Data and indicators for OSD7 monitoring

National workshop Guyana

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Dr Didier Bosseboeuf, ADEME

Laura Sudries, Bruno Lapillonne, Enerdata

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1. **Why energy efficiency indicators ?**
2. Data collection and indicators
3. BIEE template used for data collection
4. BIEE data mapper
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Energy efficiency indicators to monitor and measure energy savings?

- Energy efficiency indicators (EEI) are used to assess the progress in energy efficiency and to measure energy savings.
- EEI relate an energy consumption to an indicator of activity, measured in physical units* (tons, employee, m2), usually at sub sector level ➔ specific or unit energy consumption; they also include indicators of market penetration of energy saving technology or practice.

Types of indicator	Examples
Specific/ unit energy consumption	litre/100km, household electrical appliance (kWh/year), heating consumption per m^2 or household (eg kWh/m^2 or household), consumption per employee or m2 in services (eg kWh/m^2 or /employee)
Market penetration of energy saving technology or practice	Share of public transport for passengers, of rail/water for goods, of solar water heaters, of cogeneration, of LED etc…

**Indicators of energy intensities in monetary units (ratio energy consumption over GDP or Valude Added) are not considered as energy efficiency indicators.*

From simple energy efficiency indicators to advanced indicators

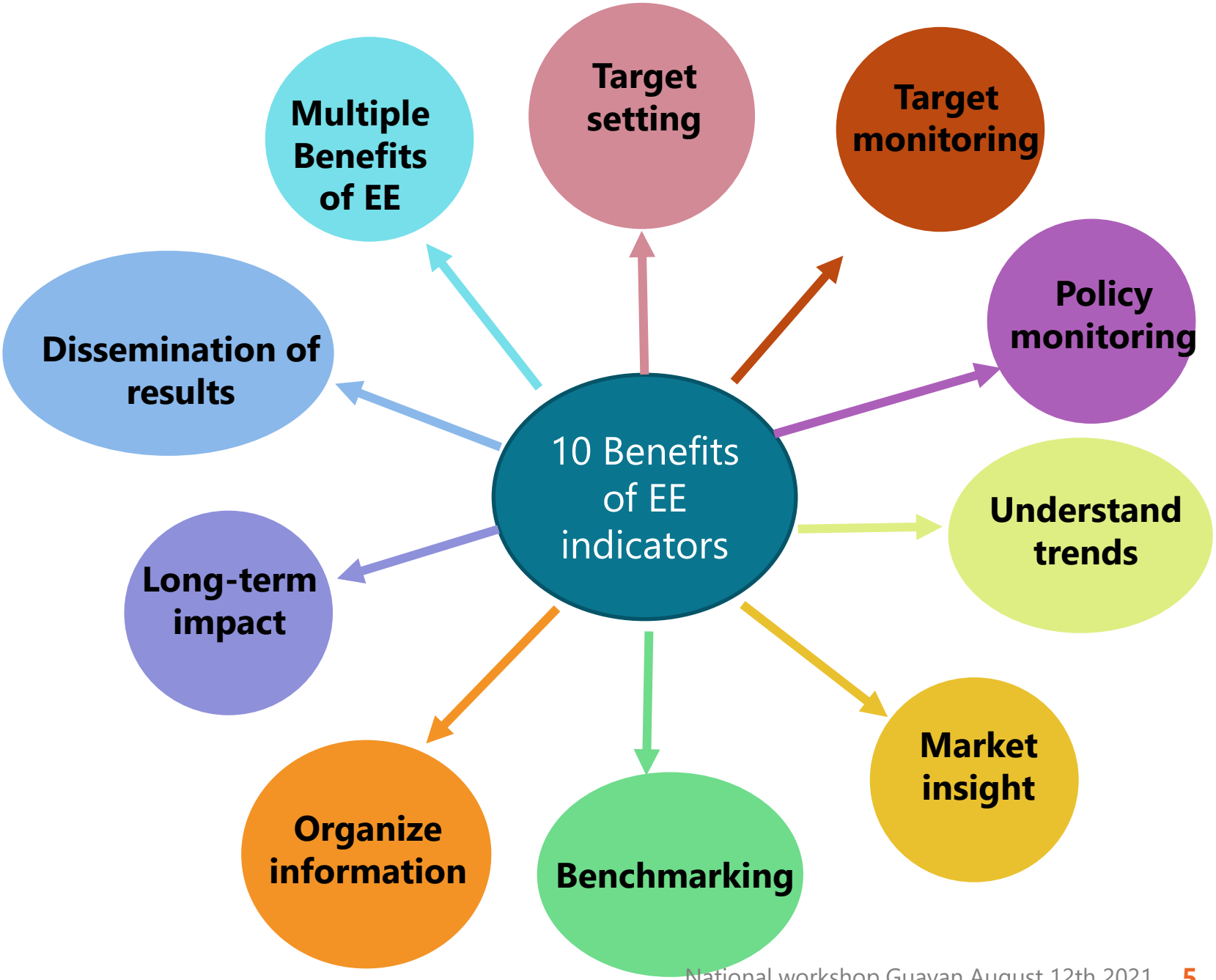
- Aggregated EEI are useful to describe trends, but cannot explain the observed trends.

- For instance the energy consumption per household shows how this unit consumption is changing but a decrease does not necessary mean that energy efficiency is improving from a technical viewpoint.

- Disaggregated and advanced indicators more powerful to explain the role of energy efficiency, but require more detailed data (e.g. by end-use or type of vehicles) and more complex calculation .

  - Disaggregated data should be produced by end-use, by sub- sector, by mode of transport.

  - Advanced indicators imply additional calculations .


10 Benefits of EE indicators
Multiple Benefits of EE
Target setting
Target monitoring
Policy monitoring
Understand trends
Market insight
Benchmarking
Organize information
Long-term impact
Dissemination of results

Content

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Mapping of data for EEI: example of Mexico

Source: CONUEE, Mexico

Overview of macro data and indicators

- Macro-economic data: GDP by sector, exchange rates
- Demography (population)
- Energy balances data: primary and final energy consumption by sector : industry, transport, households, services, et agriculture
- Degree-days for cspace heating and climatic corrections (cooling degree-days)

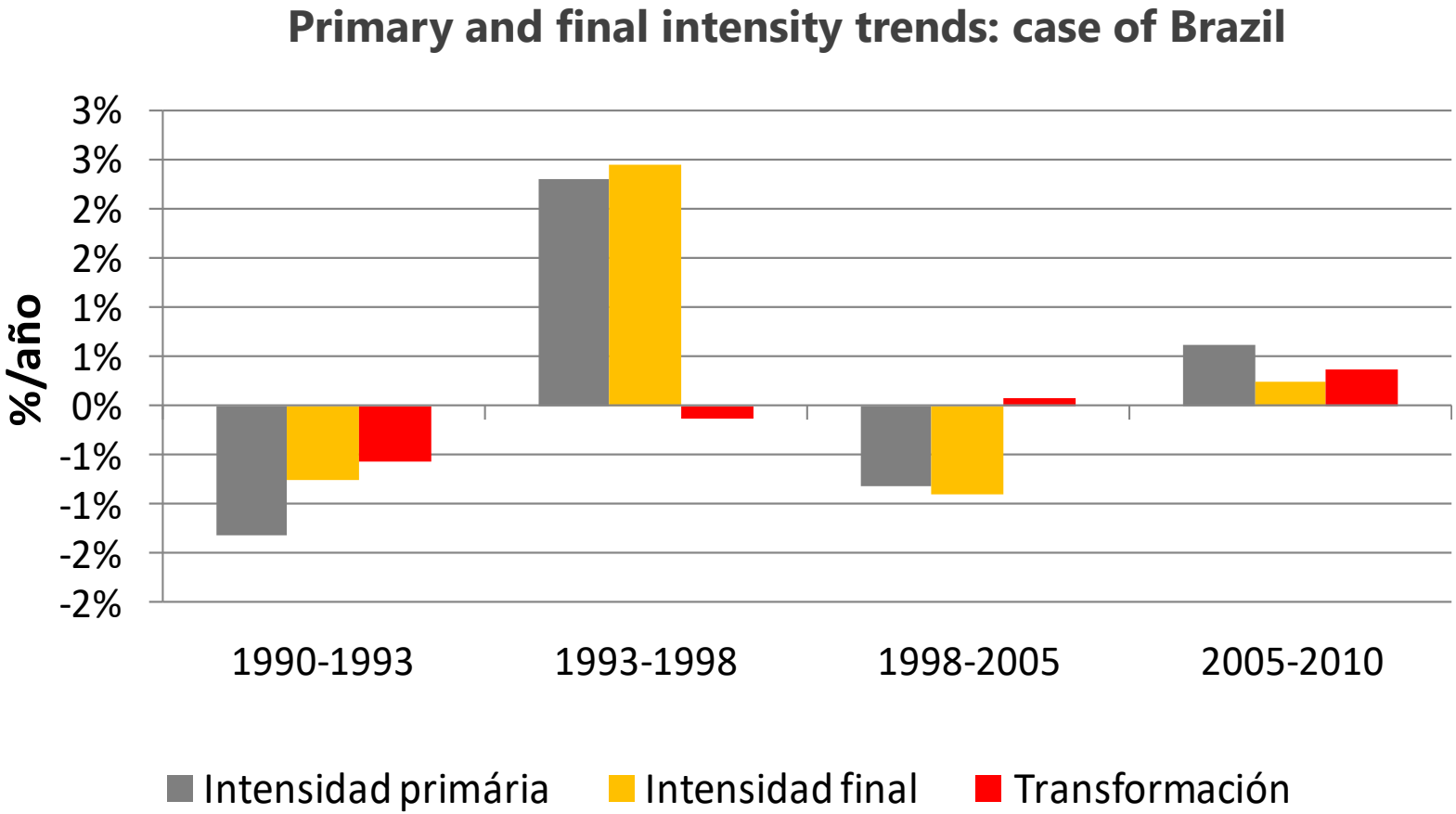
Data

INDICATORS

- Primary intensity*
- Final intensity: total and by sector*
- Ratio final/primary intensity

Different trends as to the variation of primary and final intensity in Brazil depending on transformations and mainly power sector

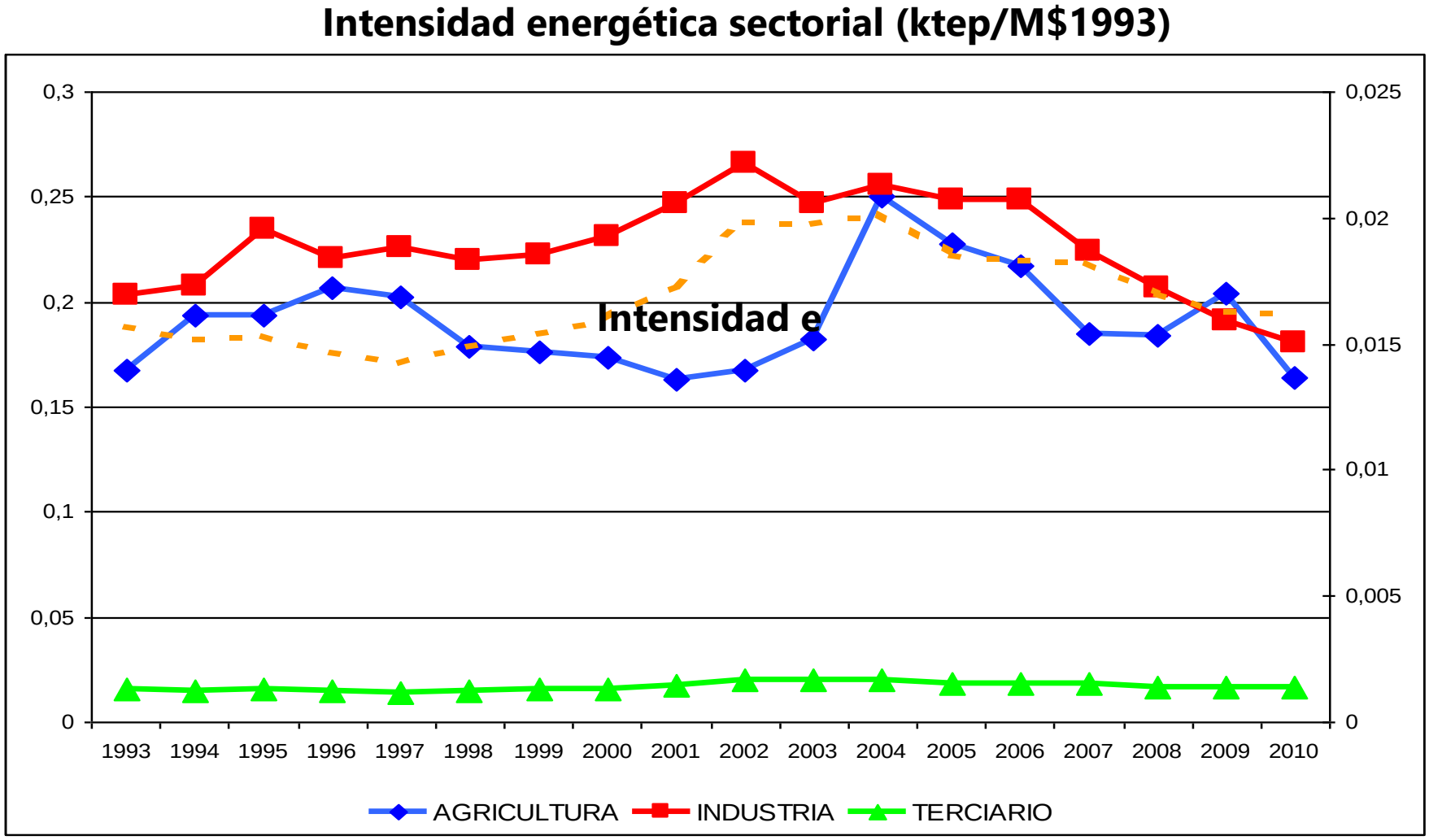
Since 1998, energy transformations contribute to increase the primary intensity due to the development of thermal power generation and biofuels production



Source BIEE/EPE

Sectoral energy intensities : case of Argentina

Industry 14 times more energy intensive than services



Source: BIEE/Secretaria de Energia

Basic indicators for the energy sector

Indicators
Average power generation efficiency
Trends in power generation efficiency
Average efficiency of thermal power generation
Trends in thermal power generation in efficiency
T&D losses
Trends in T&D losses
Overall efficiency of energy sector

Data and indicators: Transport

- Stock and sales of vehicles by type and fuel
- Average distance per vehicle
- Passenger and goods traffic in pass-km & ton-km
- Energy consumption by mode and by type of road vehicles
- Specific consumption by vehicle (average, new)

Data

INDICATORS

- Energy consumption per capita;
- Intensity;
- Energy cons. of road transport per vehicle;
- Unit consumption per car equivalent;
- Unit consumption per vehicle;
- Consumption per unit of traffic;
- Mobility in public transport per capita;
- Share of public transport for passengers;
- Share of non-road for goods.

Data and indicators : Households

- Number of households;
- Annual construction;
- Caracteristics of dwellings: number by fuel and end-use; floor area;
- Electrical appliances: stock, sales, equipement rate; specific consumption;
- Efficient equipment (CFL, solar water heaters, biomass coking stove): number, sales;
- Energy consumption: by end uses,
- Specific consumption of new dwellings

Data

INDICATORS

- Energy intensity;
- Electricity consumption per electrified households;
- Energy (electricity) consumption per households;
- Energy consumption per households and climate correccted;
- Energy consumption of space heating per dwelling, per m2, with climate corrections;
- Electricity consumption for air conditioning; per dwelling, per m2, with climate corrections;
- Energy consumption of cooking
- SHW: installed capacity; % dwellings; heat production;
- Efficient equipment (label A or equivalent): refrigerator, washing machine, AC;

Data and indicators: industry

- Value added at constant price by industrial branch;
- Production index by industrial branch;
- Physical production for energy intensive products*;
- Final energy consumption by industrial branch;

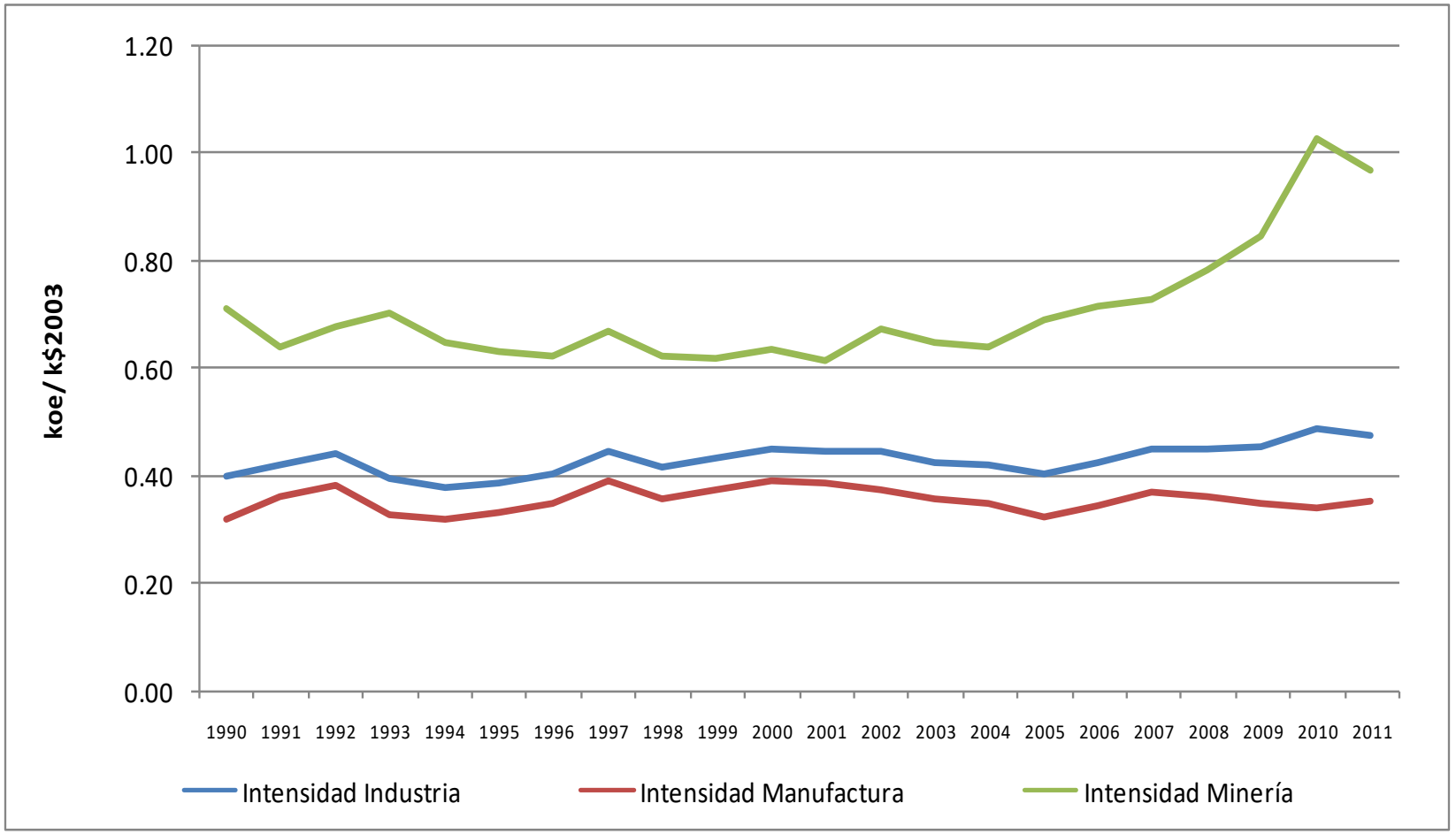
Data

INDICATORS

- Energy intensity by branch*
- Unit consumption by intensive products;
- Energy intensity at constant structure*;

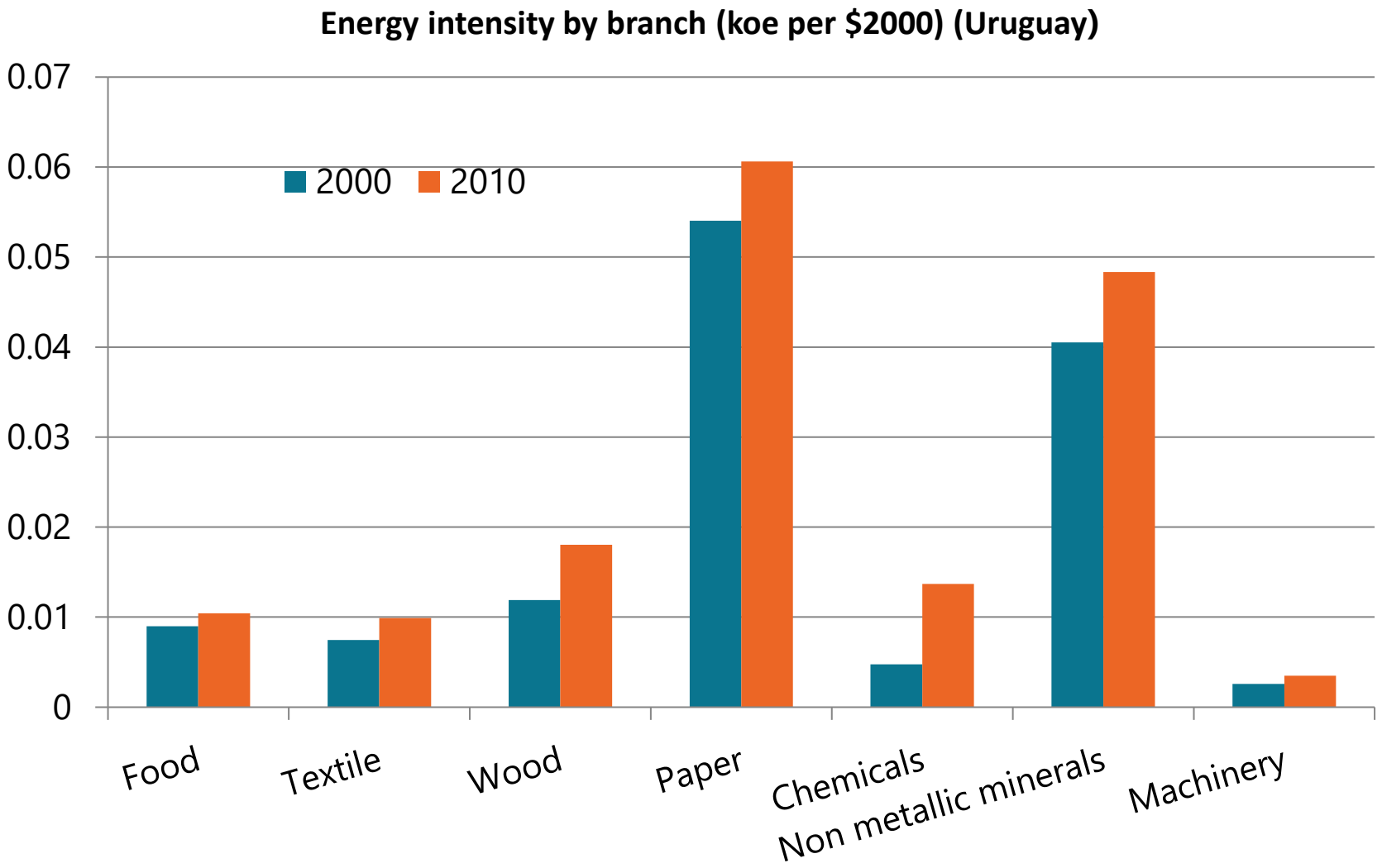
*steel, cement, aluminium, copper, ferroalloys, sugar, iron mining, potassium, ceramics, gold mining

Trends in energy intensities of industry: Chile



Source: BIEE, Ministerio de Energía de Chile

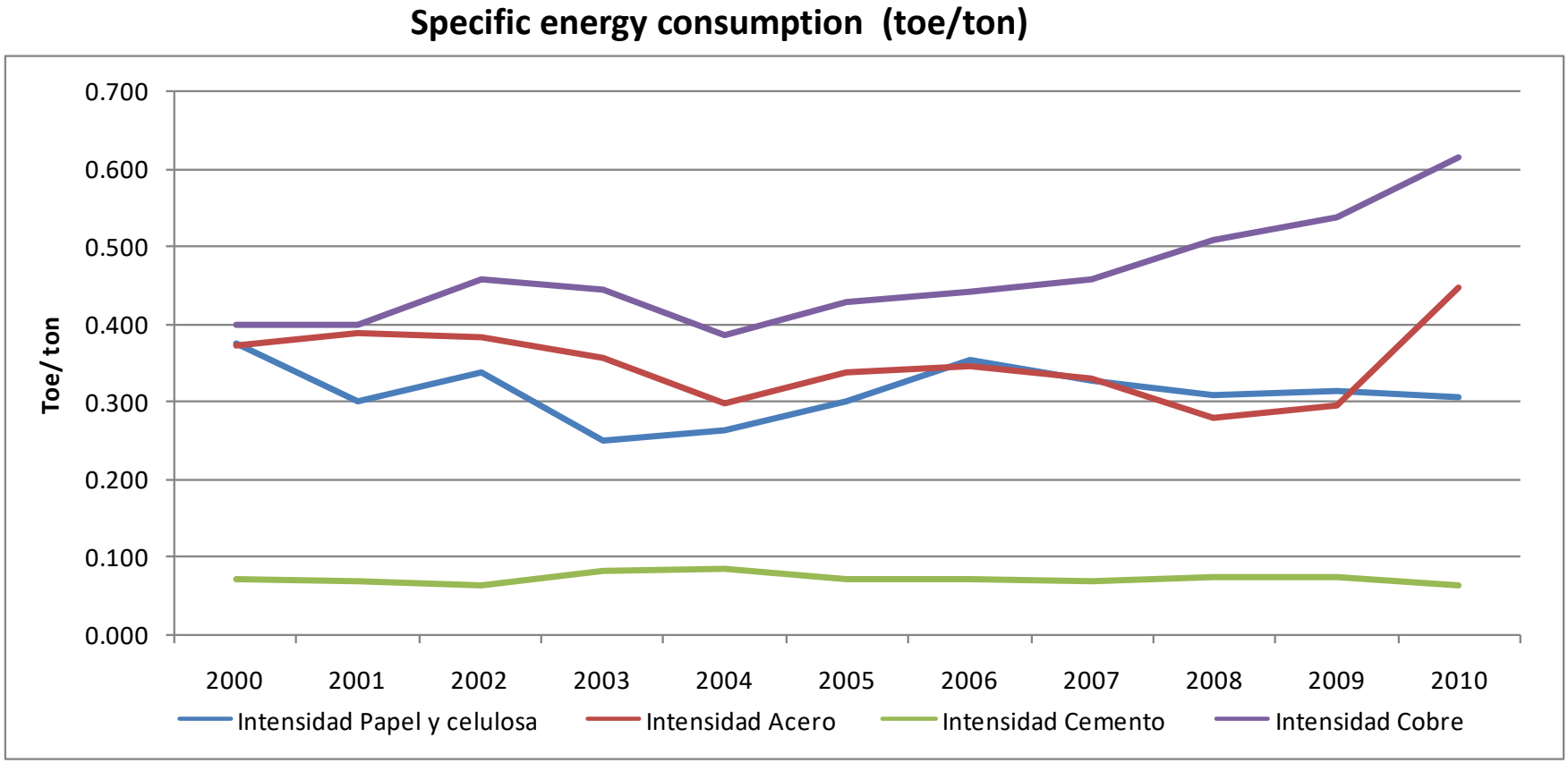
Sectoral energy intensities: case of Uruguay



Source: BIEE

Specific energy consumption of energy intensive products: case of Chile

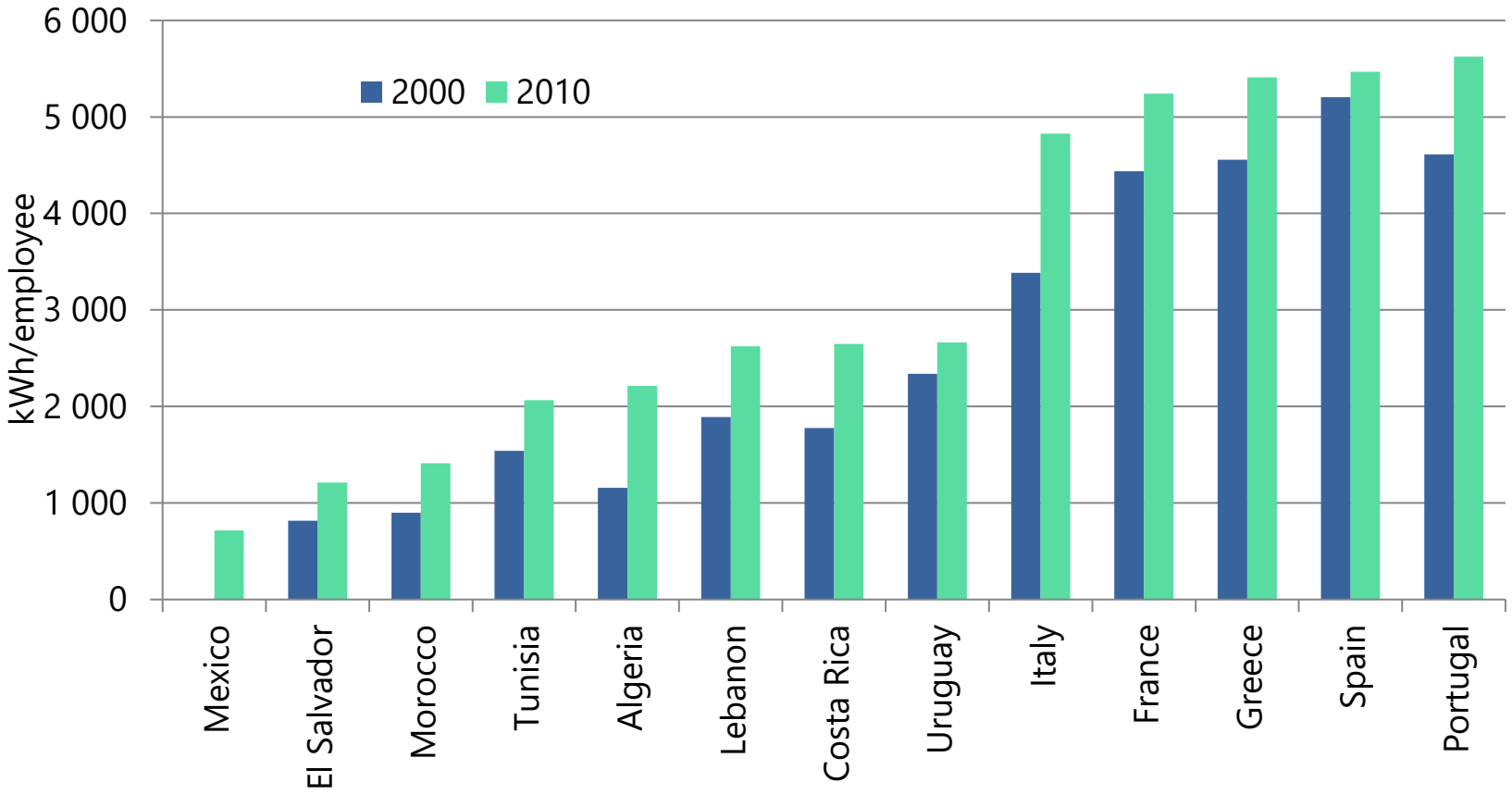
Copper is very intensive in Chile and its specific energy consumption is increasing due to less concentrated ores



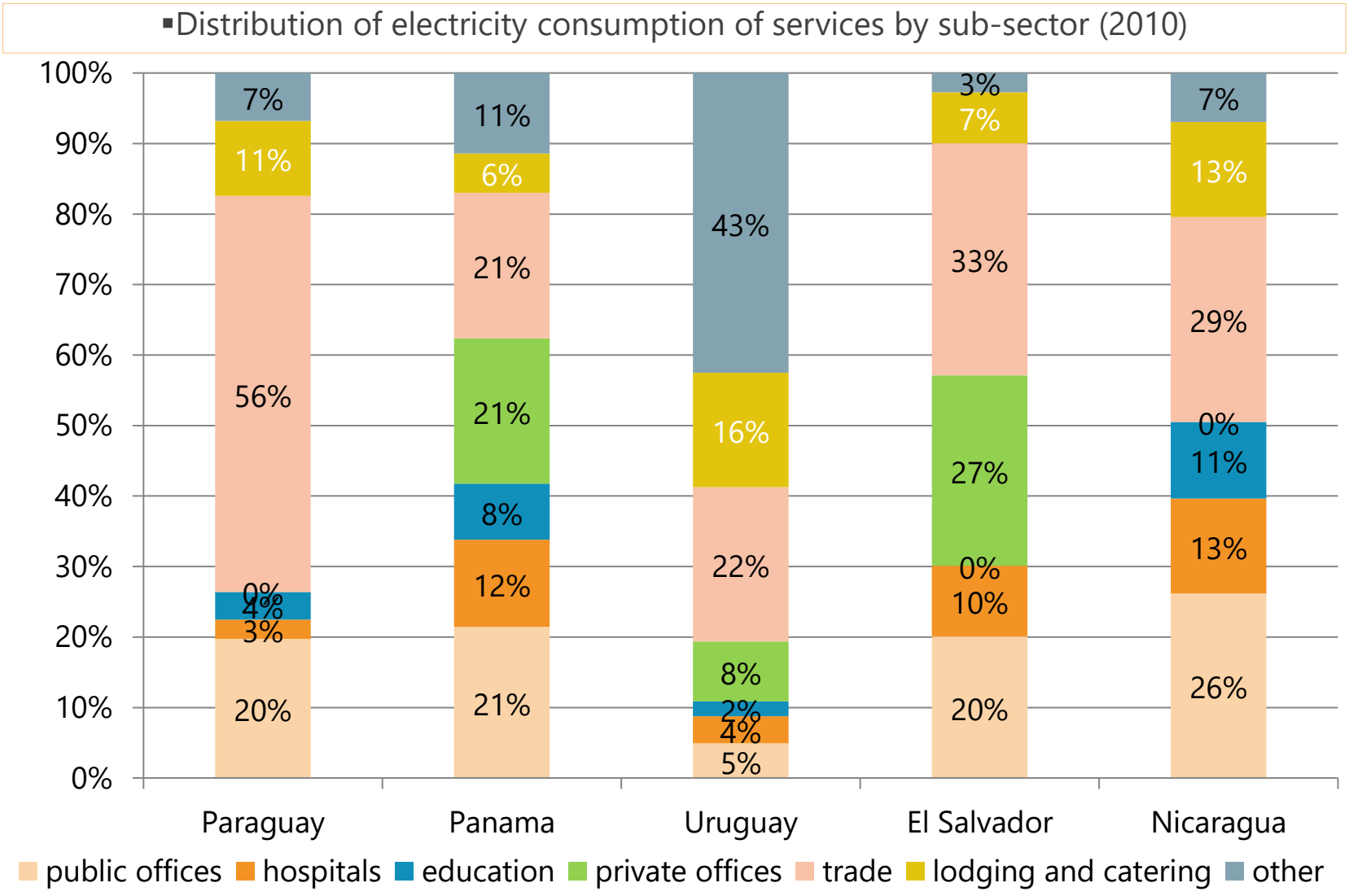
Source: BIEE, Ministerio de Energía de Chile

Specific electricity consumption per employee in services

▪Electricity consumption per employee in services: selected Mediterranean and South and Central American countries



A further breakdown is to split the consumption of services by activity according to ISIC classification



Energy efficiency indicators in agriculture

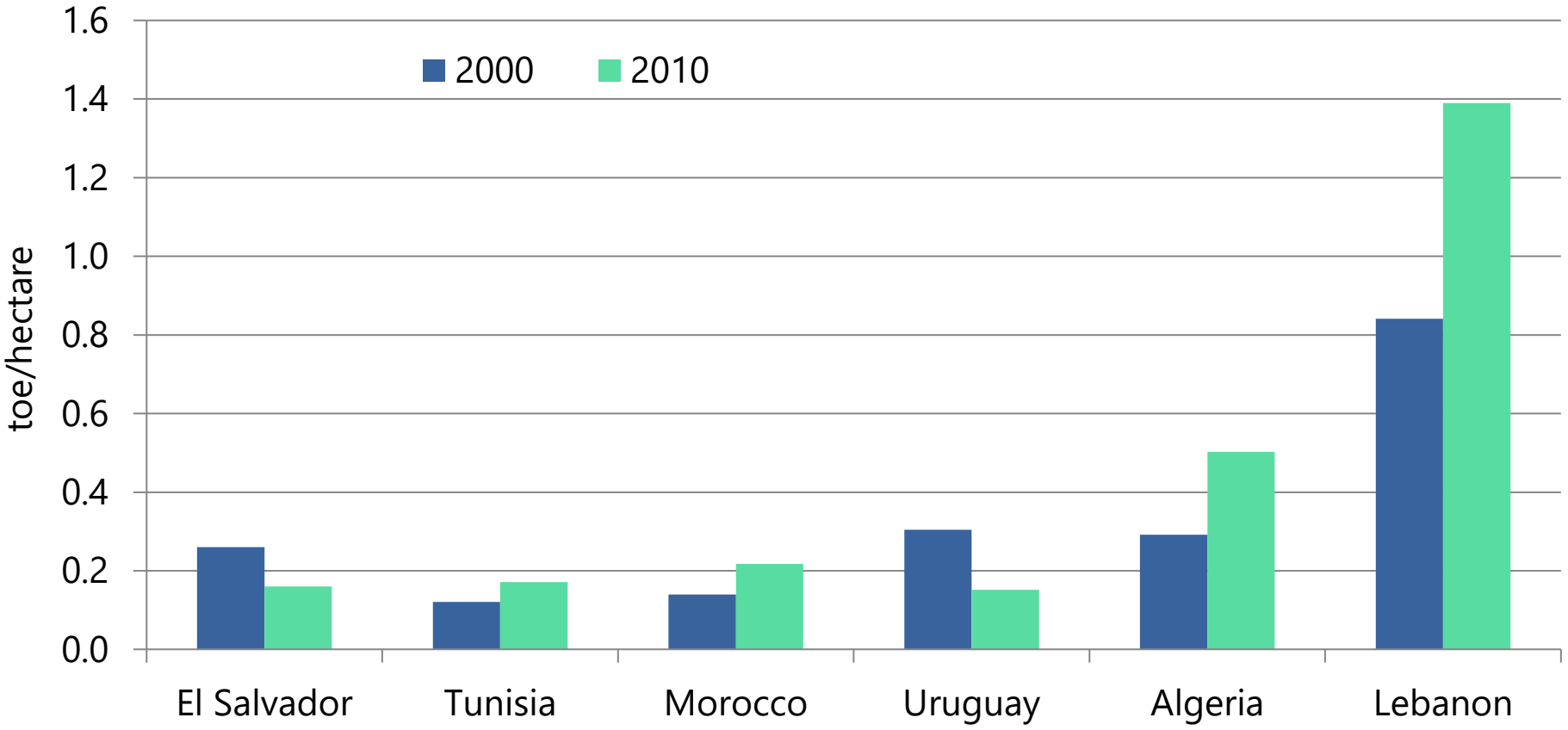
- **Overall indicators**:
  - Total energy intensity
  - Diesel intensity
  - Electric intensity

- **Indicators by sub-sector**
  - Energy intensities separated for agriculture, fishing and forestry
  - Specific consumption per hectare for agriculture
  - Specific consumption for fishing per boat

- **Indicators by type of activity (type of crop, of fishing**)

- **Indicators to be related to different explanatory factors:**
  - Rate of mechanization of agriculture
  - % of agriculture area with irrigation
  - Rate of equipment in electric and diesel pumps

Specific energy consumption of agriculture

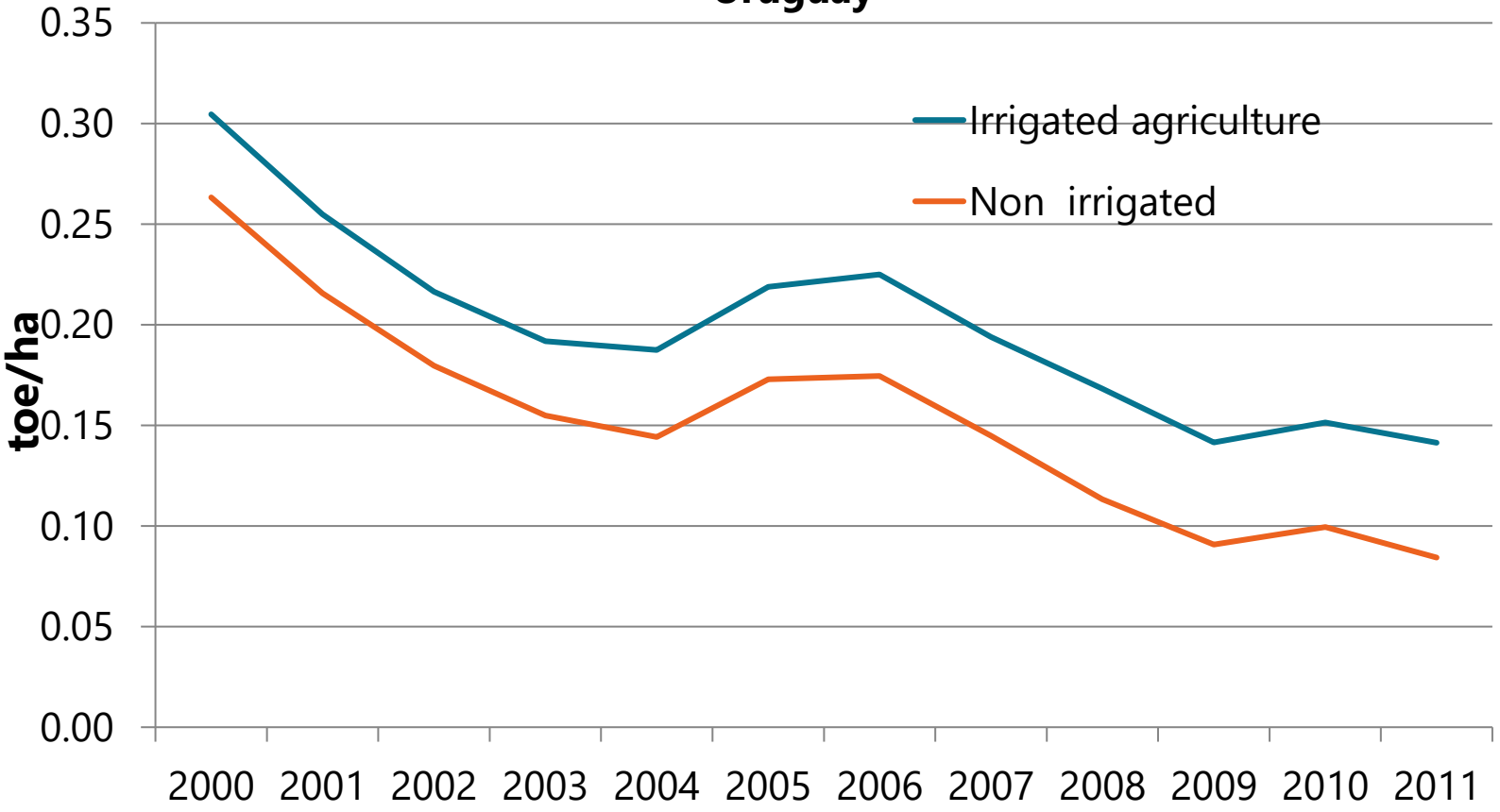


Sources: Tunisia, Morocco, Lebanon and Algeria: Medener; El Salvador, Uruguay: BIEE

Specific energy consumption of agriculture: impact of irrigation

Irrigation is twice more intensive in Uruguay (around 15% of land irrigated)

Specific energy consumption of agriculture per hectare: irrigated vs non irrigated: Uruguay



Source BIEE, from DNE/MME

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Why a template to collect data

- EEI need data on activity and data on energy consumption that usually come multiple sources: it is important to well organise and document all the required data.

- In addition, it is necessary to include the calculation of EEI, that are just division for simple indicators but can be more complex for advanced indicators.

- The BIEE template is an Excel file developed in the framework of the BIEE-ROSE project, that has been initially developed and further refined in Europe for the ODYSSEE projects.

- Similar templates have been developed in other regions (North Africa) as well as at national level for national energy efficiency agencies (e.g. Brazil, Mexico, India, Thailand, Algeria, Greece, Turkey). In that case they are customised according to the data availability in each country and the important EEI issues.

General organisation of the data template

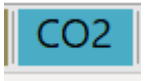
The data template is organized as follows:

- One sheet by end-use sector (7 sheets) for the storage of sectoral data and calculation of energy efficiency indicators;
- Various sheets to calculate SDG7 indicators and CO2 indicators
- A Synthesis sheet to export data in the BIEE database

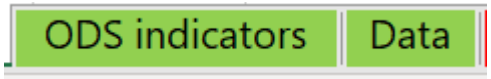
- **Grey**: user guide of the template

- **Color**: data and indicators

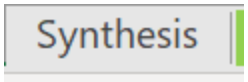
- **Light blue**: CO2 emissions and indicators



- **Light green:** SDG7 indicators



- **Grey**: summary of data & indicators to be exported in the database



Organisation of the sectoral sheets

- There are 7 sectoral sheets, as follows :
  - **"Macro"**: GDP by sector and energy balance data on primary and final energy consumption by sector and energy;
  - **Energy sector:** data on energy transformation (e.g. power sector)
  - **Industry**: data by industrial branch
  - **Transport**: data by transport mode
  - **Households**: data on equipment and end-use
  - **Services**: public and commercial sectors
  - **Agriculture**: includes fishing, forestry.

- Each sectoral sheet is organised in 3 parts:
  1. A data part for data inputs
  2. A part with automatic data control and consistency checks (control of coherence between energy consumption by end-uses and total consumption); variations over the last 5 years for a selection of data.
  3. Calculation of indicators with automatic graphs to visualise the trends.

Organisation of sectoral sheets

(1) Data part

Macro economic data

Gross Domestic Product (GDP)		Country	Units	2014	2015	2016	2017	2018	2019	source
pib	GDP in current national currency	guy	Mlc	852 153.00	883 787.00	925 677.00	980 498.00	994 472.00	1 078 729.00	Bureau of Statistics, G
pibxx	GDP at constant prices, national currency	guy	Mlc12	875 176.00	881 192.00	914 743.00	948 904.00	991 044.00	1 044 093.00	Bureau of Statistics, G
Exchange rate										
txchgus$	Exchange rate: national currency / US$	guy	1	206.50	206.50	206.50	206.50	208.50	208.50	Bank of Guyana
txchgppp	Exchange rate in ppp: national currency / $	guy	1	114.6308	113.5934	117.6992				World Bank
Value added, private consumption										
vadagr	VA at current prices of agriculture and fishing activities	guy	Mlc	103 128.65	112 118.22	93 724.15	203 983.76	174 989.09	175 340.55	Ministry of Finance
vadind	VA at current prices of industry (Section C + D + E + F)	guy	Mlc	188 938.79	195 688.39	259 199.67	264 499.50	272 351.93	297 927.44	Ministry of Finance
vadter	VA at current prices of tertiary sector	guy	Mlc	283 030.00	286 127.00	290 020.00	399 573.69	324 115.63	326 537.47	Bank of Guyana
vadagrxx	VA at constant market prices of agriculture and fishing act	guy	Mlc10	84286	89486	76145	229 509.47	245 533.61	244 849.31	Ministry of Finance
vadindxx	VA at constant market prices of industry	guy	Mlc10	186968	190493	224809	264 499.50	272 351.93	297 927.44	Ministry of Finance
vadterxx	VA at constant market prices of tertiary sector	guy	Mlc10	251 316	253 424.85	245 599.34	318 077.27	324 115.63	326 537.47	Bank of Guyana
cpr	Private consumption of households in current national curr	guy	Mlc	513 676	519 712	453 730	498 505	454 077		World Bank
cprxx	Private consumption of households in constant national cu	guy	Mlc12	527 554	518 186	448 371	482 442	452 512	0	
Population										
pop	Population	guy	k	745	742	744	741	764	767	Ministry of Finance

Organisation of sectoral sheets

(1) Data part (cont'd)

col 1 : Identification code

col 2 : Title

col 3 : Country code

col 4 : Units

col 5-X : Data (1990-2019)

col X+1: Source (acronym or abreviation)

col X+2: References, notes

Macro economic data											
Gross Domestic Product (GDP)		**Country**	**Units**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**source**
pib	GDP in current national currency	guy	Mlc	852 153.00	883 787.00	925 677.00	980 498.00	994 472.00	1 078 729.00	Bureau of Statistics, G
pibxx	GDP at constant prices, national currency	guy	Mlc12	875 176.00	881 192.00	914 743.00	948 904.00	991 044.00	1 044 093.00	Bureau of Statistics, G
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Population										
pop	Population	guy	k	745	742	744	741	764	767	Ministry of Finance

Organisation of sectoral sheets

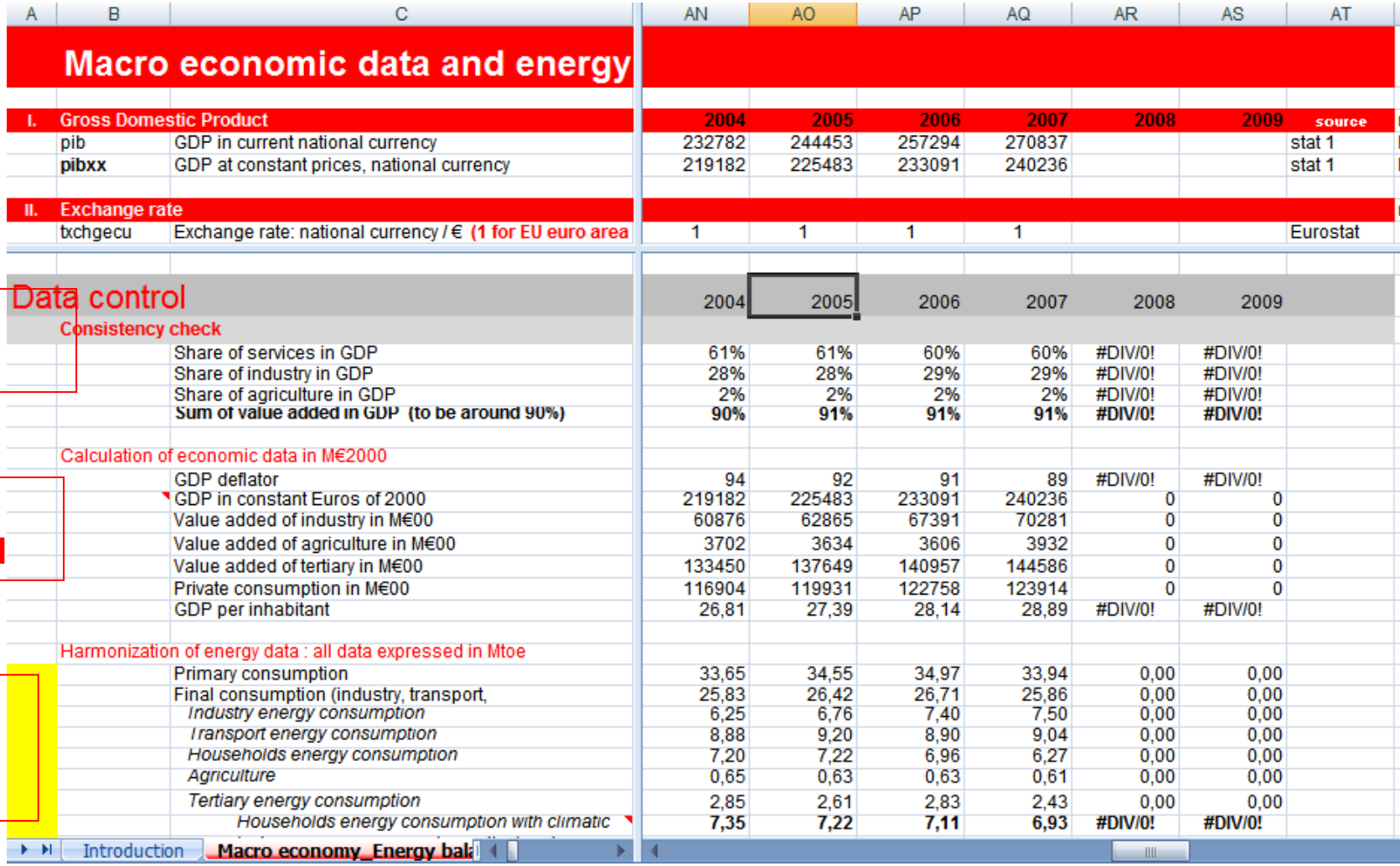
(2) Automatic data control to check the data quality

The main data controls by sector are summarised in one sheet to provide an overview of the main issues

1
Consistency check

2
Data harmonized

3
Main indicators calculated



A	B	C	AN	AO	AP	AQ	AR	AS	AT
Macro economic data and energy									
I.	**Gross Domestic Product**		**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**source**
	pib	GDP in current national currency	232782	244453	257294	270837			stat 1
	pibxx	GDP at constant prices, national currency	219182	225483	233091	240236			stat 1
II.	**Exchange rate**								
	txchgecu	Exchange rate: national currency / € (1 for EU euro area	1	1	1	1			Eurostat
	Data control		2004	2005	2006	2007	2008	2009	
	Consistency check								
		Share of services in GDP	61%	61%	60%	60%	#DIV/0!	#DIV/0!	
		Share of industry in GDP	28%	28%	29%	29%	#DIV/0!	#DIV/0!	
		Share of agriculture in GDP	2%	2%	2%	2%	#DIV/0!	#DIV/0!	
		Sum of value added in GDP (to be around 90%)	**90%**	**91%**	**91%**	**91%**	**#DIV/0!**	**#DIV/0!**	
	Calculation of economic data in M€2000								
		GDP deflator	94	92	91	89	#DIV/0!	#DIV/0!	
		GDP in constant Euros of 2000	219182	225483	233091	240236	0	0	
		Value added of industry in M€00	60876	62865	67391	70281	0	0	
		Value added of agriculture in M€00	3702	3634	3606	3932	0	0	
		Value added of tertiary in M€00	133450	137649	140957	144586	0	0	
		Private consumption in M€00	116904	119931	122758	123914	0	0	
		GDP per inhabitant	26,81	27,39	28,14	28,89	#DIV/0!	#DIV/0!	
	Harmonization of energy data : all data expressed in Mtoe								
		Primary consumption	33,65	34,55	34,97	33,94	0,00	0,00	
		Final consumption (industry, transport,	25,83	26,42	26,71	25,86	0,00	0,00	
		Industry energy consumption	6,25	6,76	7,40	7,50	0,00	0,00	
		Transport energy consumption	8,88	9,20	8,90	9,04	0,00	0,00	
		Households energy consumption	7,20	7,22	6,96	6,27	0,00	0,00	
		Agriculture	0,65	0,63	0,63	0,61	0,00	0,00	
		Tertiary energy consumption	2,85	2,61	2,83	2,43	0,00	0,00	
		Households energy consumption with climatic	**7,35**	**7,22**	**7,11**	**6,93**	**#DIV/0!**	**#DIV/0!**	

Introduction | Macro economy_Energy bal

Organisation of sectoral sheets

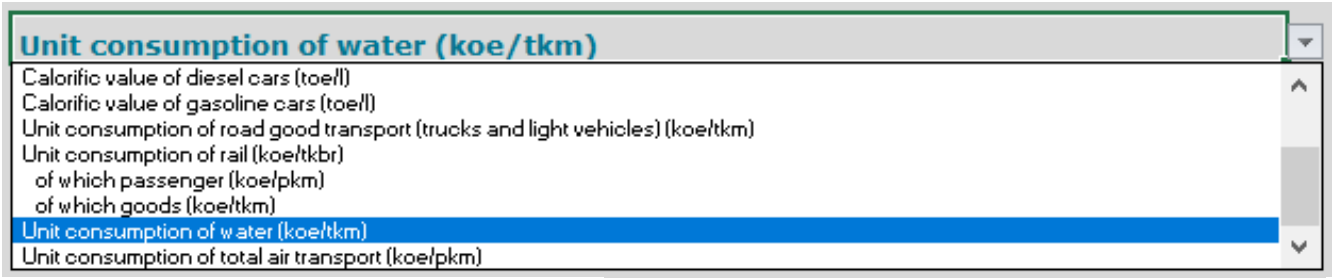
(3) Calculation of indicators with automatic graphs

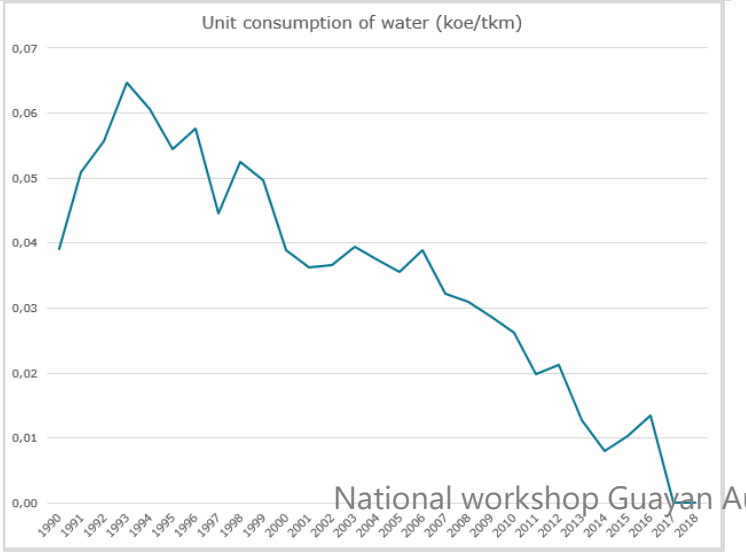
Macro | **Energy sector** | Industry | Transport | Services | Households | Agriculture

- **Graphics**

In each sectorial sheet, there is a graphic representation of the main indicators (in the « Selection of the main indicators » part).

You can choose the series to plot in the drop list.





SDG 7 indicators calculation

- Automatic calculation of SDG7 indicators (on energy access, renewables and energy efficiency) in the sheet « ODS indicators » based on data collected in sectoral sheets

OSD Indicators													
					3	24	25	26	27	28	29	30	31
Series code	English title	Spanish title	Country code	Unit	2009	2010	2011	2012	2013	2014	2015	2016
	7.1 Energy access												
	% of households with access to clean cooking technologies	% de hogares con acceso a combustible limpio para cocinar											
pcdwgascui	percent of dwelling with natural gas as main cooking fuel	Porcentaje de viviendas con gas natural como principal c	guy	%									
pcdwlpgcui	percent of dwelling with LPG as main cooking fuel	Porcentaje de viviendas con gas licuado como principal c	guy	%	56.2	58.6	61.1	63.5	65.9	68.4	70.8	73.2
pcdwelecui	percent of dwelling with electricity as main cooking fuel	Porcentaje de viviendas que usan electricidad como princ	guy	%	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0
pcdwcleancui	**% of households with access to clean cooking te**	**% de hogares con acceso a combustible limpio p**	**guy**	**%**	**57.4**	**59.8**	**62.2**	**64.6**	**67.0**	**69.4**	**71.8**	**74.2**
	% of clean fuels in households consumption	% de combustibles limpios en el consumo de los hogares											
gplcfres	Consumption of LPG of residential	Consumo de LPG de los hogares	guy	ktoe	10	11	12	12	13	13	14	15
gazcfres	Consumption of gas of residential	Consumo de gas de los hogares	guy	ktoe								
elccfres	Consumption of electricity of residential	Consumo de electricidad de los hogares	guy	ktoe	17	19	20	21	22	25	24	25
toccfres	Total consumption of households	Consumo total de los hogares	guy	ktoe	79	83	79	83	76	77	78	78
pccfcleanres	**% of clean fuels in households consumption**	**% de combustibles limpios en el consumo de los**	**guy**	**%**	**34.9**	**36.7**	**40.6**	**40.8**	**46.5**	**49.8**	**48.6**	**51.6**
	% of households with access to electricity	% de hogares con acceso a electricidad											
teqele	**% of households with access to electricity**	**% de hogares con acceso a electricidad**	**guy**	**%**	**82.9**	**84.9**	**86.8**	**88.8**	**89.2**	**89.5**	**89.8**	**90.1**
	% of households with efficient wood cooking stoves	% de hogares con cocinas de leña eficientes											
teqstove	**% of households with efficient wood cooking sto**	**% de hogares con cocinas de leña eficientes**	**guy**	**%**									
	7.2 Renewables												
	% of renewables in TPES	% de renovables en la oferta total											
enrcp	Biomass total consumption	Consumo primario de biomasa	guy	ktoe	210	202	237	201	175	163	173	159
hydpd	Hydro electricity production	Producción de electricidad hydro	guy	ktoe								
egepd	Geothermal and solar electricity production	Producción de electricidad geotérmica y solar	guy	ktoe	0	0	0	0	0	0	0	0
edvpd	*of which solar electricity production*	*de la cual solar*	*guy*	*ktoe*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

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1. Why energy efficiency indicators ?
2. Data collection and indicators
3. BIEE template used for data collection
4. **BIEE data mapper**
5. Annexes

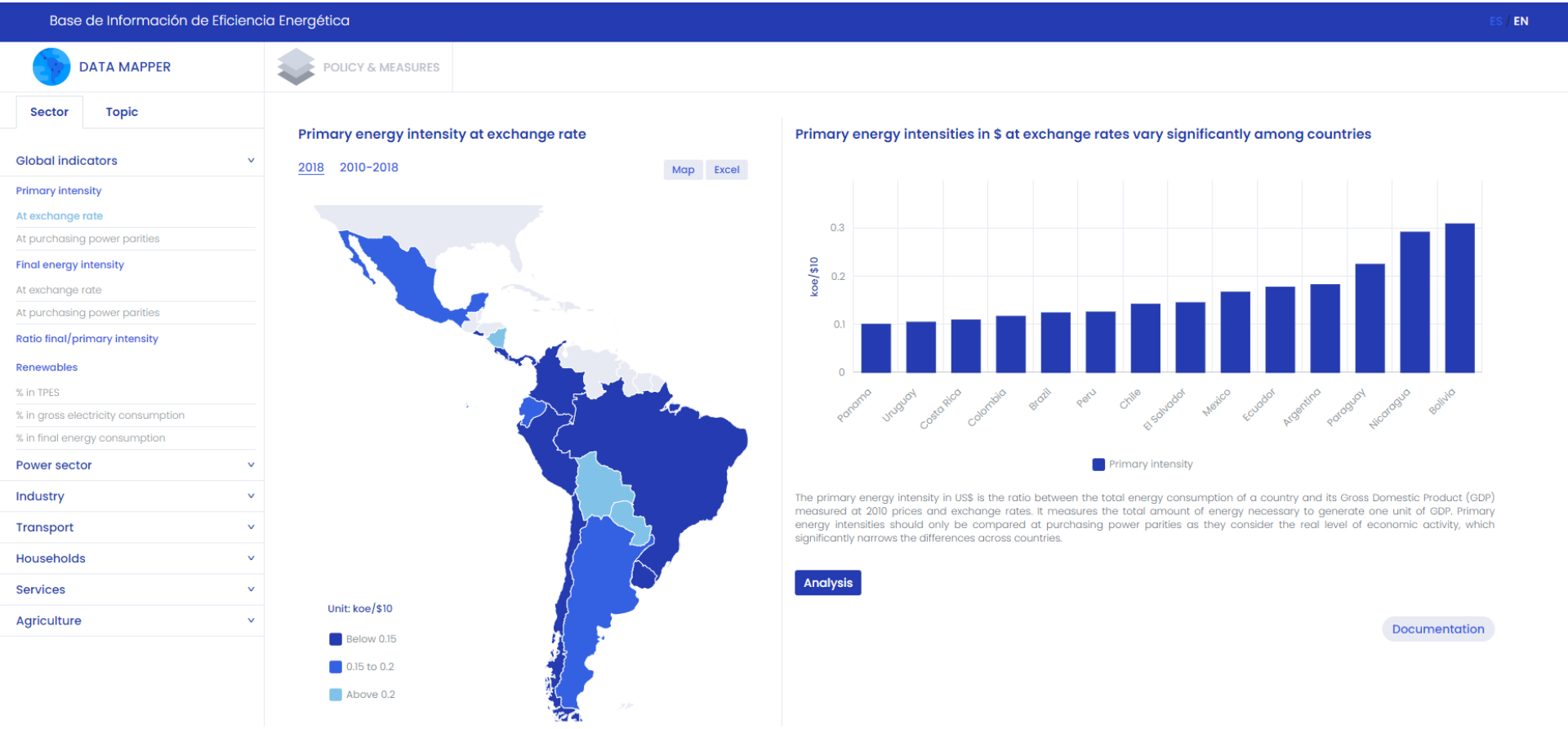
BIEE data mapper: main features

- The BIEE data mapper gives access to a selection of indicators showing both the range of values by country on a map and a ranking of countries (bar charts).
- Both levels and trends are available.
- Open access
- Key messages and a short analysis is available for each indicator in English and Spanish
- Possibility to access to some additional indicators to explain the trends observed ("Analysis")

→ Data collected for Guyana trough the template will be added in the BIEE data mapper

BIEE data mapper: online demonstration

- https://biee-cepal.enerdata.net/datamapper/



Content Table

Annex 1: additionnal information on energy efficiency

Data requirements by sector: transport

- **Priority 1**
  - Stock of vehicles by fuel type
  - Energy consumption by mode (road, rail, water, air)
  - Passenger and freight traffic of rail and water transport
  - Passenger traffic by air

- **Priority 2**
  - ❖ Sales of new vehicles
  - ❖ Specific consumption of new cars

- **Priority 3**
  - ○ Energy consumption by road transport vehicle
  - ○ Passenger and freight traffic of road transport and cars
  - ○ Annual distance travelled by car

Basic indicators in transport

Indicator	Comment
Energy consumption of transport per capita	Very aggregate ; includes change in vehicles ownership
Energy intensity of transport to GDP	Very aggregate ; measures the relative variation between energy use and GDP
Energy consumption of road transport per vehicle	Includes change in mix of vehicles
Gasoline consumption of transport per gasoline vehicle (including biofuels)	Includes change in mix of vehicles
Diesel consumption of transport per diesel vehicle (including biofuels)	Includes change in mix of vehicles
Energy consumption of road transport per car equivalent	Cleaned from changes in mix of vehicles ➔ in ODYSSEE

Advanced indicators on transport

Indicators
Energy consumption of air, water and rail transport per unit of traffic (passenger-km or tonnes-km)
Energy consumption of buses per pkm (goe/pkm)
Energy consumption of rail transport per pkm (goe/pkm)
Energy consumption of rail transport per tkm
Energy consumption of water transport per tkm
Mobility in public transport per capita
Share of public transport in total passenger traffic
Share of rail & water transport for goods

Advanced indicators for road vehicles

Indicators
litres/100 km for cars
litres/100 km for trucks
litres/100 km for light duty vehicles
litres/100 km for new cars
Share of low emission or efficient cars in annual sales
goe/passenger-km for buses
toe/car , toe per truck, toe per light duty vehicle
Energy consumption of road goods transport per ton-km

SEC: Specific Energy Consumption

Data requirements by sector: Households

➢ **Priority 1**

- Number of dwellings
- Equipment ownership; fans; electric water heaters
- Multiple ownership (TV, AC, fans)
- Cooking fuel mix
- Share of dwelling with gas and gas appliance (water heaters)

Useful for estimation consumption by end-use

➢ **Priority 2**

❖ Penetration of efficient appliances, CFL, solar water heaters, cooking stove?

❖ Definition of efficiency label (ie consumption band)

Priority 3

- Sales by appliance
- Energy consumption by end-uses
- Specific consumption per appliance

Basic indicators for households

Indicator	Comment
Energy consumption per household	Very aggregate ; includes change in equipment ownership
Electricity consumption per household	Very aggregate ; includes change in equipment ownership and electrification
Electricity consumption per electrified household	Very aggregate ; includes change in equipment ownership
Energy consumption of dwelling per unit of private consumption	Very aggregate ; measures the relative variation between energy use by household and their private consumption (a proxy for income)

Indicators of specific consumption by main end-use : cooling, cooking and water heating, electrical appliances

Indicators	Type
Energy consumption for cooking per household	SEC
Useful energy consumption for cooking per household	SEC
Specific electricity consumption for lighting (kWh/dwelling)	SEC
Energy consumption for water heating per dwelling	SEC
Energy consumption for water heating per capita	SEC
Specific electricity consumption per appliance (kWh/dwelling)	SEC

SEC: Specific Energy Consumption

Activity data in industry : overview

- Activity data by branch are usually collected by National Statistical Offices
- The branch covered follows at national level national classifications that are usually adapted from international classifications:
- Published by National Statistical Offices often in current prices, sometimes also at constant price
- If constant price not available, data may be given with price index by branch and/or index of volume by branch ➔ can be used to calculate value added values at constant price

Energy consumption by branch: main sources

Different sources of information are available:

- The most comprehensive sources are industrial surveys;
- The other source is administrative , i.e. the administration; requires utilities and/or consumers to provide the information;
- Modeling may be used to complete the information for intermediate years;
- Metering relate to audits data that can only be used at national level if the sample is representative.

Content Table

Annex 2: Indicators for energy access and renewables

Proposed indicators for energy access (7.1)

% of households with access to clean cooking technologies
% of clean fuels in households consumption
% of households with access to electricity

Indicators for renewables in power sector

Share of renewables in power generation (i.e. in power mix):

- Total (actual)
- Total (normalized)
- Without large hydro (actual)
- Without large hydro (normalized)

Share of renewables in electricity capacity

- Total
- Without hydro

Share of renewables in electricity consumption (actual)

Share of renewables in electricity consumption (normalized)

Indicators for renewables: households and transport

Households
Share of renewables in household final consumption
Share of renewables in household final consumption (including renewable electricity)
Share of biomass in household sector
Area of solar water heaters: • Total area • Area per capita

Transport
Share of biofuels in transport sector
Share of renewables in transport sector (including renewable electricity)
Share of biofuels in road transport
Share of biofuels in consumption of gasoline and diesel in road transport (i.e. average blending rate)

Indicators for renewables: services and industry

Share of renewables in services final consumption
Share of renewables in services final consumption (including renewable electricity)
Share of renewables in industry final consumption
Share of renewables in industry final consumption (including renewable electricity)