



System of Environmental Economic Accounting



System of
Environmental
Economic
Accounting

Energy accounts

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United Nations

Content

- Energy accounts: some important concepts
- Physical supply and use
- Exercise
- Air emissions (depending on time!)
- Exercise (depending on time!)



ENERGY ACCOUNTS: SOME IMPORTANT CONCEPTS



Types of Energy accounts

- The supply and use of energy (important for emission accounts as well)
- The stocks of energy and changes in them
- Other economic aspects related to energy
- Further details can be found in the SEEA Energy which was recently adopted by the UN Committee of Experts on Environmental Economic Accounting (UNCEEA)



Important concepts: SNA

- Definitions and principles have their origin in the SNA
- Closely linked to energy statistics and energy balances
- Scope
 - > National economy
- National economy interacts with the environment and rest of the world

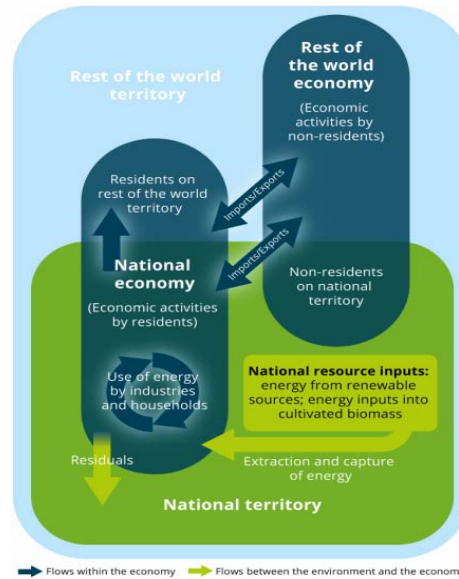


Important concepts: physical flows and residence principle

Physical flows of energy

The subsystem for energy flow accounts records energy flows in physical units,

- from the initial extraction or capture of energy resources **from the environment into the economy**,
- to the flows of energy **within the economy** in the form of the supply and use of energy by industries and households,
- and, finally, it records the flows of energy residuals **back to the environment**.



Energy as natural inputs

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

← "Conventional" solid and liquid natural resources (for extraction)

← Circular" renewable forms of energy (for capture)

← Energy embedded in cultivated biomass (for harvest)

Energy from renewable sources

Inputs of energy from renewable sources are the non-fuel sources of energy provided by the environment. Inputs of energy originating from natural resources are not included under this heading, e.g. timber, other biomass or solid waste.

- Inputs of energy from renewable sources are **classified by source**, e.g. solar, hydro, wind, wave and geothermal.
- Estimates of inputs of energy from renewable sources will generally reflect the amount of **energy actually produced**.
- For hydropower, the entries concerning the flows from the environment should be considered **inputs from renewable energy sources** equal to the electricity produced.



Energy as a product

- Standard International Energy Product Classification (SIEC)
- Often useful to distinguish between primary and secondary energy products

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



Energy as a residual

- Losses are grouped into 4 groups
 - > Extraction
 - > Distribution
 - > Storage
 - > Transformation
- Other energy residuals



ENERGY ACCOUNTS: PHYSICAL SUPPLY AND USE



Physical supply and use table

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

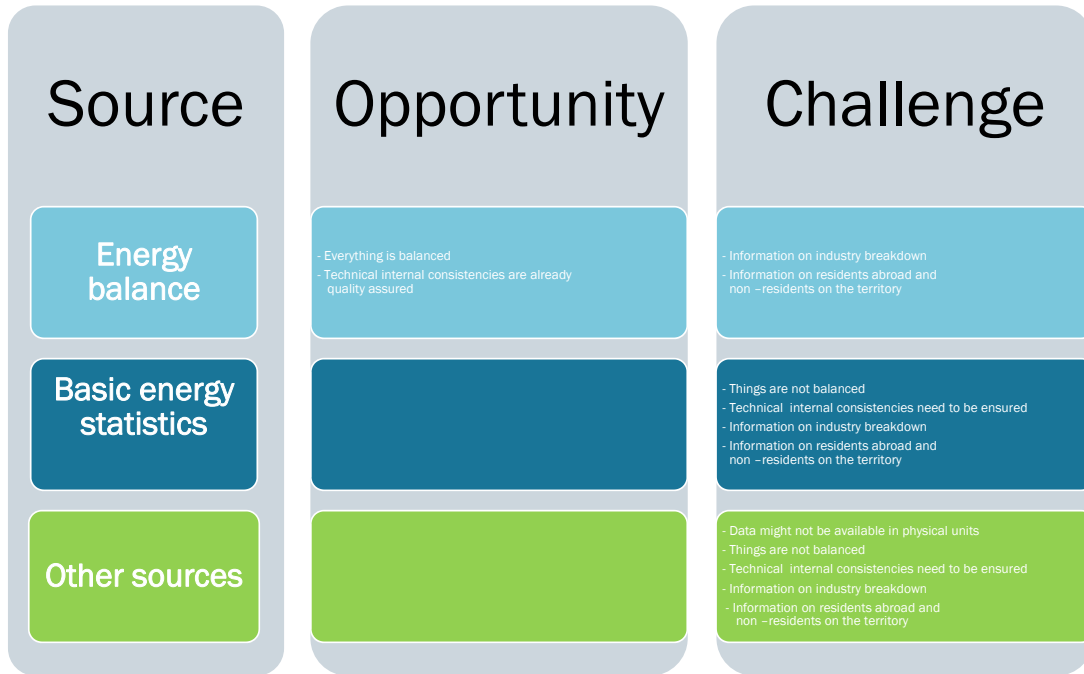


Practical guidance

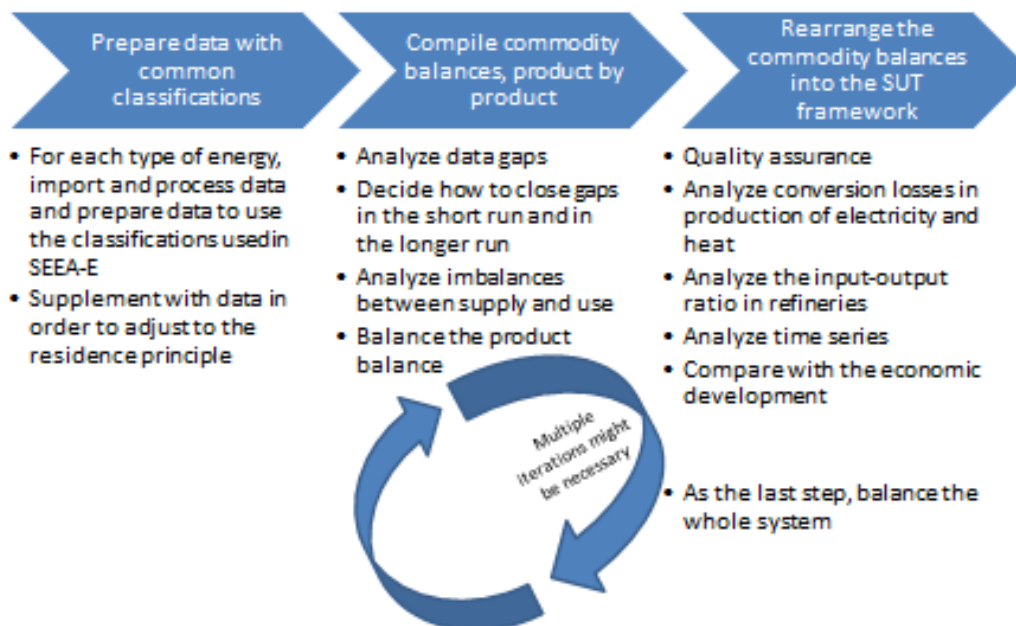
- The practical implementation of physical energy flow accounts depends on the available data sources
 - > Energy balances
 - > Basic energy statistics
 - > Other energy related information available in the various statistics e.g. external trade statistics, production statistics, surveys on industries use of inputs, private final household consumption survey
- The different data sources as the potential starting point entail different opportunities and challenges



Challenges and opportunities



Starting from basic statistics



ENERGY ACCOUNTS: PHYSICAL SUPPLY AND USE EXERCISE

SEE HANDOUTS



Energy aggregates

- **Gross energy input** reflects the total energy captured from the environment, energy products that are imported and energy from residuals within the economy
- **Net domestic energy use** is defined as the end use of energy products (including changes in inventories of energy products) less exports of energy products plus all losses of energy (losses during extraction, losses during transformation, losses during storage and losses during distribution).



AIR EMISSION ACCOUNTS: SOME IMPORTANT CONCEPTS

BASED ON PRESENTATION BY OLE PEDERSON, STATISTICS DENMARK



Flows of air emissions

- Emissions to air are gaseous and particulate substances released to the atmosphere by **establishments and households** as a result of **production, consumption and accumulation processes**.
- CO₂, SO₂, NO_x, CH₄, N₂O, SF₆, NH₃, PM₁₀, etc.
- The SEEA air emissions account records the generation of air emissions **by resident economic units** and **by type of substance**.



Supply and use table for Air Emissions

Type of substance	Supply table for air emissions									Use table for air emissions			
	Generation of emissions									Accumulation Emissions from landfill	Total supply of emissions	Flows to the Environment Emissions released to the environment	Total use of emissions
	Industries					Households							
	Agriculture	Mining	Manufacturing	Transport	Other	Transport	Heating	Other					
Carbon dioxide	10 610.3	2 602.2	41 434.4	27 957.0	82 402.4	18 920.5	17 542.2	1 949.1	701.6	204 119.6	204 119.6	204 119.6	
Methane	492.0	34.1	15.8	0.8	21.9	2.4	15.5	1.7	222.0	806.3	806.3	806.3	
Dinitrogen oxide	23.7		3.5	0.8	2.6	1.0	0.2	0.1	0.1	32.0	32.0	32.0	
Nitrous oxides	69.4	6.0	37.9	239.5	89.0	38.0	12.1	1.3	0.3	513.6	513.6	513.6	
Hydrofluorocarbons			0.3		0.4					0.7	0.7	0.7	
Perfluorocarbons													
Sulphur hexafluoride													
Carbon monoxide	41.0	2.5	123.8	46.2	66.2	329.1	51.2	5.7	1.1	666.9	666.9	666.9	
Non-methane volatile organic compounds	5.2	6.5	40.0	16.4	27.2	34.5	29.4	3.2	0.9	163.3	163.3	163.3	
Sulphur dioxide	2.7	0.4	28.0	62.4	8.1	0.4	0.4	0.1	0.0	102.5	102.5	102.5	
Ammonia	107.9		1.7	0.2	0.9	2.3	11.4	1.2	0.2	125.9	125.9	125.9	
Heavy metals													
Persistent organic pollutants													
Particulates (incl PM10, dust)	7.0	0.1	8.5	9.3	4.4	6.0	2.8	0.5	0.0	38.5	38.5	38.5	

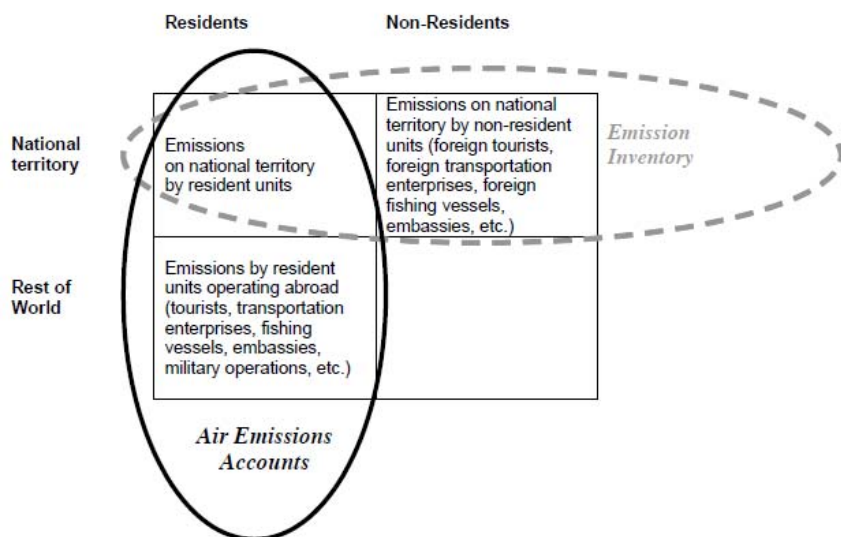


Flows of air emissions: some notes

- All actual CO₂ emissions should be **included** in the accounts – also CO₂ emissions from **burning of biomass**
- However, it is recommended that, where possible, carbon dioxide emissions resulting from the burning of fossil fuels should be **distinguished** from carbon dioxide emissions from biomass.



Flows of air emissions: some notes



Bridge tables needed

- The national economy totals of Air Emissions Accounts most likely differ from totals as presented in national emission inventories.
- These differences are recorded and presented in so-called bridge tables
- Bridge tables are important for both compilers and users

Example of a bridge table

	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



Further notes

Flows of air emissions within the environment are not in the scope of the accounts:

- **Transboundary flows** of air emissions are **excluded** from the air emissions accounts
- **Capture of gases by the environment**, for example, carbon captured in forests and soil are **excluded** from the accounts
- Emissions such as **unintended forest and grassland fires** and human metabolic processes which are not the direct result of economic production are **excluded**.



Further notes

- **Secondary emissions** (results of processes in the environment) are **excluded**
- **Flaring and venting** of e.g. natural gases are **included**
- **Emissions from manure** collected and spread on agricultural land are **included** (dissipative use)
- **Leakages from accumulations** (durable goods like refrigerators, landfills, etc.) should be recorded **as they occur** and **attributed to the owner** of the good at the time of the leakage

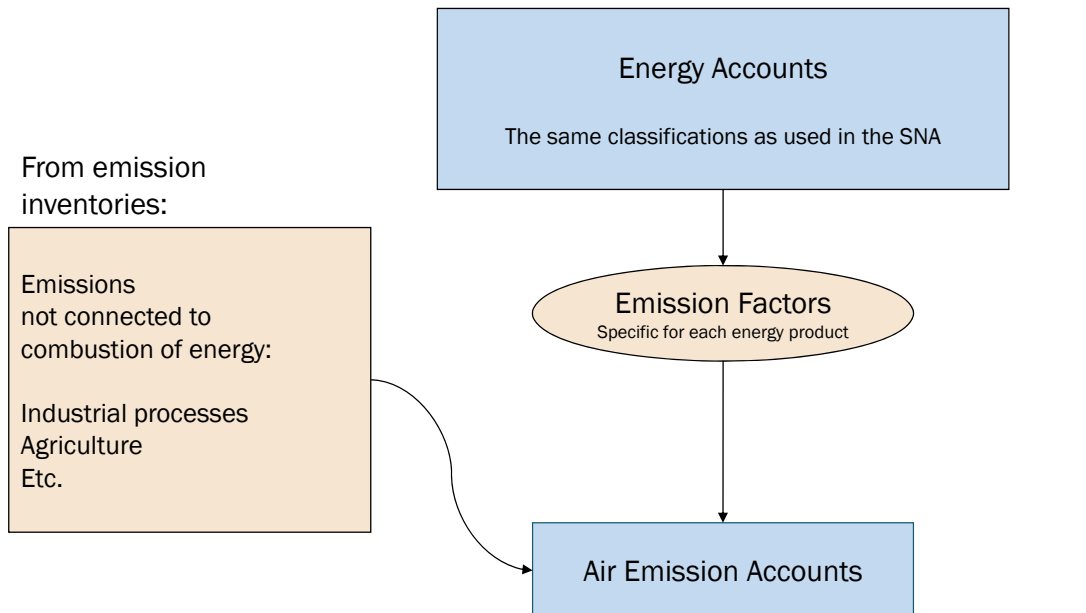


Implementation of air emission accounts

- The compilation of Air Emissions Accounts **starts from existing data**, namely data on air emissions, energy use and/or other parameters.
- These **existing data need to be manipulated and re-arranged** according to the accounting principles of National Accounts.
- Two general approaches are used:
“Energy First” and “Inventory first”



Energy first approach



**AIR EMISSIONS ACCOUNTS:
EXERCISE**

SEE HANDOUTS





THANK YOU

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