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Overview of Energy Flow Accounts

System of Environmental Economic Accounting

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Outline

- **Level 1**: What are energy flow accounts? (30min)
  - Links to other SEEA accounts
  - Links to SDGs
- Group exercise (30min)
- **Intermezzo:** Linking energy balances and energy accounts (15min)
- **Level 2**: Issues, data sources, country examples (20min)
- Questions and discussion (10min)

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Learning objectives

- **Know** what Energy Flow Accounts are and why they are important
- **Understand** the basic concepts and how they are treated in the SEEA
- **Learn** to compile Energy Flow Accounts
- **Understand** how Energy Flow Accounts are linked with Energy Balances and be aware of main differences
- **Be aware** of data sources, country examples and measurement challenges

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Environment accounts and statistics

SEEA-CF (Central Framework)	• **Assets** • **Physical flows** • **Monetary flows**	• Minerals & Energy, Land, Timber, Soil, Water, Aquatic, Other Biological • Materials, Energy, Water, Emissions, Effluents, Wastes • Protection expenditures, taxes & subsidies
SEEA Water; **SEEA Energy;** **SEEA Agriculture, Forestry and Fisheries**	Add sector detail	As above for • Water • Energy • Agricultural, Forestry and Fisheries
SEEA-EEA (Experimental Ecosystem Accounting)	Adds spatial detail and ecosystem perspective	Extent, Condition, Ecosystem Services, Carbon, Water, Biodiversity
FDES (Framework for the Development of Environment Statistics)	Basic statistics for above plus…	• Extreme events and disasters • Human settlements and health • Protection, management & engagement

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Scope of energy flow accounts

- SEEA-CF 3.140…*record flows of energy, in physical units,*
  - *from the initial **extraction or capture** of energy resources from the environment into the economy;*
  - *the flows of energy **within the economy** in the form of the supply and use of energy by industries and households; and, finally,*
  - *the flows of energy **back to the environment**.*

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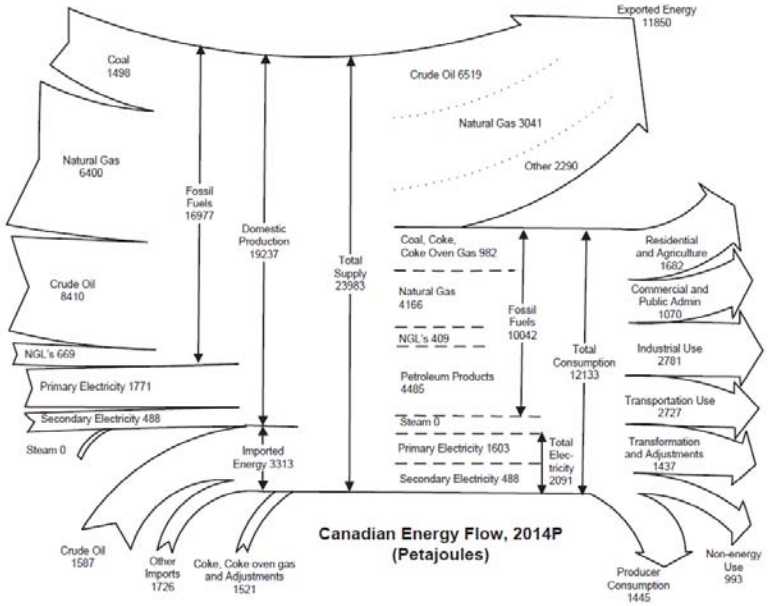
Energy flows



Statistics Canada. (2016). **Report on Energy Supply and Demand in Canada** 2014 Preliminary. Catalogue no. 57-003-X.

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Which are energy **flows**?

- ☒ Carbon emissions from fossil fuel combustion
- ☑ Cutting trees for fuel wood
- ☑ Heating/cooling a home
- ☒ Installing solar panels
- ☑ Driving a car
- ? Buying mercury-free batteries
- ☑ Generating electricity from wind turbine
- ☒ Oil and gas reserves
- ☒ Fuel tax

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Uses

- Implied in a number of SDGs
  - Accessible? Clean?
  - Sustainable?
  - Efficient?
- Trade-offs between goals?
- Integrated view of energy policy
- A critical look at "traditional" energy statistics

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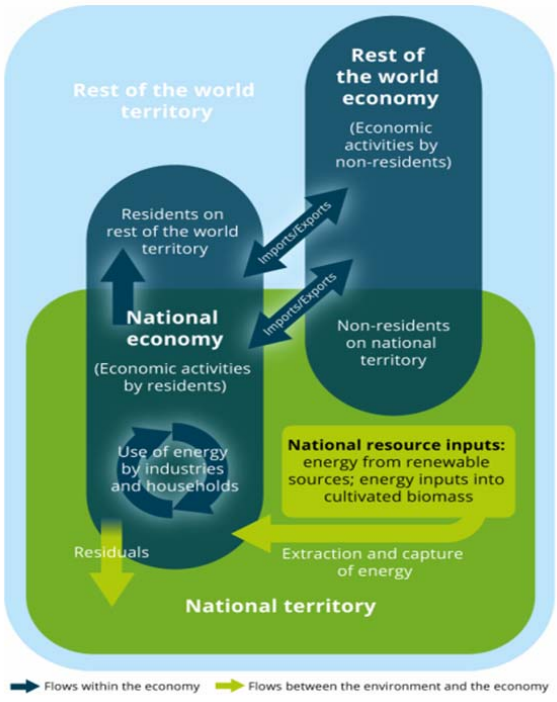
Some principles

- Physical units (Joules)
- Residence principle (to align with SNA)
  - Residents of country regardless of location (e.g., energy products sold to residents)
- Energy balances:
  - Territorial principle
  - Different concept of "intermediary" and "final" consumption



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The supply-use chain

Supply Table

	Industries	Households	Accumulation	Rest of the world	Environment	Totals
Energy from natural inputs					Energy inputs from the environment	Supply of energy from natural inputs
Energy products	Output			Imports		Supply of energy products
Energy residuals	Generated by industry	Generated by households	From Accumulation	Received from rest of the world	Recovered from the environment	Supply of energy residuals

Use Table

	Industries	Households	Accumulation	Rest of the world	Environment	Totals
Energy from natural inputs	Extraction, harvesting, capture					Use of energy from natural inputs
Energy products	Intermediate consumption	Household consumption	Change in inventories	Exports		Use of energy products
Energy residuals	Collection and treatment		Accumulation of energy residuals	Exports of energy residuals	Releases to the environment	Use of energy residuals

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Some definitions

Energy inputs from the environment

Supply Table

	Industries	Households	Accumulation	Rest of the world	Environment	Totals
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Energy residuals	Collection and treatment		Accumulation of energy residuals	Exports of energy residuals	Releases to the environment	Use of energy residuals

Energy from natural inputs			
	Mineral and energy resources		
		Oil	
		Natural gas	
		Coal and peat	
		Uranium and other nuclear fuels	
	Natural timber resources		
Inputs of energy from renewable sources			
	Solar		
	Hydro		
	Wind		
	Wave and tidal		
	Geothermal		
	Other heat and electrical		
Other natural inputs			
	Energy inputs to cultivated biomass		

Conventional solid and liquid resources **extracted** and **harvested**

Renewable resources **captured**

Embedded in cultivated biomass **harvested**

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Some definitions

Energy products

- Standard International Energy Product Classification (SIEC)
  - Countries may use others (CPC, HS)
- Useful to distinguish
  - Primary/secondary
  - Energy/non-energy uses

Supply Table

	Industries	Households	Accumulation	Rest of the world	Environment	Totals
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Standard International Energy Product Classification (SIEC)

Classes of energy products
0 Coal
1 Peat and peat products
2 Oil shale / oil sands
3 Natural gas
4 Oil
5 Biofuels
6 Waste
7 Electricity
8 Heat
9 Nuclear fuels and other fuels n.e.c

Section/ Division/ Group	Class	Title	CPC link	HS Link
0		Coal		
01		Hard coal		
011	0110	Anthracite	11010*	2701.11
012		Bituminous coal		
	0121	Coking coal	11010*	2701.19
	0129	Other bituminous coal	11010*	2701.12
02		Brown coal		
021	0210	Sub-bituminous coal	11030*	2702.10*
022	0220	Lignite	11030*	2702.10*
03		Coal products		
031		Coal coke		
	0311	Coke oven coke	33100*	2704*
	0312	Gas coke	33100*	2704*
	0313	Coke breeze	33100*	2704*

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Some definitions

Energy Residuals

- Losses during
  - Extraction
  - Distribution
  - Storage
  - Transformation
- Other energy residuals
  - Releases to the environment (lost heat) from energy consumption
- Note: Some non-energy residuals (emissions to air, CO_2, solid waste) can be calculated from energy accounts.

Supply Table

	Industries	Households	Accumulation	Rest of the world	Environment	Totals
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Table 3.4

Typical components for groups of residuals

Group	Typical components
Solid waste (includes recovered materials)[a]	Chemical and health-care waste, radioactive waste, metallic waste, other recyclables, discarded equipment and vehicles, animal and vegetal wastes, mixed residential and commercial waste, mineral wastes and soil, combustion wastes, other wastes
Wastewater[a]	Water for treatment and disposal, return flows, reused water
Emissions to air	Carbon dioxide, methane, dinotrogen oxide, nitrous oxides, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, carbon monoxide, non-methane volatile organic compounds, sulphur dioxide, ammonia, heavy metals, persistent organic pollutants, particulates (e.g., PM10 dust)
Emissions to water	Nitrogen compounds, phosphorus compounds, heavy metals, other substances and (organic) compounds
Emissions to soil	Leaks from pipelines, chemical spills
Residuals from dissipative use of products	Unabsorbed nutrients from fertilizers, salt spread on roads
Dissipative losses	Abrasion (tyres/brakes), erosion/corrosion of infrastructure (roads, etc.)
Natural resource residuals	Mining overburden, felling residues, discarded catch

[a] This list of typical components for groups of residuals can also be applied to certain flows defined as products.

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Classifications

Industries

SEEA based on International Standard Industrial Classification (ISIC)

- Countries may use others

Supply Table

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Significant energy industries

- Section A: Agriculture, **forestry** and fishing
- Section B: **Mining** and quarrying
- Section C: Manufacturing
- Section D: **Electricity**, gas, steam and air conditioning supply
- Section H: **Transportation** and storage
- Other industries
- Households

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Group exercise

- Situation:
  - Have information on energy supply and use
  - Compile basic supply and use tables
- Groups of 3-5 (not alone!)
  - Put data into correct cells in handouts
  - Check totals
- Report on
  - Total supply of energy from natural inputs
  - Total energy supply
  - Total use of energy residuals
  - Total energy use

Physical supply table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows from the environment	Total
Energy from natural inputs						
Coal						
Solar						
Energy products						
Coal						
Electricity						
Heat						
Energy residuals						
Extraction						
Transformation						
Other						
Total						

Physical use table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows to the environment	Total
Energy from natural inputs						
Coal						
Solar						
Energy products						
Coal (Transformation)						
Electricity (End use)						
Heat (End use)						
Energy residuals						
Extraction						
Transformation						
Other						
Total						

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Group Exercise

A simplified physical supply and use table for energy:

1. The mining industry extracts **150 PJ** of coal.
2. In total, **60 PJ** of electricity are generated from solar panels,
   - **50 PJ** of which are produced by solar power industry and the rest by households.
3. All the coal is sent for processing to the coal power plant.
   - However, due to losses during extraction, the coal power plant received **140PJ** of coal.
4. The remaining supply of coal is converted to electricity and heat.
   - The coal power plant produces **75 PJ** of electricity and **35 PJ** of heat.
   - Losses during transformation account for the rest of the coal supply.
5. The resulting electricity from solar and coal is used as follows:
   - Mining **15 PJ**, manufacturing **20PJ**, Electricity **32 PJ** and with households consuming the rest of the electricity.
6. Households use 26PJ of heat, electricity sector uses 2 PJ and the rest is used by mining.

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Group exercise – the answers

- Total supply of energy from natural inputs (**210 PJ**)
- Total energy supply (**730 PJ**)
- Total use of energy residuals (**210 PJ**)
- Total energy use (**730 PJ**)

Physical supply table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140					140
Electricity			135			135
Heat			35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
Other	22	20	34	94		170
Total	**172**	**20**	**234**	**94**	**210**	**730**

Physical use table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows to the environment	Total
Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
Total	**172**	**20**	**234**	**94**	**210**	**730**

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Group exercise – the answers

1. The mining industry extracts **150 PJ** of coal.
2. In total, 60 PJ of electricity are generated from solar panels,
   - 50 PJ of which are produced by solar power industry and the rest by households.

Household solar generation is in electricity industry

3. All the coal is sent for processing to the coal power plant.
   - However, due to losses during extraction, the coal power plant received 140PJ of coal.

Physical supply table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140					140
Electricity			135			135
Heat			35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
Other	22	20	34	94		170
Total	**172**	**20**	**234**	**94**	**210**	**730**

Physical use table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows to the environment	Total
Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
Total	**172**	**20**	**234**	**94**	**210**	**730**

Group exercise – the answers

4. The remaining supply of coal is converted to electricity and heat.
   - The coal power plant produces 75 PJ of electricity and 35 PJ of heat.
   - Losses during transformation account for the **rest** of the coal supply. (140 – 35 – 75 = 30)

Total electricity supply (135 PJ) = 75 PJ form coal + 60 PJ from solar

5. The resulting electricity from solar and coal is used as follows:
   - Mining 15 PJ
   - Manufacturing 20PJ
   - Electricity 32 PJ and with
   - Households consuming the **rest** of the electricity. (68 PJ)

Physical supply table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140		75+			140
Electricity			135			135
Heat			60 35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
Other	22	20	34	94		170
Total	**172**	**20**	**234**	**94**	**210**	**730**

Physical use table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows to the environment	Total
Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
Total	**172**	**20**	**234**	**94**	**210**	**730**

Group exercise – the answers

6. Households use 26PJ of heat, electricity sector uses 2 PJ and the **rest** (7PJ) is used by mining.
7. "Other" residual is total end use

Check:

- Total supply of natural inputs = total use of natural inputs
- Total supply of energy products = total use of energy products
- Total supply of energy residuals = total use of energy residuals

Bonus question: What energy product is double-counted and why?

Physical supply table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140					140
Electricity			135			135
Heat			35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
Other	22	20	34	94		170
Total	**172**	**20**	**234**	**94**	**210**	**730**

Physical use table for energy

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Housholds	Flows to the environment	Total
Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
Total	**172**	**20**	**234**	**94**	**210**	**730**

Intermezzo .....

- Linking energy balances and energy accounts

An overview

Energy Statistics	Energy Balances	Energy Accounts
Based on primary statistics (production, foreign trade, business survey)	Based on energy statistics	Based on energy statistics and balances
	Supply and and use balances	Supply and use balances
Specific energy surveys	Various formats (IEA, Eurostat, UN)	Uses national accounts SUT format
No specific format	Sectors and industries (ISIC)	Industries classified by ISIC
	Rearrangement of industries' energy use according to purpose (transport, auto-producers and heat for sale)	No re-arrangement of industries' energy use
	Detailed description of energy sector including technologies	Energy "sector" described by ISIC No description of technologies
	All transport in one separate sector	Own account transportation included in industries' activities
Territory principle	Territory principle	Resident principle
	Statistical differences	No statistical differences
Physical	Physical	Physical and monetary

Creating balances and accounts

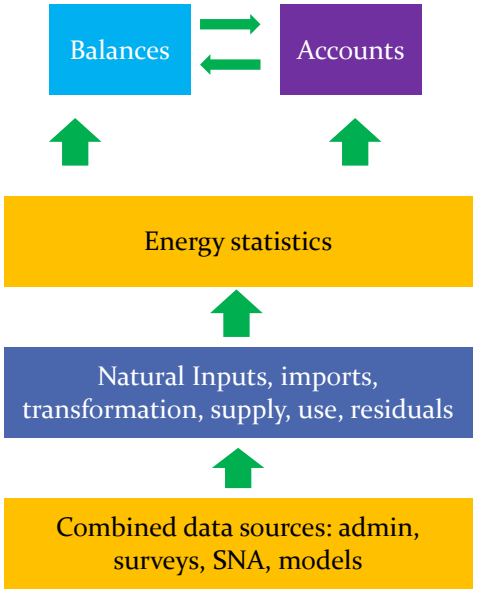
Use the same data

- Many flows are identical in balances and accounts

Important differences

- Terminology
- Territory vs residence principle
- Treatment of transport

Note: Purpose of accounts is comprehensiveness and consistency with SNA



Terminology: Energy supply

- Supply in the energy balance:

  Total energy supply =

  + Primary energy production
  + Import of primary and secondary energy
  - Export of primary and secondary energy
  - International (aviation and marine) bunkers
  - Stock changes

- Supply in the energy account:

  Supply = output + imports

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Terminology: Energy use and storage

Final consumption:

- Energy balance: Refers to the use of fuels, electricity and heat delivered to final consumers being it industries or households.
- Energy accounts: Refers to household use of energy only

Use in the energy account:

- Intermediate consumption, households final consumption, exports, international bunkers and stock changes are considered uses of energy

Storage

Stocks and changes in stocks (energy balance)

EQUALS

Inventories and changes in inventories (energy accounts)

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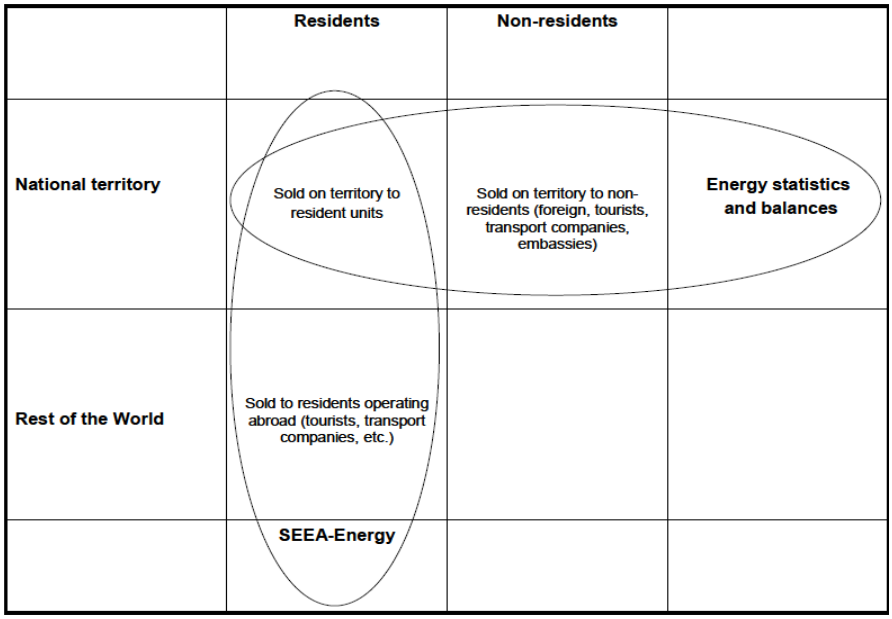
Territory vs residence principle



Actual difference – territory vs. residence principle

	1000 tonnes
Total emissions originating from the Danish territory (IPCC-emission inventory)	54 568
+ Emissions caused by Danish operated vehicles abroad	1 905
+ Emissions caused by Danish operated planes abroad	1 105
+ Emissions caused by Danish operated ships abroad	35 084
+ Other differences in emissions from transport and cross border trade	612
= Total Emissions from Danish economic activities (Environmental Accounts)	93 274

- An extreme case, but still …..

Tools to ease the conversion

- Working group led by UNSD (with IEA, Eurostat, OECD + experts)
- Will provide assessment of existing sources; and roadmap
- Applies to countries not currently filling the detailed IEA energy statistics questionnaires

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- Welcome to Level 2!

(It's not that easy)

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Energy supply in the SEEA

Physical supply table for energy

	Production (including household production on own account); generation of residuals								Flows from the rest of the world		
	Agriculture, forestry and fishing ISIC A	Mining and quarrying ISIC B	Manufac-turing ISIC C	Electricity, gas, steam and air condition-ing supply ISIC D	Transporta-tion and storage ISIC H	Other industries	Households	Accumula-tion	Imports	Flows from the environ-ment	Total supply
Energy from natural inputs											
Natural resource inputs											
Mineral and energy resources										1 161.0	1 161.0
Timber resources										5.0	5.0
Inputs of energy from renewable sources											
Solar										20.0	20.0
Hydro										100.0	100.0
Wind										4.0	4.0
Wave and tidal											
Geothermal											
Other heat and electrical											
Other natural inputs											
Energy inputs to cultivated biomass										2.0	2.0
Total energy from natural inputs										1 292.0	1 292.0
Energy products											
Production of energy products by SEC class											
Coal									225.0		225.0
Peat and peat products											
Oil shale/oil sands											
Natural gas (extracted)		395.0									395.0
Natural gas (distributed)				369.1							369.1
Oil (e.g., conventional crude oil)		721.0									721.0
Oil (oil products)			347.0						930.0		1 277.0
Biofuels	5.3		0.2	1.5							7.0
Waste	39.0		54.5						16.9		110.4
Electricity				212.0					22.0		234.0
Heat				78.5							78.5
Nuclear fuels and other fuels n.a.c.											
Total energy products	44.3	1 116.0	401.7	661.1					1 193.9		3 417.0
Energy residuals											
Losses during extraction		45.0									45.0
Losses during distribution				12.0							12.0
Losses during storage			6.0								6.0
Losses during transformation			7.0	204.4							211.4
Other energy residuals	50.3	3.2	418.7	90.6	632.0	96.0	240.0				1 530.8
Total energy residuals	50.3	48.2	431.7	307.0	632.0	96.0	240.0				1 805.2
Other residual flows											
Residuals from end use for non-energy purposes			51.0								51.0
Energy from solid waste								93.5			93.5
Total supply	94.6	1 164.2	884.4	968.1	632.0	96.0	240.0	93.5	1 193.9	1 292.0	6 658.7

Energy from natural inputs

Energy products

Residuals & other flows

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Energy use in the SEEA

Physical use table for energy

	Intermediate consumption; use of energy resources; receipt of energy losses						Final consumption		Flows to the rest of the world		
	Agriculture, forestry and fishing ISIC A	Mining and quarrying ISIC B	Manufacturing ISIC C	Electricity, gas, steam and air conditioning supply ISIC D	Transportation and storage ISIC H	Other industries	Households	Accumulation	Exports	Flows to the environment	Total use
Energy from natural inputs											
Natural resource inputs	5.0	1 161.0									1 166.0
Inputs of energy from renewable sources				124.0							124.0
Other natural inputs	0.3		0.2	1.5							2.0
Total energy from natural inputs	5.3	1 161.0	0.2	225.5							1 292.0
Energy products											
Transformation of energy products by SIEC class											
Coal				223.0							223.0
Peat and peat products											
Oil shale/oil sands											
Natural gas (extracted)				395.0							395.0
Natural gas (distributed)				87.0							87.0
Oil (e.g., conventional crude oil)			360.0								360.0
Oil (oil products)				16.0							16.0
Biofuels											
Waste				31.0							31.0
Electricity											
Heat											
Nuclear fuels and other fuels n.a.c.											
Total transformation of energy products			360.0	752.0							1 112.0
End-use of energy products by SIEC class											
Coal	2.0	0.1	17.0				1.0	-21.0	1.9		1.0
Peat and peat products											
Oil shale/ oil sands											
Natural gas (extracted)											
Natural gas (distributed)	2.0		39.0	0.1		12.0	26.0	2.0	201.0		282.1
Oil (e.g. conventional crude oil)									361.0		361.0
Oil (oil products)	34.0	2.0	326.0		621.0	49.0	102.0	-3.0	80.0		1 211.0
Biofuels	0.3		0.2	1.5			5.0				7.0
Waste	3.0	0.1	4.0	37.0		1.0	33.0	0.3	1.0		79.4
Electricity	7.0	1.0	22.0	50.0	10.0	15.0	29.0		100.0		234.0
Heat	2.0		10.5	2.0	1.0	19.0	44.0				78.5
Nuclear fuels and other fuels n.a.c.											0.0
Total end-use for energy purposes	50.3	3.2	418.7	90.6	632.0	96.0	240.0	-21.7	744.9		2 254.0
End-use of energy products for non-energy purposes			51.0								51.0
Energy residuals											
Losses during extraction										45.0	45.0
Losses during distribution										12.0	12.0
Losses during storage										6.0	6.0
Losses during transformation										211.4	211.4
Other energy residuals										1 530.8	1 530.8
Total energy residuals										1 805.2	1 805.2
Other residual flows											
Residuals from end use for non-energy purposes								51.0			51.0
Energy from solid waste	39.0		54.5								93.5
Total use	94.6	1 164.2	884.4	968.1	632.0	96.0	240.0	29.3	744.9	1 805.2	6 658.7

Energy from natural inputs

Energy products Transformation & End -Use

Residuals & other flows

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Compilation challenges & data

Getting data in detail (energy balances help)

- ISIC and SIEC

Bridge tables to convert from balance to account

- Balance may be by "purpose" (e.g., transport)

Getting data from importers/distributers

- May be easier for NSOs than Energy/Environment (if for statistical purposes!)

Allocating to natural inputs, products, residuals

- "Mixed" producers (e.g. co-production of electricity and district heating; coal mines own power generation)

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Compilation challenges & data

Energy from natural inputs

- Supply & Use: May need to estimate losses from "factor"
- Data:
  - Energy balances
  - Ministries of energy, mining, natural resources, forestry (timber)
  - Commodity reports, annual reports, industry associations
  - Sample surveys
  - Royalty payments on extraction, harvesting
  - Administrative data (e.g., reporting to government)

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Compilation challenges & data

Energy products:

- Supply & use: Industry & product detail
  - Conversion to energy units (different "kinds" of oil…)
- Data:
  - Energy balances, energy statistics, imports
  - Ministries of Energy, utility companies, industry associations
  - Commodity reports, annual reports
  - National Accounts, I-O Tables (expenditures, transactions between producers/users)
  - Administrative (energy taxes, distribution to users)
  - Surveys (energy use by business and households)

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Compilation challenges & data

Transformation of energy products

- Supply & use: Duplicate energy flows (multiple inputs)
- Data:
  - Same as above (balances, statistics, surveys, admin)
  - Estimate from transformation efficiency "factors"
    - 100 PJ black coal → 33 PJ electricity
  - Estimate unknowns from balance between supply and use
    - 1000 PJ crude oil supply
    - 400 PJ exported
    - 250 PJ transformed to secondary oil products
    - 300 PJ stored [increased stock]
    - Remainder (50 PJ) allocate to losses

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Compilation challenges & data

Transformation of energy products

- Cogeneration: Australia steel industry generates 80% of own electricity, 96% from cogeneration (i.e., heat)
- Own account production: Requires survey
- More detail is better:
  - Same energy product for different purposes
  - Easier to monetize

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Compilation challenges & data

Energy end-use:

- Most interesting to policy; most time-consuming
- Data:
  - Balances, surveys, SNA/I-O
  - Admin (exports, emissions trading, electricity and gas bills)
  - Models:
    - Motor vehicle use: Allocate activity (km) to industry (joules); **Remember**: non-transport use (e.g., diesel generators)
    - Domestically collected fuelwood
    - Bunkers = storage for ships and airplanes (ownership?)

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Compilation challenges & data

Energy residuals:

- Supply & use:
  - Estimating losses from extraction, distribution & storage, transformation, end use (heat)
  - Losses in renewable?
  - Policy: efficiency, pollution (losses), relate to GHGs
- Data:
  - Supply and end use of energy products, transformation
  - Admin (annual reports, emission reports, GHG inventories)
  - Academic (life cycle analysis, storage losses, efficiencies of facilities)

Simplifications & Extensions

- Simplifications
  - Supply & use of electricity, renewables or fossil fuels
- Extensions
  - Monetary supply and use for energy (currency units)
  - Calculating air emissions from fossil fuel consumption
    - Apply "factors" to consumption → CO_2, SO_x, solids, …
  - Allocation to "types" of households (volunteers?)
    - Energy for all? Could disaggregate with survey.

SDG indicators

Universal access

- 7.1.1 …population with access to electricity
  - Sample survey to allocate household consumption
  - How much is enough?
- 7.1.2 …population with…reliance on clean fuels & technology … for cooking
  - Define "clean"

Share of renewable

- 7.2.1 Renewable energy share …
  - From energy account

Energy efficiency

- 7.3.1 Energy intensity…in terms of primary energy and …GDP…
  - Compare use from energy account with value added from SNA

Country examples: Netherlands

- High policy demand → inform SNA ($)
- Energy accounts 1/3 person/year
- Bridge table (2006) linking energy balances

	PJ
Final use (energy balances)	2 750
Conversion losses (energy balances)	482
Total energy use in the Netherlands (energy balances)	3 232
Use residents abroad (+)	166
Use non residents (-)	12
Bunkering Dutch companies in the Netherlands (+)	142
Total net energy use Dutch economy (net energy accounts)	3 527

Sjoerd Schenau, Statistics Netherlands

Discussion

- Which aspects are most relevant to begin with in your country (electricity, fossil fuels, efficiency, access)?
- What are the main institutional challenges (data sharing, data access, expertise…)?

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Thank you!