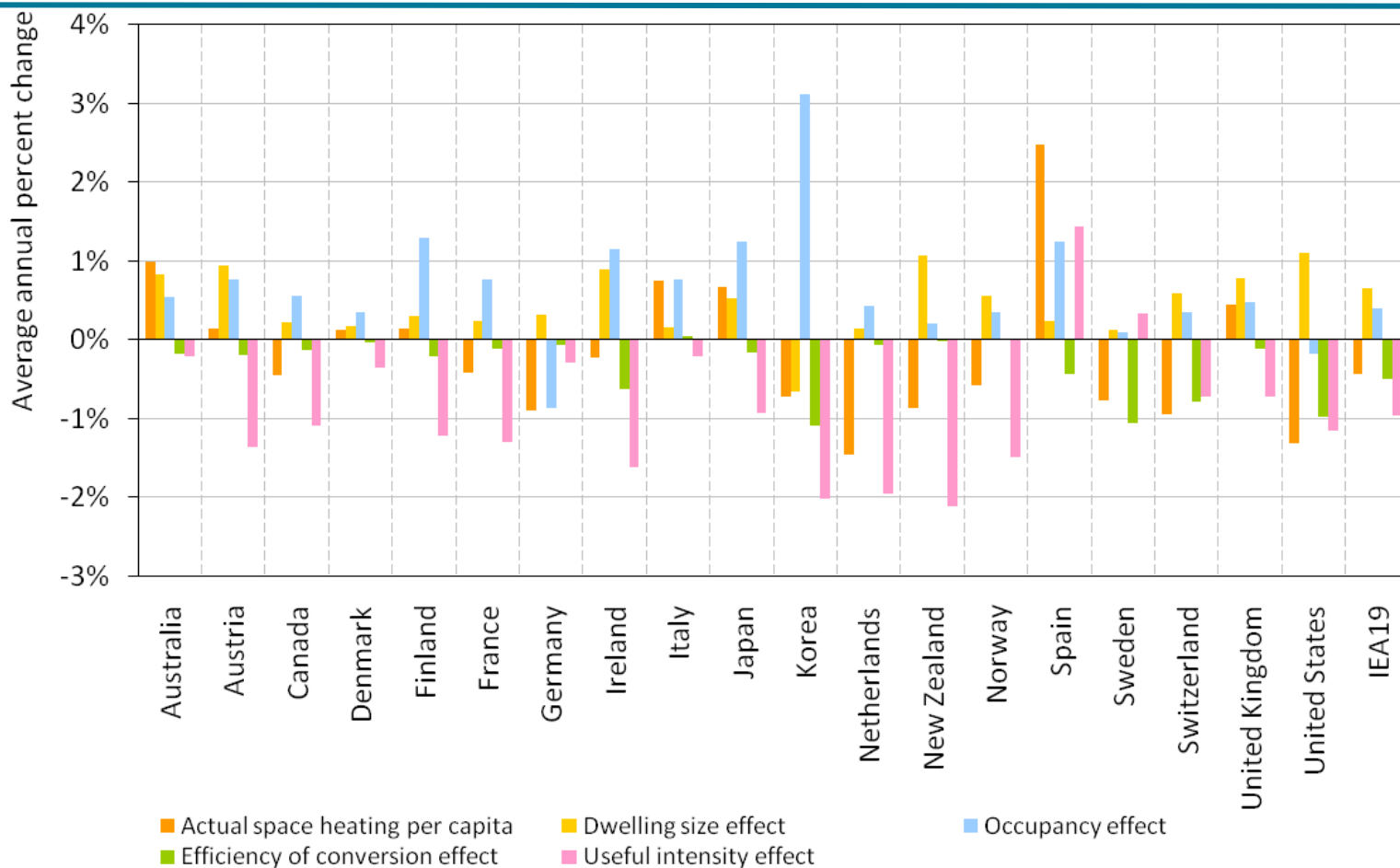


The growth in total appliances energy consumption was entirely due to the increase in small appliances... but little detailed information exists for this category

Energy consumption from large appliances decreased by 11%

Policies in many IEA countries to improve the efficiency of large appliances resulted in a reduction in energy consumption

It also provides insights on the main factors influencing the trends in energy consumption



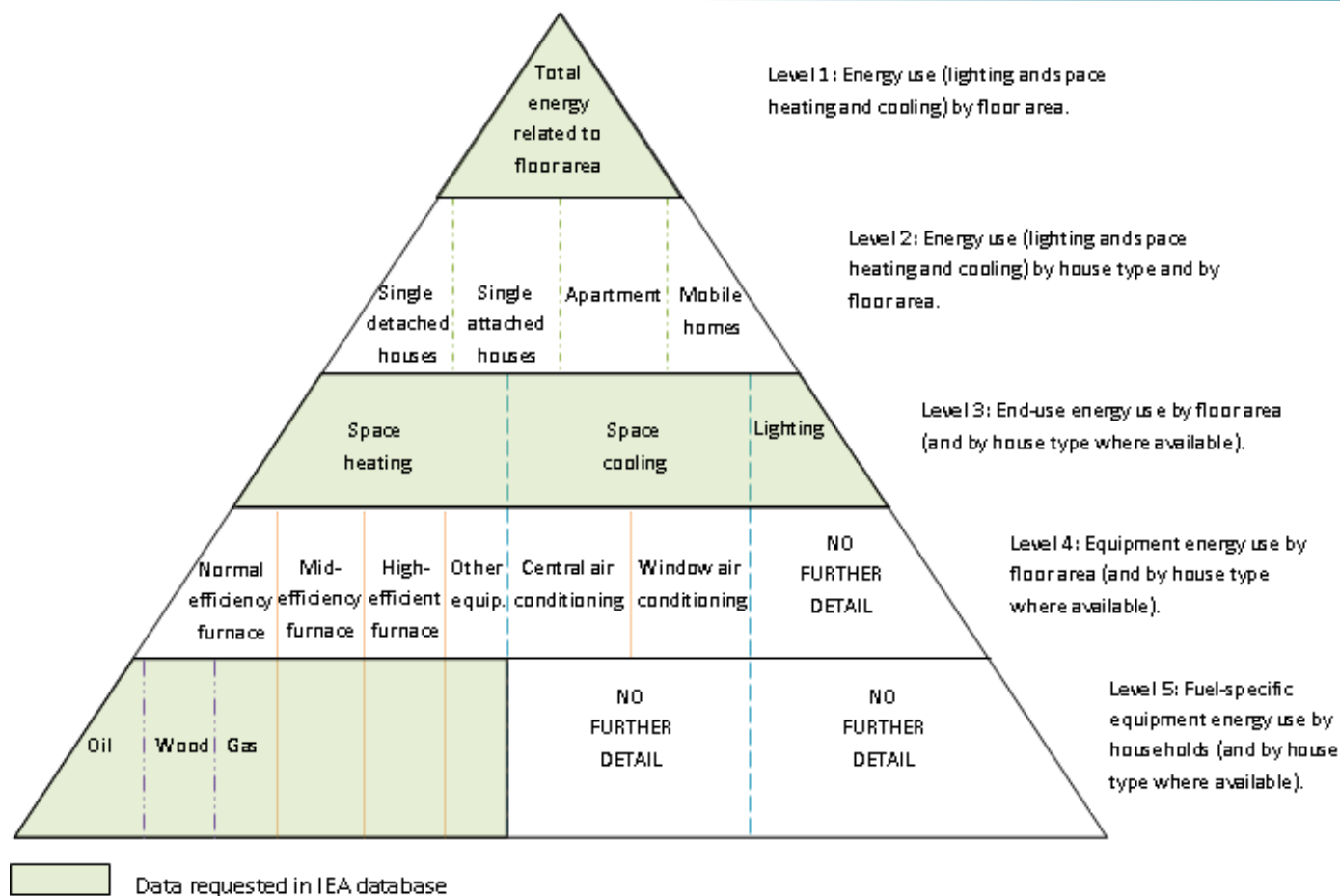
Key Insights from
IEA Indicator Analysis

In general, higher energy demand – caused by fewer occupants and larger homes – was offset by lower end-use conversion losses and a decline in the useful intensity of space heating

But collecting this information is not straightforward

- Difficulty in obtaining consumption information at the end-use level
 - Households usually know their overall energy consumption, but not how this energy is used in the house
 - Use of an increasing number of small appliances
- Difficulty in obtaining a better representation of the appliance end-use
 - Household do not usually know the rated efficiency of their appliances
 - There is a fast increase in the use of numerous small appliances, and little information available on them
- Distinction between rural and urban area is important for some countries
- Quantification of the use of combustible renewables
- Necessity to correct for climate variations
 - End-use level information is required for space heating and cooling
 - Heating and cooling degree-days are required

The pyramid approach helps countries defining their data collection strategies



Key Insights from
IEA Indicator Analysis

This hierarchy will be different from country to country as it depends on country specificities and questions that need to be answered.

The IEA template:

1) provides a starting point for collecting important data

	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
5															
6		Total Energy Use in Residential Sector													
7		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
8		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
9		Combust. 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
10		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
11		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
12		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
13		Space Heating													
14		Oil & Petroleum Products	PJ	0	0	0	0	0	4.01	3.38	2.72	2.27	2.26	3.18	3.82
15		Natural Gas	PJ	0	0	0	0	0	0.20	0.19	0.17	0.10	0.10	0.13	0.15
16		Combust. Renewables & Waste	PJ	0	0	0	0	0	0	0	0	0	0	0	0
17		Electricity	PJ	0	0	0	0	0	2.05	2.21	2.36	1.67	2.25	1.14	1.06
18		Total	PJ	0	0	0	0	0	6.26	5.78	5.25	4.04	4.61	4.45	5.04
19		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
20		Space Cooling													
21		Electricity	PJ	0	0	0	0	0	8.82	8.71	8.62	13.00	11.02	14.85	18.76
22		Total	PJ	0	0	0	0	0	8.82	8.71	8.62	13.00	11.02	14.85	18.76
23		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
24		Water Heating													
25		Oil & Petroleum Products	PJ	0	0	0	0	0	174.51	179.14	181.81	169.37	170.32	197.76	209.65
26		Natural Gas	PJ	0	0	0	0	0	15.17	17.47	18.76	18.79	18.41	20.46	21.26
27		Total	PJ	0	0	0	0	0	189.68	196.61	200.57	188.16	188.74	218.23	230.91
28		Cooking													
29		Oil & Petroleum Products	PJ	0	0	0	0	0	108.14	109.64	109.92	102.01	101.55	99.64	90.60
30		Natural Gas	PJ	0	0	0	0	0	9.52	10.79	11.47	11.45	11.09	10.43	9.30
31		Combust. Renewables & Waste	PJ	0	0	0	0	0	266.24	267.03	266.65	266.43	264.60	263.24	262.05
32		Electricity	PJ	0	0	0	0	0	0.20	0.22	0.25	0.42	0.51	0.26	0
33		Total	PJ	0	0	0	0	0	384.10	387.68	388.28	380.31	377.76	373.57	361.95
34		Lighting													
35		Electricity	PJ	0	0	0	0	0	41.17	42.24	43.34	43.67	45.61	46.26	46.83
36		Total	PJ	0	0	0	0	0	41.17	42.24	43.34	43.67	45.61	46.26	46.83

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 ⁵	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 ⁵	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 ⁵	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		Combust. Renewables & Waste	PJ	281.18	282.33	283.59	284.98	287.09	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

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

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





25

Energy Efficiency Recommendations across **7** Sectors

Cross-sectoral



Buildings



Appliances and
equipment



Lighting



Transport



Industry



Energy utilities



Energy
Efficiency
Policy

W. I. N.

Worldwide Implementation Now

25 Energy Efficiency Policy Recommendations Across 7 Priority Areas

1. Across sectors

- 1.1 Measures for increasing investment in energy efficiency;
- 1.2 National energy efficiency strategies and goals;
- 1.3 Compliance, monitoring, enforcement and evaluation of energy efficiency measures;
- 1.4 Energy efficiency indicators;
- 1.5 Monitoring and reporting progress with the IEA energy efficiency recommendations themselves.

2. Buildings

- 2.1 Building codes for new buildings;
- 2.2 Passive Energy Houses and Zero Energy Buildings;
- 2.3 Policy packages to promote energy efficiency in existing buildings;
- 2.4 Building certification schemes;
- 2.5 Energy efficiency improvements in glazed areas.

3. Appliances

- 3.1 Mandatory energy performance requirements or labels;
- 3.2 Low-power modes, including standby power, for electronic and networked equipment;
- 3.3 Televisions and “set-top” boxes;
- 3.4 Energy performance test standards and measurement protocols.

4. Lighting

- 4.1 Best practice lighting and the phase-out of incandescent bulbs;
- 4.2 Ensuring least-cost lighting in non-residential buildings and the phase-out of inefficient fuel-based lighting.

5. Transport

- 5.1 Fuel-efficient tyres;
- 5.2 Mandatory fuel efficiency standards for light-duty vehicles;
- 5.3 Fuel economy of heavy-duty vehicles;
- 5.4 Eco-driving.

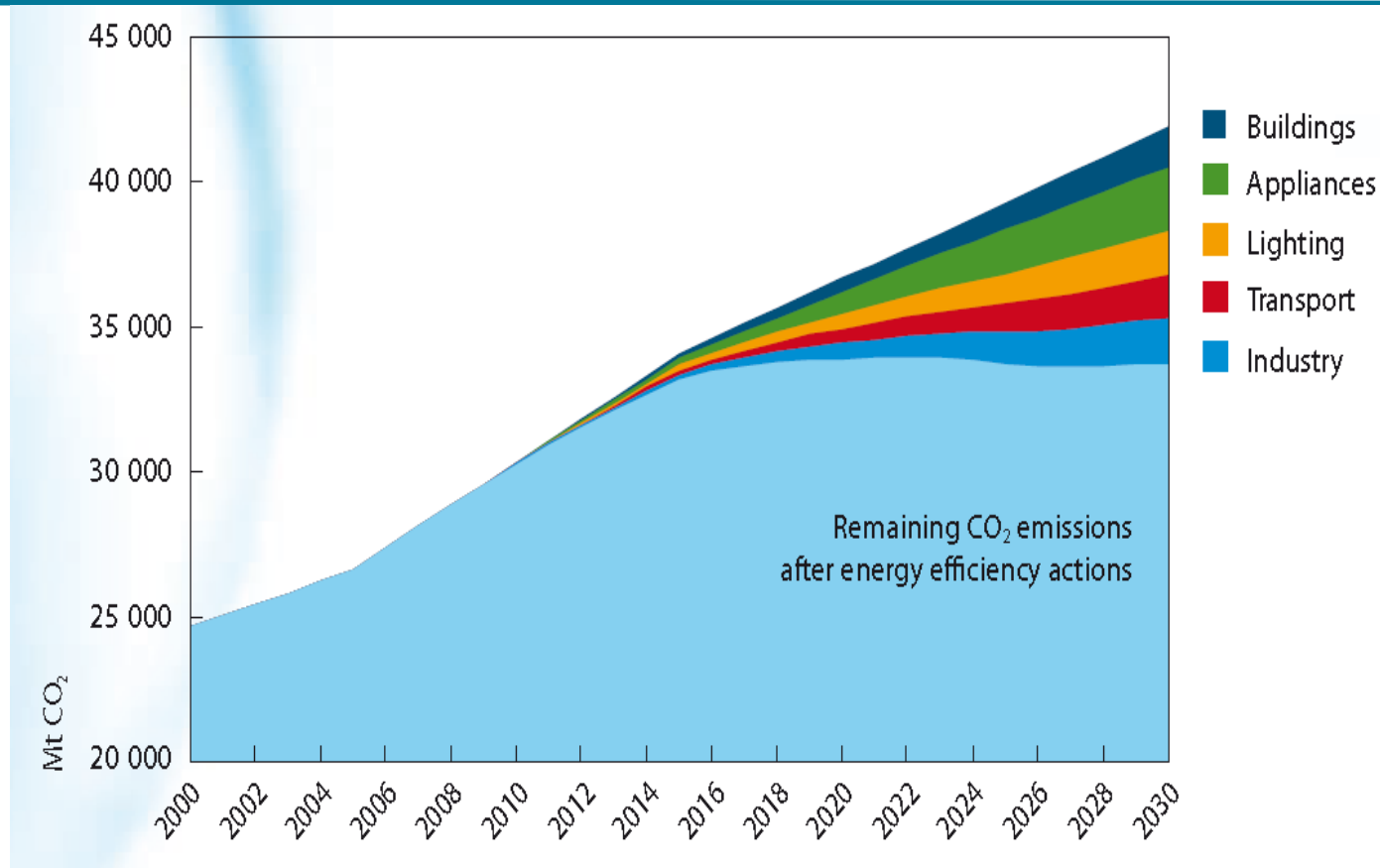
6. Industry

- 6.1 Collection of high quality energy efficiency data for industry;
- 6.2 Energy performance of electric motors;
- 6.3 Assistance in developing energy management capability;
- 6.4 Policy packages to promote energy efficiency in small and medium-sized enterprises.

7. Utilities

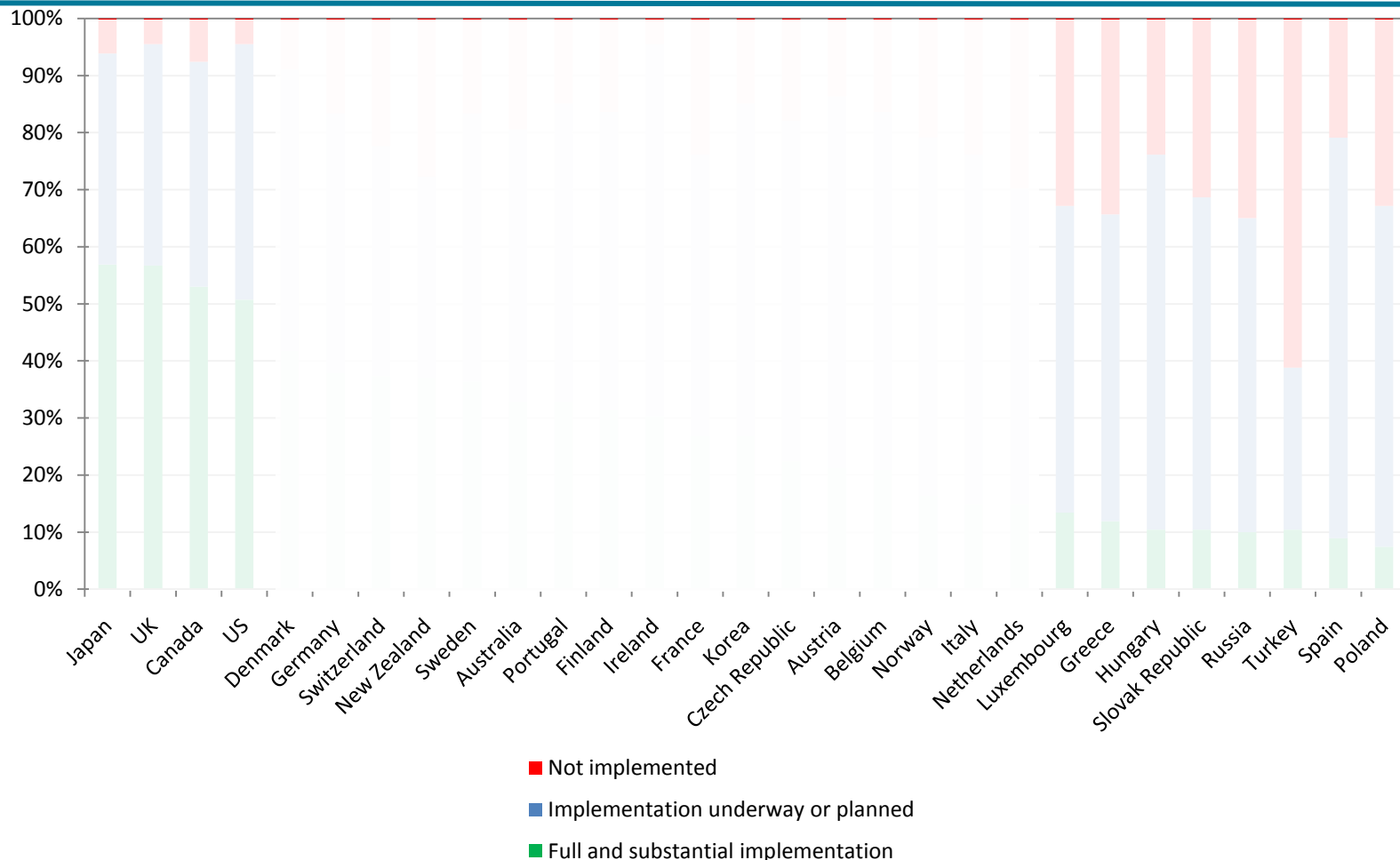
- 7.1 Utility end-use energy efficiency schemes.

CO₂ savings potential



Global implementation of recommendations could save around 8.2 GtCO₂/yr by 2030; this is equivalent to 20% of global reference scenario energy related CO₂ emissions in 2030

How does implementation compare across countries – all recommendations?



No country has ‘fully’ or ‘substantially’ implemented more than 57% of the relevant recommendations.

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 CO₂ 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

Key recommendations for ASEAN

- Develop/improve energy balance
- Improve end-use data availability to develop indicators
 - Build on past work on energy efficiency indicators
 - Define priority areas
 - Gather data available
 - ◆ Assessment of quality
 - ◆ Assessment of comparability
 - Collect other required data
 - Build on existing expertise (EU/Canada) and successful projects (IEA/Mexico)
- Develop indicators to understand past trends, assess potential and better support policy-making towards meeting Presidential targets and goals
- Use indicators work to guide development of policy and measures
- Develop tools to ensure compliance, enforcement and monitoring of energy efficiency policies