

Key analytical challenges in developing energy efficiency indicators

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Dr Didier Bosseboeuf (ADEME, Fr)
Karine Pollier (Enerdata)

1 – General consideration : to go beyond the energy balance

2 – Key challenges in end-use data collection by sector (activity and energy)

3 – The experience of ODYSSEE on the data quality check

4 – Conclusions : a step by step approach

Annex : Main data requirements for energy efficiency indicators

Key analytical challenges in developing energy efficiency indicators/energy savings

- Indicators choices (toe/car; l/100 km, Goe/pkm, L/Kg of car etc).
- Statistical sources choices
- Disaggregation level (basic chemical, parachemical)
- Reference year, moving average year
- Re-agregation (including non saving?)
- « universal » adjustment (climate, structure etc.)
- structural effect calculation (laspeyres, Divisia)
- Business cycle (industry, transport, services?)
- Total saving vs policy induced savings
- uncertainties

All these issues are somehow related to data issues (availability and quality)

Key challenges in analysing end-uses energy consumption

- Proper monitoring of the energy efficiency requires detailed data which go far beyond the classic energy balance. Data should be available on long term basis and possibly year by year.
- New questions or new technologies require permanent updating of the data collection(ex air conditioning, ICT, heat pump, label etc.)
- The main difficulties concern :
 - Breakdown by end-uses
 - Breakdown by branch (services and industries)
- These break-downs should be also combined with the breakdown by fuel
- They are new issues due to new policies, technologies and indicators.

Issues from the Energy balance

This is the prerequisite for good indicators

- Breakdown between residential, services and agriculture and construction sector
- Allocation of diesel according to the end-use sector
- RES and particularly biomass (especially in DCs)
- Heat
- Mix biofuels and motor fuels
- Climatic correction
- Special fuels (ex cement)
- Etc.

Housing (the most important in terms of current monitoring of policies)

- Stock of dwelling by type of labels
- M2, M2 heated (or air conditioned) in existing buildings
- Stock of electrical appliances (multi ownership)
- Stocks of energy efficient products (CFLs, label A+ for electrical appliances) for indicators of diffusion
- Improvements of energy consumption trends breakdown by end-use (heating, hot water, cooking etc.) (usually constant key of splitting)
- Improvements of electricity trends by end-uses (heating, lighting, air conditioning, electrical appliances) (uncomplete modelling)
- Improvement of electricity consumption trends of small appliances (half of the electricity consumption in Europe) including ICT
- Interpolation of trends between robust activity data (Census or housing surveys).
- Unit consumption measures are generally not representative of the stocks (metering)

Services : the worst data coverage

- M2, M2 heated (or air conditioned) in existing buildings
- Breakdown of energy consumption by branches including the public sector is not enough detailed or non available
- Improvements of energy consumption trends breakdown by end-use (heating, hot water, cooking etc.) (usually constant key of splitting)
- Difficulty to match the activity and energy nomenclatures

Industry (The best coverage)

- Insufficient breakdown of energy consumption by **sub-sector** (ex chemical), by **process** mainly in intensives industries (oxygen/electric steel; dry and wet in cement, by **products** (intensive industries ex pulp and paper, sugar, metallic minerals)
- Difficulty to match the activity and energy nomenclatures
- Consumption by company size (SMEs)

Transport (the most difficult one)

- Difficult coherence between motor fuels sales, **domestic** consumption and domestic traffic (and transit)
- Improvement of motor fuels sales breakdown by **vehicle types** (usually through modelling)
- **On road** stock of vehicles by fuel types
- Yearly car (**LDVs**) mileage by fuel type (excluding foreign vehicles)
- **Domestic road** passenger and freight traffic by vkm, **pkm** & tkm separating trucks and LDVs for vehicles (load factor for cars kept constant)
- Split of the energy consumption between passengers and freight by mode
- **On road specific consumption** by vehicle type (l/100 km) and by fuel types (in particular **trucks** which include usually LDVs)
- Border trade effect and smuggling
- Introduction of biofuels in the motorfuels sales and analysis (energy coefficient)



Data availability by country (ODYSSEE)

Even if improvement, many countries still with important data gap for households consumption by end-use, road transport consumption by mode and in services → the project is developing some methods to help countries with missing data to do estimates on the basis of the methodology of countries with data

Households	AT	BE	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SE	SI	SK	UK	RO	HR	BG
Space heating																												
Water heating																												
Cooking																												
Electrical appliances and lighting																												
Electricity cons. by electrical appliance																												
Lighting																												
Transport	AT	BE	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SE	SI	SK	UK	RO	HR	BG
Cars																												
Motorcycles																												
Trucks & light vehicles																												
Buses																												
Rail																												
Boats, inland																												
Services	AT	BE	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SE	SI	SK	UK	RO	HR	BG
Electricity cons by branch																												
Space Heating																												
Cooling																												
Ventilation																												
Water heating																												
Office equipment																												
Lighting																												

available

added recently

few years available

not existing (not relevant)

Qualification of data uncertainty

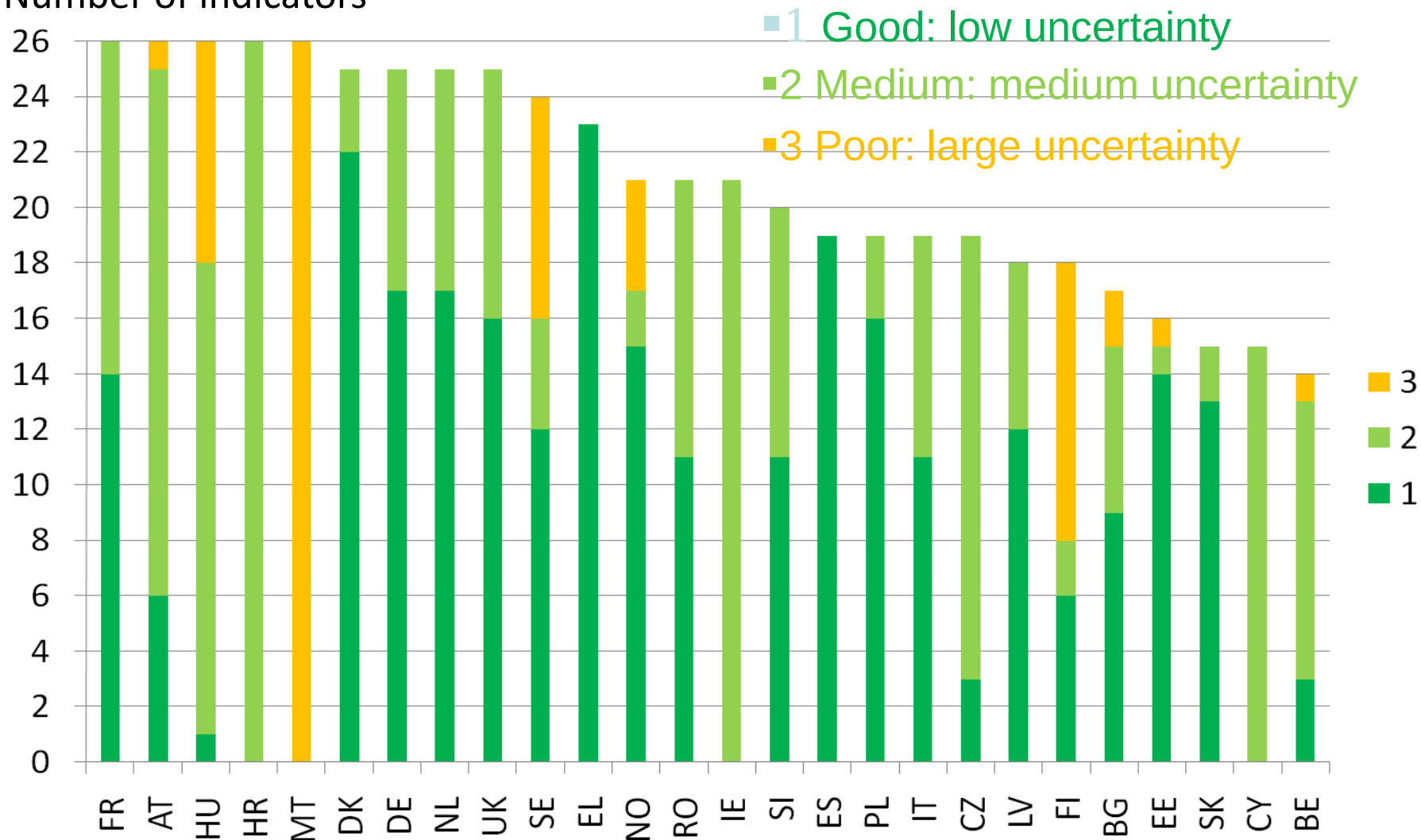
Quality grades:

- 1 Good: low uncertainty
- 2 Medium: medium uncertainty
- 3 Poor: large uncertainty

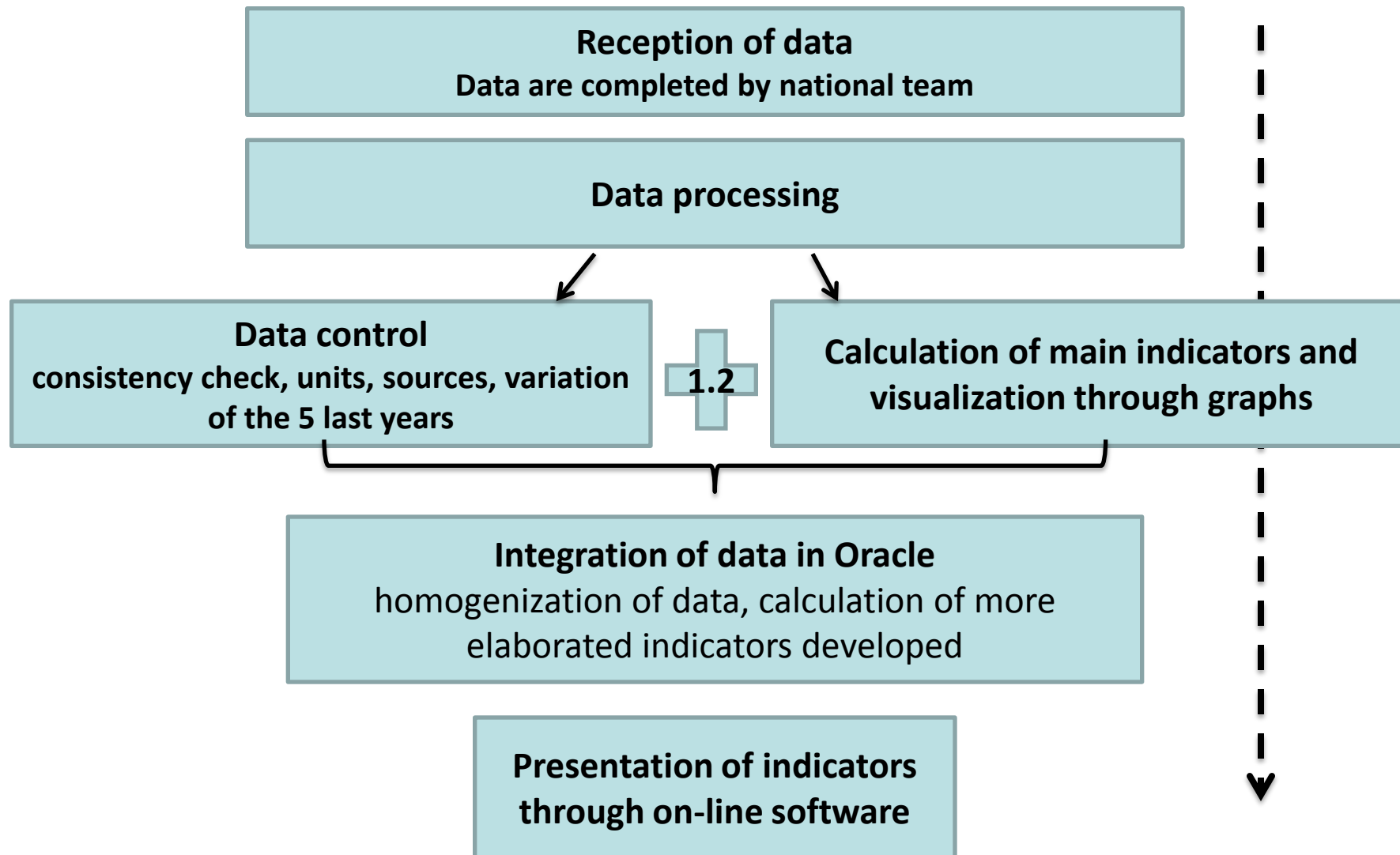
- ➔ For official sources :subjective appreciation made by national teams in collaboration with the source of data: 1 or 2
- ➔ For surveys: quality grade depends on the size of the sample :large sample=1....
- ➔ For estimates by national team : quality grade depends on the method: formal modelling higher quality (1 or 2) than expert estimate (2 to 3)

Uncertainty of data used to calculate ODEX/energy savings in ODYSSEE

Number of indicators



Data processing procedure in ODYSSEE





3 steps for preliminary data control

Consistency check

- Data control and consistency check
 - eg sum of industrial branches or end uses consumption compared to total

Harmonization

- Harmonization of data, comparison with other international sources
 - Calculation of homogeneous data (Mtoe for energy data, '000 for data on stock, € 2000 for economic data)
 - Comparison with Eurostat data, DGMOVE* data on transport

Indicators

- Calculation of indicators
 - In the Excel sheet for more transparency (in Oracle for more elaborated indicators)
 - Calculation of the variation for the 5 last years
 - Visualisation of indicators through graphs

* EU Transport in figures (statistical pocketbook)

Data checking in the database (1)

□ Macro:

- Share of value added in GDP
- Final consumption by sector versus total consumption
- Primary consumption by energy and total

□ Industry

- Value added by branches versus total
- Energy consumption by branches versus total
- Share of non-conventional energies in cement, paper and total industry
- Comparison of energy consumption by branches compared to Eurostat

Data checking in the database (2)

☐ Transport

- Energy consumption of main modes compared to total transport
- Energy consumption by fuel compared to total
- Energy consumption by road type compared to total road
- Stock of vehicles by fuel compared to total
- Consistency check between consumption, specific consumption in litre or GJ/km and kilometers

☐ Households

- Energy (electricity) consumption by end-uses compared to total

☐ Tertiary

- Energy consumption by end-uses compared to total
- Energy (electricity) consumption by branches compared to total

Control 2: Control of data and indicators

Age
et di

- After an update, systematic control of actual data and indicators versus the previous update on Excel

Old vs new update

Comparison of level with EU as reference

Control of data difference and evolution

Graphs

	A	B	C	D	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
		Title	Unit		2006	2007	2008	2009	###		2000	2007		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2006/2007/2008/2009							
1	I- Botto	up INDICA	ORS																													
2	odextot	Energy efficiency in 2000=100	Old		81,2	89,7	89,0	91,2			100,0	91,4		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
3	odexres	Energy efficiency in 2000=100	Old		84,6	83,8	83,4	82,6			100,0	92,1		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
4	odextra	Energy efficiency in 2000=100	Old		90,7	89,4	88,8	88,7			100,0	92,6		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
5	odexman	Energy efficiency in 2000=100	Old		96,3	94,1	93,2	99,3			100,0	89,5		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
6	odexman	Energy efficiency in 2000=100	New		96,3	94,1	96,9	99,3			100,0	89,5		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
7	I- General INDICATORS																															
8	ietoctfcc	Final energy inten: koe/€2000	Old		0,114	0,111	0,109	0,109			0,12	0,11		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
9	ietoctfcc	Final energy inten: koe/€2000	New		0,114	0,111	0,109	0,109			0,12	0,11		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
10	ietoctfcstcc	Final energy inten: koe/€2000	Old		0,116	0,113	0,111	0,112			0,12	0,11		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
11	ietoctfcstcc	Final energy inten: koe/€2000	New		0,116	0,113	0,111	0,112			0,12	0,11		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
12	ietoctfcjapp	Final energy inten: koe/€2005p	Old		0,107	0,101	0,099	0,098			0,11	0,10		-0,3	-0,4	-0,4	-0,3	-0,3	-0,3	-0,4	-0,5	-0,4	-0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
13	ietoctfcjapp	Final energy inten: koe/€2005p	New		0,107	0,100	0,099	0,098			0,11	0,10		-0,3	-0,4	-0,4	-0,3	-0,3	-0,3	-0,4	-0,5	-0,4	-0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
14	ietoctfcceajpp	Final energy inten: koe/€2005p	Old		0,106	0,102	0,100	0,098			0,11	0,10		0,5	0,4	0,3	0,3	0,3	0,2	0,1	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
15	ietoctfcceajpp	Final energy inten: koe/€2005p	New		0,106	0,102	0,100	0,098			0,11	0,10		0,5	0,4	0,3	0,3	0,3	0,2	0,1	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
16	ietoctfcppcc	Final energy inten: koe/€2005p	Old		0,109	0,106	0,104	0,104			0,11	0,10		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
17	ietoctfcppcc	Final energy inten: koe/€2005p	New		0,109	0,106	0,104	0,104			0,11	0,10		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
18	ietoctpccc	Primary energy int: koe/€2000	Old		0,149	0,144	0,142	0,139			0,19	0,17		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
19	ietoctpccc	Primary energy int: koe/€2000	New		0,149	0,144	0,142	0,139			0,19	0,17		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
20	ietoctpcppcc	Primary energy int: koe/€2005p	Old		0,142	0,138	0,136	0,132			0,17	0,16		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
21	ietoctpcppcc	Primary energy int: koe/€2005p	New		0,142	0,138	0,136	0,132			0,17	0,16		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
22	rdtfc	Ratio final/primary %	Old		76,402	76,414	76,554	78,085			64,80	64,40		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
23	rdtfc	Ratio final/primary %	New		76,402	76,414	76,554	78,085			64,80	64,40		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
24	II- Industry																															
25	ietocind	Energy intensity of koe/€2000	Old		0,1	0,1	0,1	0,1			0,1	0,1		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
26	ietocind	Energy intensity of koe/€2000	New		0,1	0,1	0,1	0,1			0,1	0,1		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
27																																
28																																
29																																
30																																

General Indicators

Control of data and indicators : interaction with national teams (1)

☐ Data comments are sent to national teams during or after each update

- A document on major data revision is published for public access on the website (to inform the public on the changes in the database)
- A document on data comments by country is written and can be completed by national teams to add remarks / explanation useful for the understanding of the database

Control of data and indicators : interaction with national teams (2)

❑ If data are not properly updated / filled in (error in data, lack of sources, none available main data):

- Enerdata contacts directly the team by email (with a response under 8 days or less if the problem is important)
- The error is corrected in the database and/or comments are added in the report on datacomments for the next update

Conclusions (1/2)

- Data collected should be representative at national level;
- Official data should be preferred but additional good detailed data are needed (ex by end uses) ;
- Data collection will improve step by step;
- Coherence should be ensured between activity and energy data (nomenclatures sometimes differ) particularly difficult in transport);
- Activity data are generally more easily available and earlier provided than energy data ;
- Detailed consumption data are more difficult to get. They should be collected only if corresponding activity data are available;

Conclusions (2/2)

- End-uses consumption data have generally a 2 years delay (from consumer surveys);
- Data collection should be prioritise according to the energy saving potential Cost effectiveness of data collection is difficult to assess;
- Data collected should be duly referenced (to keep the memory).
- Quality check can be partly automatic (total and sum of the branch)
- Data quality check can be done every 3-4 years)
- Institutional framework is to organised the data collection a key to success
- International comparisons and data issues exchange through routine workshops provide confidence in the data collection among countries

Thank you for your attention !

Coordinator of the ODYSSEE MURE project:

Didier Bosseboeuf (didier.bosseboeuf@ademe.fr)

Technical coordinator of ODYSSEE database:

Karine Pollier (karine.pollier@enerdata.net)

Bruno Lapillonne (Bruno.lapillonne@enerdata.net)



- ANNEX : Main Data collection requirements for energy efficiency indicators

Housing (Activity)

- Stock of dwelling by type (main residence, age, flat/individual) combined with the fuel types, **label**)
- M2, M2 heated (or air conditioned)
- Stock of heating (or cooling) systems by type (individual, central)
- Stock of electrical appliances (multi ownership)
- Stocks of energy efficient products (CFLs, label A+ for electrical appliances) for indicators of diffusion

Housing (Energy)

- By end-use (heating, hot water, cooking etc.)
- Specific electricity by end-uses (heating, lighting, air conditioning, electrical appliances)
- By electrical appliances (large appliances, small appliances (half of the electricity consumption in Europe), ITC
- By age (for the building codes) and type of dwelling
- By heating system (individual, collective)

Services (Activity)

- Number of employees (by branch)
- VA by branch
- Physical indicators by branch (number of beds, of nights, M2, M2 heated)

Services (Energy)

- By end-uses (heating, hot water, cooking etc.)
- By branches (including public sector)

Industry (Activity)

- VA by sector
- Index of production by branch
- Production in physical terms for intensive industries

Industry (Energy)

- By sector (with an emphasis on intensive industries)
- By sub-sector (ex chemical)
- By process mainly in intensives industries (oxygen/electric steel; dry and wet in cement,
- By products (intensive industries ex pulp and paper, sugar, metallic minerals)
- By size (SMEs,)

Transport (Activity)

- New registrations by vehicle type and fuels
- On road stock of road vehicles by fuels types
- Stock of cars by power
- Yearly car (LDVs) mileage by fuel type (excluding foreign vehicles)
- Domestic freight traffic by vkm & tkm separating trucks and LDVs for domestic vehicles
- Pkm for cars

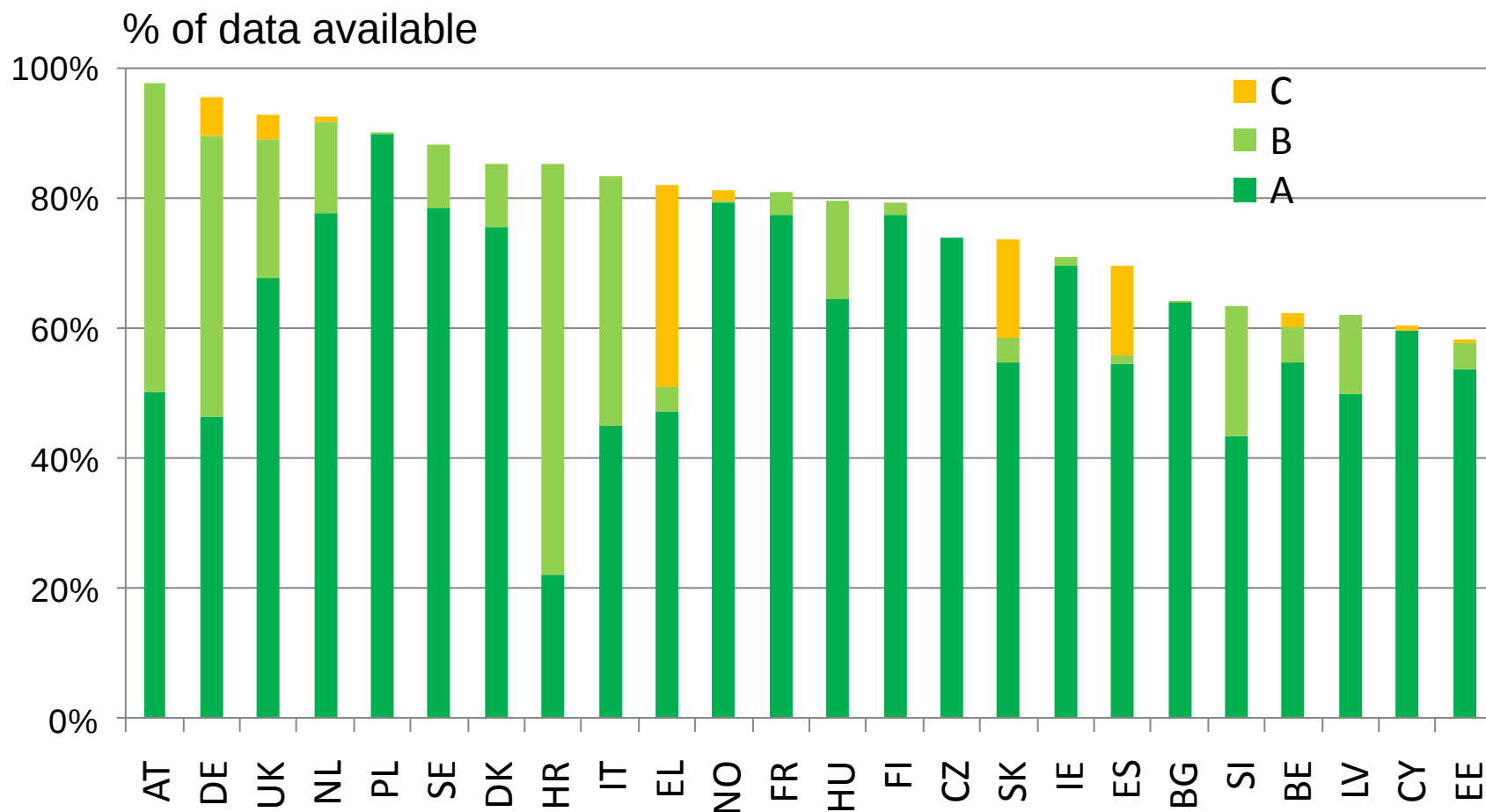
Transport (Energy)

- By mode
- By road vehicles type (in particular LDVs and trucks)
- Domestic consumption
- Specific consumption (tested) of new vehicles (l/100 km) by fuel types
- Unit consumption by vehicle type (l/100 km) by fuel types

Qualification of data sources in ODYSSEE

- A: Official statistics
 - Official statistics/surveys (national statistical office, Eurostat/AIE, Ministries statistics)
 - Model estimations used as official statistics
 - Data “stamped” by Ministries
- B: Surveys/ modelling estimates : consulting, research centres, universities, industrial associations
- C: Estimations made by national teams (for the project)

Qualification of data sources in ODYSSEE



A: Official statistics **B:** Surveys/ modelling estimates

C: Estimations made by national teams