

# 6. Data sources and collection strategies for renewable energy

**IRENA Renewable Energy Statistics Training**



# Outline

- Renewable energy sampling strategy
- Administrative data
- Trade data
- Using surveys to collect energy data

# RE sampling strategy

## Who produces and uses renewable energy?

FLOW	SECTOR						
	Energy	Industry	Commerce	Services	Other (AFF)	Transport*	Households
<b>Commodity production</b>	Primary and secondary fossil fuels and <b>primary renewable heat</b>	Secondary fossil fuels, <b>primary renewable heat, biofuels and waste</b>		<b>Waste, biofuels (solids, biogas)</b>	<b>Biofuels (solids, biogas)</b>		<b>Biofuels (solids, biogas) and primary renewable heat (solar water heating)</b>
<b>Commodity trade, stock changes and bunkers</b>	Primary and secondary fossil fuels and <b>biofuels</b>	Primary and secondary fossil fuels and <b>biofuels</b>	Primary and secondary fossil fuels and <b>biofuels</b>	Primary and secondary fossil fuels and <b>biofuels</b>	Primary and secondary fossil fuels and <b>biofuels</b>	Primary and secondary fossil fuels and <b>biofuels, international bunkers</b>	
<b>Electricity and heat production and associated transformation</b>	<b>Electricity and heat from all sources [MAIN ACTIVITY PRODUCERS]</b>	<b>Electricity and heat from all sources</b>	<b>Electricity from renewables (small-scale devices, such as solar PV, wind)</b>	<b>Electricity and heat from all sources, especially waste, biogas and solar PV</b>	<b>Electricity and heat from all sources, especially biofuels</b>	<b>Electricity from all sources (for rail)</b>	<b>Electricity from renewables (small-scale devices, such as solar PV, wind)</b>
<b>Other transformation</b>	Primary to secondary fuel transformation	<b>Primary to secondary fuel transformation</b>					<b>Charcoal production</b>
<b>Distribution losses</b>	Electricity, heat and <b>fuel losses</b>	Electricity, heat and <b>fuel losses</b>		Electricity, heat and <b>biogas losses</b>	Electricity, heat and <b>biofuel losses</b>	<b>Fuel losses</b>	
<b>Final consumption by sector</b>	Own use and final sales of all energy types	Own use and final sales of <b>all energy types</b>	Own use of all energy types and final sales of <b>fuels</b>	Own use of all energy types and final sales of <b>waste, biofuels, electricity and heat</b>	Own use of all energy types and final sales of <b>biofuels, electricity and heat</b>	Own use of all energy types and final sales of secondary fossil fuels and <b>biofuels</b>	Own use of all energy types and final sales of <b>biofuels</b>

\* Transport includes fuel retailing, as well as road, rail, air and shipping operators

# Administrative data sources

## Regulators:

- Power sector (production, end-use sectors)
- Planning authorities (capacity)
- Issuance of permits (biofuels, waste, others)
- Tax records (sales taxes and duties)

## Incentive schemes:

- Government agencies and tax authorities

## Existing survey sources:

- Business surveys (autoproduction)
- HH surveys and census (off-grid production)

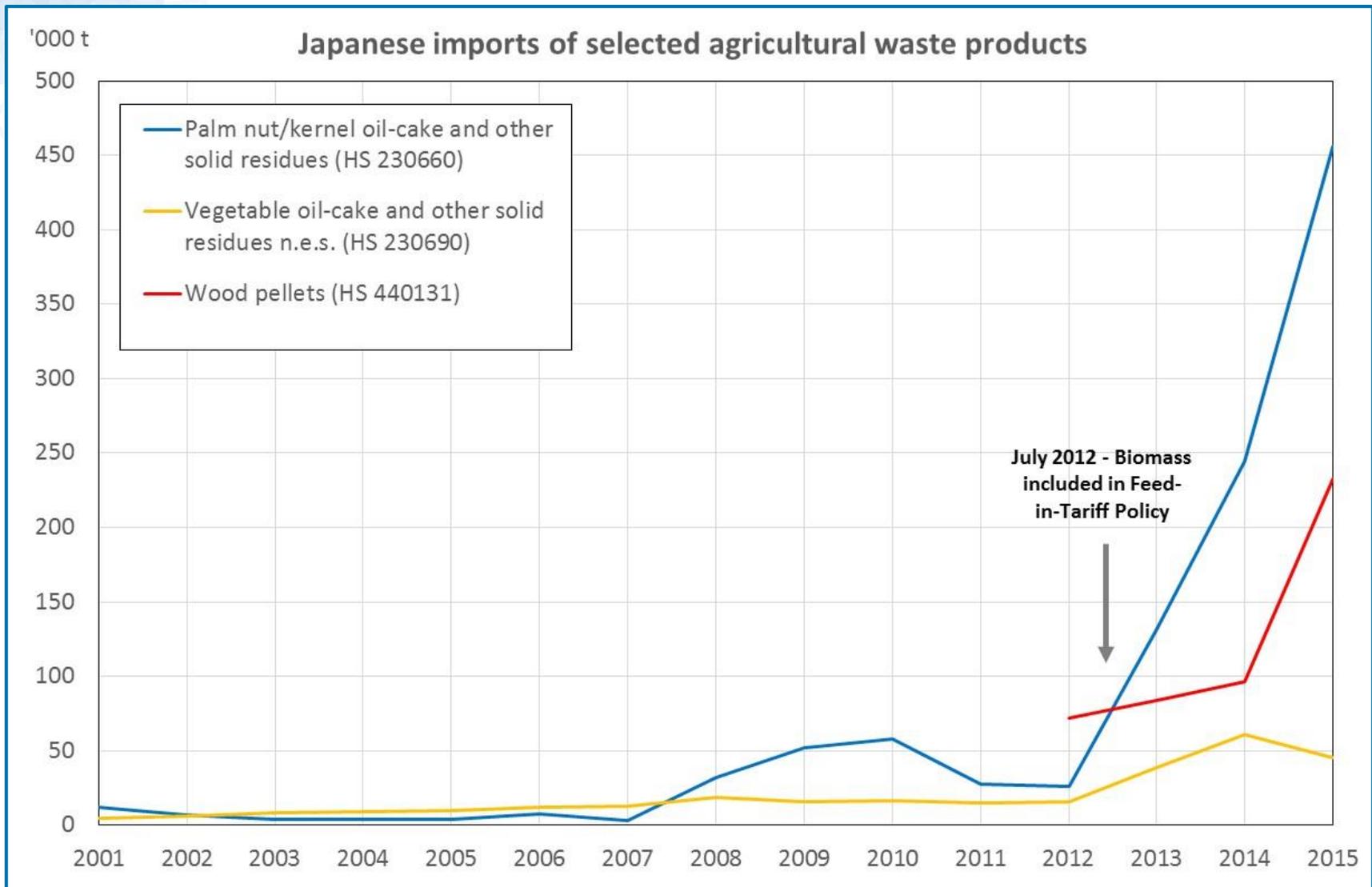
# Trade data (HS 2012 codes)

## Biofuels:

- Woodfuel 1401.10\*, 4401.10, 4401.21/22\*
- Charcoal 4402.00
- Wood waste 4401.21/22/39\*, 4707.10-90\*
- Straw 1213.00\*
- Bagasse 2303.20\*
- Rice husks 2302.40\*
- Biomass pellets 4401.31, plus many others!
- Biogasoline 2207.20\*, 2905.11/13/14\*,  
2905.14\*, 2909.19\*
- Biodiesel 2710.20\*, 3826.00\*

\* = only part of a product category may be used for energy

# Trade data (HS 2012 codes)



# Trade data (HS 2012 codes)

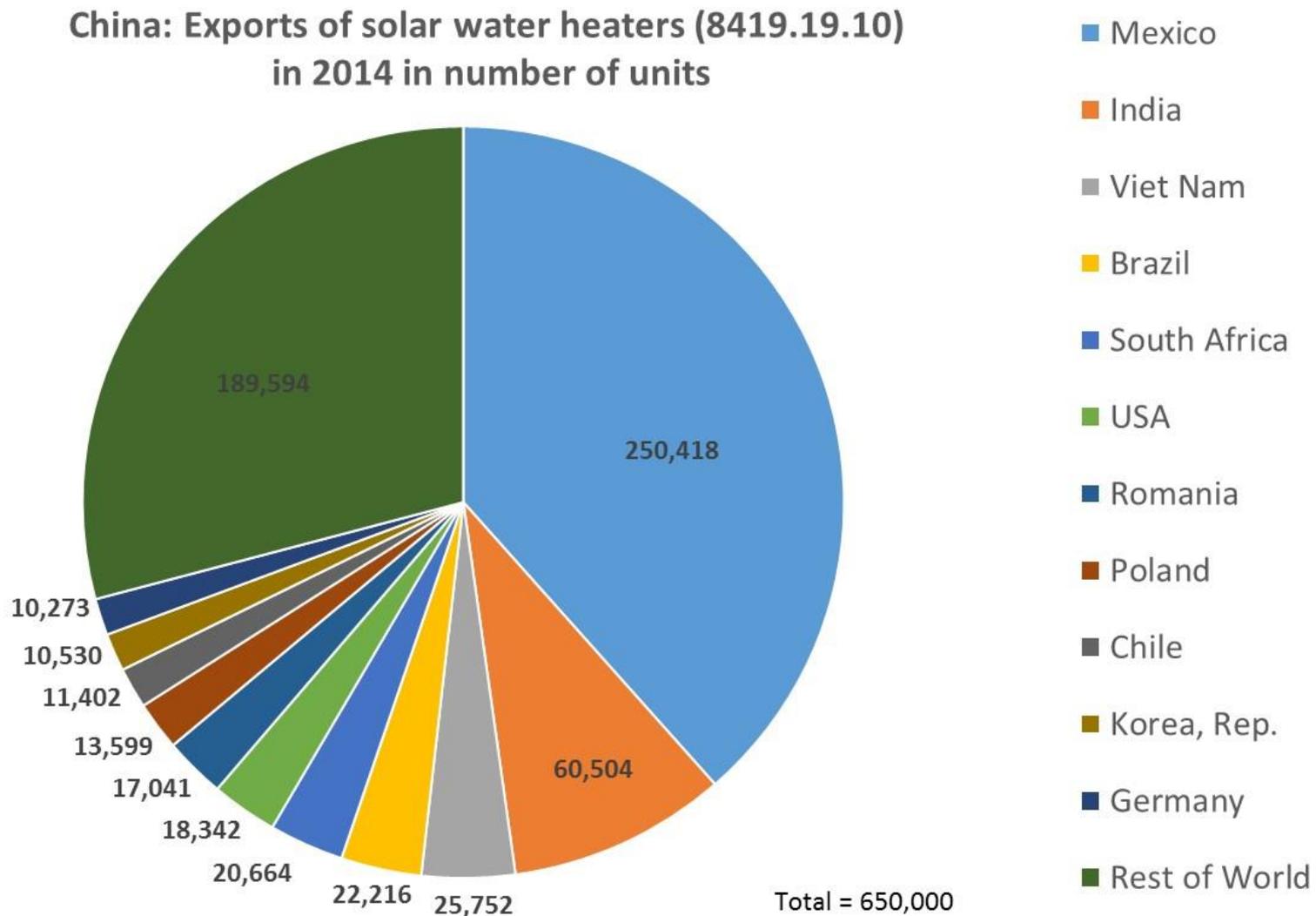
## Equipment:

- Solar panels 8541.41\*  
*(Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; **light-emitting diodes**)*
  
- Solar water heaters 8419.19\*  
*(Instantaneous or storage water heaters, non-electric, other) - ex. gas*

Trade data always records amount, value and weight, which can be used to estimate capacity  
*(e.g. 10 W per kg of solar panels)*

# Trade data: solar heaters

China: Exports of solar water heaters (8419.19.10)  
in 2014 in number of units

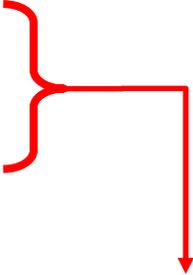


# Enterprise surveys

## Sampling strategy:

- Sampling frame: registered enterprises (businesses)
- Population: establishments (facilities) or enterprises
- Stratified sampling based on
  - Industry
  - Geography (region, province, etc.)
  - Size (small/medium/large turnover)
- Checking across enterprises and between years
- Imputation from similar enterprises
- Sampling strategy often in-line with other enterprise surveys

## Survey instrument - energy consumption:

- Questionnaire (paper, online, telephone)
  - Annual (+quarterly/monthly production, for some)
  - I. Identification and classification of company
  - II. Energy consumption (including self-generation):
    - As fuel for industrial production
    - For electricity production
    - For commercial heat
    - For non-energy uses
  - III. More detailed questionnaire on electricity and heat production, losses, own-use, capacity, customers, etc.  
*(In some detail for main activity energy producers)*
- 

# Example (Canada):

**Business activity**

1. Statistics Canada uses the **North American Industrial Classification System** to classify the activities of each business. According to our records, this business's **main activity** is classified as:

Is this the **main activity** of this business?

B05002

Yes, this is the **main activity** of this business. ▶ **Go to question 1c**

No, this is **not the main activity** of this business. ▶ **Go to question 1a**

▼

a. Was this business's main activity, which typically generates the most revenue, **ever** classified as described above?

B05111

Yes ▶ **When did the main business activity change?** ▶ **Date :** B05219

YYYY MM DD

No ▶ **Go to question 1b**

▼

b. Please provide a **brief but precise description** of this business's **main activity** (e.g., "breakfast cereal manufacturing" or "shoe store" or "software development").

B05003

c. Approximately what **percentage of this business's revenue** is generated by this **main activity**? Estimates are acceptable. .... B05004   %

Are there any other activities that **contribute significantly** (at least 10%) to this **business's revenue**?

B05004

Yes ▶ **Go to question 1d**

No ▶ **Go to next page**

d. Please provide a **brief but precise description** of this business's **secondary activity** (e.g., "breakfast cereal manufacturing" or "shoe store" or "software development").

B05005

*Annual industry energy consumption questionnaire*

# Example (Canada):

Type of energy consumed					
1. Which type of energy was consumed by this business?					
Type of energy commodity <small>Please report only the consumed portion</small>	Unit of measure	Amount consumed			
		* as fuel for the production process	to produce steam for sale to another business	to produce electricity	** for non-energy use
<b>Electricity</b>	E42001_UCM	E42001			
self-generated .....			<del>                    </del>	<del>                    </del>	<del>                    </del>
	E46001_UCM	E46001			
purchased .....			<del>                    </del>	<del>                    </del>	<del>                    </del>
	E61002_UCM	E61002	E61003	E61004	E61005
<b>Natural gas</b> .....					
	E61007_UCM	E61007	E61008	E61009	E61011
<b>Propane</b> .....					
	E61013_UCM	E61013	E61014	E61015	E61016
<b>Middle distillates</b>					
diesel (on-site only) .....					
	E61018_UCM	E61018	E61019	E61021	
light fuel oil .....					<del>                    </del>
	E61023_UCM	E61023	E61024	E61025	
kerosene and other middle distillates .....					<del>                    </del>
<b>Heavy fuel oil</b>					
foreign country .....	E61027_UCM	E61027	E61028	E61029	E61031
	E61033_UCM	E61033	E61034	E61035	E61036
Canadian (domestic) companies .....					
	E61038_UCM	E61038	E61039	E61041	
<b>Wood and wood waste</b> .....					<del>                    </del>
	E61043_UCM	E61043	E61044	E61045	
<b>Spent pulping liquor</b> .....					<del>                    </del>
<b>Refuse – please specify:</b>					
<small>B40034_p8</small>	E61047_UCM	E61047	E61048	E61049	E61051

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# Example (Canada):

CO-GENERATION					
<p><i>Co-generation is defined as the simultaneous generation of electricity and useful thermal energy (e.g. steam) in one process and from the same fuel source. Types of co-generation units/systems include condensing steam turbines, combined cycle gas turbines, etc.</i></p>					
<p>1. Does this business, organization or institution have a co-generation unit / system?</p> <p>010 1 <input type="radio"/> Yes</p> <p>3 <input type="radio"/> No → please go to question 4</p>					
<p>2. For all co-generation units/systems at your establishment, please complete the following table for the calendar year 2005, and indicate:</p> <ul style="list-style-type: none"> <li>• electrical and thermal capacity (as a total for all units)</li> <li>• the amount of electricity and thermal energy produced (as a total for all units)</li> <li>• the amounts of electricity and thermal energy that were either sold to another establishment or consumed by your establishment.</li> </ul>					
Co-generation Product	Unit of Measure	A Total Capacity	B Total Amount Produced	C Total Amount Sold to another establishment	D Total Amount Consumed at your establishment (column B - column C)
Electricity	011 1 <input type="radio"/> KWh 2 <input type="radio"/> MWh 3 <input type="radio"/> GJ 4 <input type="radio"/> other (please specify) 012	013	014	015	016
Useful thermal energy (e.g. steam)	017 1 <input type="radio"/> KWh 2 <input type="radio"/> MWh 3 <input type="radio"/> GJ 4 <input type="radio"/> other (please specify) 018	019	020	021	022

*Annual energy production questionnaire (sub-sample)*

*A more complicated questionnaire is also used for main activity energy producers*

# Example (Canada):

		MW.h	
<b>1. ELECTRICITY GENERATED</b> <b>ÉLECTRICITÉ PRODUITE</b>			
<b>Note:</b> These generation figures should aggregate to Schedule #4 annual figures. <b>Nota :</b> Ces chiffres de production doivent se concorder aux chiffres rapportés sur le questionnaire annuel # 4.	Hydro - Hydraulique	1.1	
	Steam - Vapeur	1.2	
	Nuclear - Nucléaire	1.3	
	Internal combustion - Combustion interne	1.4	
	Combustion turbine - Turbine à combustion	1.5	
	Tidal - Marémotrice	1.6.1	
	Wind - Éolienne	1.6.2	
	Solar - Solaire	1.6.3	
	Other (specify) - Autre (préciser)	1.6	
	Total generation - Production totale	1.9	

*Monthly large generators questionnaire (sub-sample)*

# Enterprise surveys

## Survey instrument - biofuel production:

- Annual questionnaire (paper, online, telephone)
- Often part of agriculture, forestry or waste surveys
- More detail on raw material sources and types
- Pay careful attention to measurement units
- May also include details of customers/end-uses

Surveys of retailers may also be useful in some circumstances (e.g. pellets, charcoal, liquid biofuels)

# Household surveys

## Useful for:

- HH energy use (especially non-electricity)
- Off-grid solar and wind
- Solar water heating, cooking fuel
- Biofuel production and consumption

## Survey instrument:

- Annual questionnaire, often integrated into other household surveys
- Pay careful attention to measurement units

# Sampling strategy

FLOW	SECTOR						
	Energy	Industry	Commerce	Services	Other (AFF)	Transport*	Households
Commodity production	Primary and secondary fossil fuels and primary renewable heat	secondary fossil fuels, primary renewable heat, biofuels and waste		Waste, biofuels (solids, biogas)	Biofuels (solids, biogas)		Biofuels (solids, biogas) and primary renewable heat (solar water heating)
Commodity trade, stock changes and bunkers	Primary and secondary fossil fuels and biofuels	Primary and secondary fossil fuels and biofuels	Primary and secondary fossil fuels and biofuels	Primary and secondary fossil fuels and biofuels	Primary and secondary fossil fuels and biofuels	Primary and secondary fossil fuels and biofuels, international bunkers	
Electricity and heat production and associated transformation	Electricity and heat from all sources [MAIN ACTIVITY PRODUCERS]	Electricity and heat from all sources	Electricity from renewables (small-scale devices, such as solar PV, wind)	Electricity and heat from all sources, especially waste, biogas and solar PV	Electricity and heat from all sources, especially biofuels	Electricity from all sources (for rail)	Electricity from renewables (small-scale devices, such as solar PV, wind)
Other transformation	Primary to secondary fuel transformation	Primary to secondary fuel transformation					Charcoal production
Distribution losses	Electricity, heat and fuel losses	Electricity, heat and fuel losses		Electricity, heat and biogas losses	Electricity, heat and biofuel losses	Fuel losses	
Final consumption by sector	Own use and final sales of all energy types	Own use and final sales of all energy types	Own use of all energy types and final sales of fuels	Own use of all energy types and final sales of waste, biofuels, electricity and heat	Own use of all energy types and final sales of biofuels, electricity and heat	Own use of all energy types and final sales of secondary fossil fuels and biofuels	Own use of all energy types and final sales of biofuels

\* Transport includes fuel retailing, as well as road, rail, air and shipping operators

*Most energy data can be collected from four surveys*



# IRENA

International Renewable Energy Agency

**Questions?  
Thank you!**