System of
Environmental
Economic
Accounting

Energy Accounts

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SEEA: SOME DETAILS

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What is the SEEA-Energy?

- Agreed concepts, definitions, classifications, tables and accounts related to energy supply and use and stocks of energy resources
- Builds upon energy statistics
- Closely related to energy balances
- Three main types of information on energy
  - The supply and use of energy (flows)
  - The stocks of energy and the changes in them
  - Other economic aspects related to energy

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Scope of physical flow accounts

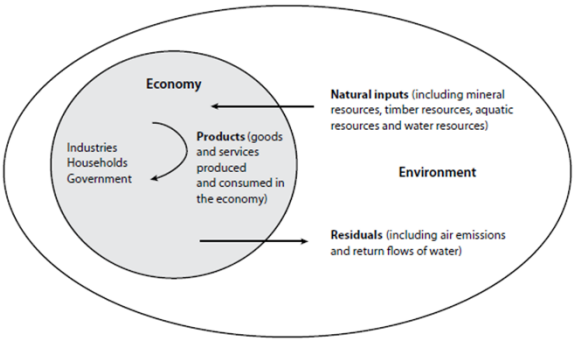
SEEA defines three types of ”stuff” that flows

Natural inputs

Products

Residuals

Figure 2.1
Physical flows of natural inputs, products and residuals



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Supply and use

SUPPLY TABLE						
	Industries	**Households**	**Accumulation**	**Rest of the World**	**Environment**	**Totals**
Energy from natural inputs					Energy inputs from the environment	Total supply of energy from natural inputs
Energy products	Output			Imports		Total supply of energy products
Energy Residuals	Energy residuals generated by industry	Energy residuals generated by household consumption	Energy residuals from accumulation	Energy residuals received from the rest of the world	Energy residuals recovered from the environment	Total supply of energy residuals

USE TABLE						
	Industries	**Households**	**Accumulation**	**Rest of the World**	**Environment**	**Totals**
Energy from natural inputs	Extraction of energy from natural inputs					Total use of energy from natural inputs
Energy products	Intermediate consumption	Household consumption	Changes in inventories	Exports		Total use of energy products
Energy residuals	Collection & treatment of energy residuals		Accumulation of energy residuals	Energy residuals sent to the rest of the world	Energy residual flows direct to environment	Total use of energy residuals

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Stocks

Opening stock of resources		
Additions to stock of resources		
	Growth in stock	
	Discoveries of new stock	
	Upwards reappraisals	
	Reclassifications	
	Total additions to stock	
Reductions in stock of resources		
	Extractions	
	Normal loss of stock	
	Catastrophic loss	
	Downwards reappraisals	
	Reclassifications	
	Total reductions in stock	
Revaluation of the stock of resources *		
Closing stock of resources		

* Only applicable for asset accounts in monetary terms

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PHYSICAL SUPPLY AND USE

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Purpose of the physical energy flow accounts

- Describe
  - Extraction and capture of energy from environment
  - Transaction of energy within the economy
  - The losses of energy and residual flows back to the environment
- Measurement unit:
  - In principle all *natural units* can be used (depending on purpose) Tonnes, cubic metres, litres, but most often practical to use a *common unit* like *Joules*

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The rows - Natural inputs

- Energy removed or captured from the environment by resident economic units is a flow of natural inputs
- Energy from cultivated biomass is first recorded as a flow of a product

(Energy) natural resource inputs
Mineral and energy resources
Oil resources
Natural gas resources
Coal and peat resources
Uranium and other nuclear
Timber resources (natural)
Inputs of energy from renewable sources
Solar
Hydro
Wind
Wave and tidal
Geothermal
Other electicity and heat
Other natural inputs
Energy inputs to cultivated biomass

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The rows - Products

- Energy products include fuels that are produced or generated by an economic unit
- Energy products are classified by the Standard International Energy Product Classification (SIEC)
- No 1-1 correspondence between SIEC and CPC

Table 3.1: Standard International Energy Product Classification (SIEC)

SIEC Headings			Correspondences	
Section / Division / Group	Class		CPC Ver.2	HS 2007
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		Coke oven coke		
	0311	Coke oven coke	33100*	2704*
	0312	Gas coke	33100*	2704*
	0313	Coke breeze	33100*	2704*
	0314	Semi-cokes	33100*	2704*
032	0320	Patent fuel	11020	2701.20
033	0330	Brown coal briquettes (BKB)	11040	2702.20
034	0340	Coal tar	33200*	2706
035	0350	Coke oven gas	17200*	2705*
036	0360	Gas works gas (and other manufactured gases for distribution)	17200*	2705*
037		Recovered gases		
	0371	Blast furnace gas	17200*	2705*
	0372	Basic oxygen steel furnace gas	17200*	2705*
	0379	Other recovered gases	17200*	2705*
039	0390	Other coal products	33500*, 34540*	2707*, 2708.10*, .20*, 2713.90*
1		**Peat and peat products**		
11		**Peat**		
111	1110	Sod peat	11050*	2703*
112	1120	Milled peat	11050*	2703*
12		**Peat products**		
121	1210	Peat briquettes	11050*	2703*
129	1290	Other peat products	11050*, 33100*, 33200*, 33500*	2703*, 2704*, 2706*, 2713.90*
2		**Oil shale / oil sands**		
20		**Oil shale / oil sands**		
	2000	Oil shale / oil sands	12030	2714.10
3		**Natural gas**		
30		**Natural gas**		
	3000	Natural gas	12020	2711.11, .21
4		**Oil**		
41		**Conventional crude oil**		
410	4100	Conventional crude oil	12010*	2709*
42		**Natural gas liquids (NGL)**		
420	4200	Natural gas liquids (NGL)	33420*	2711.14, .19*, .29*
43		**Refinery feedstocks**		
430	4300	Refinery feedstocks	x	x
44		**Additives and oxygenates**		
440	4400	Additives and oxygenates	34131*, 34139*, 34170*, others	2207.20*, 2905.11, 2909.19*, others
45		**Other hydrocarbons**		
450	4500	Other hydrocarbons	12010*, 34210*	2709*, 2804.10
46		**Oil products**		
461	4610	Refinery gas	33420*, 34210*	2711.29*, 2804.10
462	4620	Ethane	33420*	2711.19*, .29*
463	4630	Liquefied petroleum gases (LPG)	33410	2711.12, .13
464	4640	Naphtha	33330*	2710.11*
465		Gasolines		
	4651	Aviation gasoline	33310*	2710.11*
	4652	Motor gasoline	33310*	2710.11*
	4653	Gasoline-type jet fuel	33320	2710.11*
466		Kerosenes		
	4661	Kerosene-type jet fuel	33342	2710.19*
	4669	Other kerosene	33341	2710.19*
467		Gas oil / diesel oil and Heavy gas oil		
	4671	Gas oil / Diesel oil	33360*	2710.19*
	4672	Heavy gas oil	33360*	2710.19*
468	4680	Fuel oil	33370	2710.19*
469		Other oil products		
	4691	White spirit and special boiling point industrial spirits	33350	2710.11*
	4692	Lubricants	33380*	2710.19*
	4693	Paraffin waxes	33500*	2712.20*
	4694	Petroleum coke	33500*, 34540*	2713.11, .12, 2709.20
	4695	Bitumen	33350*	2713.20
	4699	Other oil products n.e.c.	33350*, 34540*	2710.10*, 2710.11*, 2712.10*, .20*-.90*, 2713.90
5		**Biofuels**		
51		**Solid biofuels**		
511		Fuelwood, wood residues and by-products		
	5111	Wood pellets	39280*	4401.30*
	5119	Other Fuelwood, wood residues and by-products	03190, 31230, 39280*	4401.10, 4401.21, .22, 4401.30*
512	5120	Bagasse	39140*	2303.20*
513	5130	Animal waste	34654*	3101*
514	5140	Black liquor	39230*	3804.00*
515	5150	Other vegetal material and residues	39120*, 39150*	2302*, 2308*, 0901.90*, 1802*
516	5160	Charcoal	34510	4402
52		**Liquid biofuels**		
521	5210	Biogasoline	34131*, 34139*, 34170*	2207.20*, 2905.11*, .13*, .14* 2909.19* 3824.90*
522	5220	Biodiesels	35490*	
523	5230	Bio jet kerosene		
529	5290	Other liquid biofuels		
53		**Biogases**		
531		Biogases from anaerobic fermentation		
	5311	Landfill gas	33420*	2711.29*
	5312	Sewage sludge gas	33420*	2711.29*
	5319	Other biogases from anaerobic fermentation	33420*	2711.29*
532	5320	Biogases from thermal processes		
6		**Waste**		
61		**Industrial waste**		
610	6100	Industrial waste	39120*, 39150*	0901.90*, 1802*, 2302*, 2308*
62		**Municipal waste**		
620	6200	Municipal waste	39910	3825.10
7		**Electricity**		
70		**Electricity**		
700	7000	Electricity	17100	2716
8		**Heat**		
80		**Heat**		
800	8000	Heat	17300	2201.90*
9		**Nuclear fuels and other fuels n.e.c.**		
91		**Uranium and plutonium**		
910	9100	Uranium and plutonium	13000*, 33610, 33620, 33710, 33720	2612.10, 2844.10, .20, .30, 8401.30
92		**Other nuclear fuels**		
920	9200	Other nuclear fuels	13000*, 33630*, 33690*	2612.20, 2844.30*, 2844.40*
99		**Other fuels n.e.c.**		
990	9900	Other fuels n.e.c.		

The rows - Residuals

- Residuals associated with energy are materials and energy discarded or emitted as a result of energy related production, consumption or accumulation activities. Different energy residuals are recorded
  - Losses during extraction, distribution and storage
  - Losses during transformation/conversion
  - Other energy residuals
- Residuals are supplied by industries and households and used by environment
- For other residual flows, the energy embodied in energy products used for non-energy purposes is recorded as supplied by various industries and by households and is recorded as being retained within the economy within the accumulation column in the use table

COMPILING ENERGY ACCOUNTS

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Sources of data

- Energy statistics
- Energy balances
- Foreign trade statistics
- Production statistics
- Agricultural/forestry statistics, etc.
- Monetary data and unit prices
- Often necessary to make estimations and assumptions
- Note that defintions and borderlines may be different in different statistical sources

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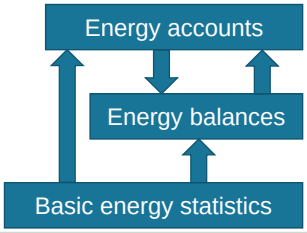
The link with energy accounts

- The main purpose of the energy accounts is to provide a comprehensive description of the flows of energy, which is consistent with the system of national accounts
- Basic energy statistics and energy balances are the starting point
- Many of the flows described in the basic energy statistics and the energy balances are the same as in the energy accounts
- Some crucial differences also exists between accounts and balances
  - Differences in terminology and concepts
  - Conceptual differences territory principle / residence principle
  - Treatment of transport



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Differences in terminology

- In the energy balance, the supply is defined as:

  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
- In the energy accounts the supply is defined as output+imports
- In the energy accounts *intermediate consumption*, *households final consumption*, *exports*, *international bunkers* and *stock changes* are considered uses
- In the energy balance, *final consumption* refers to the use of fuels, electricity and heat delivered to final consumers being it industries or households. In the energy accounts, *final consumption* refers to the households use of energy only
- Stocks and changes in stocks defined in the energy balances are referred to as inventories and changes in inventories defined in the energy accounts

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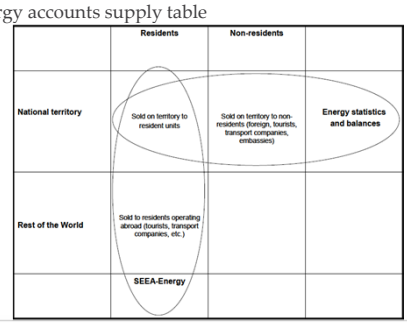
From energy balances to energy accounts

- Adjustments to the resident principle
  - Energy use by residents abroad
  - Energy use by non-residents on the territory
- Breakdown by ISIC industries
  - The primary production of energy and use of energy in the energy balance needs to be broken down by ISIC industries in the energy accounts supply table
  - Reallocation of transport activities
- UNSD Excel tool



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Comparison of Energy Statistics, Energy Balances and Energy Accounts

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

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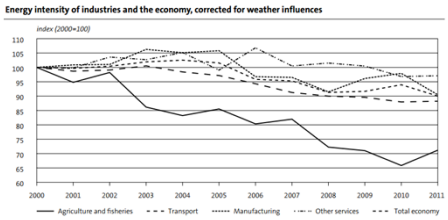
Added value of energy accounts

- Combined presentation of monetary and physical flows
  - Efficiency/productivity indicators (also part of the SDGs)
  - Decoupling of energy use from economic output and/or emissions to air
- Depletion adjusted measures
- Allows for seamless linking with other financial information such as taxes and subsidies to provide a more complete picture
- Important input in the calculation air emission accounts



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Practical guidance

Prepare data with common classifications

- For each type of energy, import and process data and prepare data to use the classifications used in SEEA-E
- Supplement with data in order to adjust to the residence principle

Compile commodity balances, product by product

- Analyze data gaps
- Decide how to close gaps in the short run and in the longer run
- Analyze imbalances between supply and use
- Balance the product balance

Multiple iterations might be necessary

Rearrange the commodity balances into the SUT framework

- Quality assurance
- Analyze conversion losses in production of electricity and heat
- Analyze the input-output ratio in refineries
- Analyze time series
- Compare with the economic development
- As the last step, balance the whole system;

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EXERCISE

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THANK YOU

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