

Air emission accounts and the link to energy accounts

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Content

- Why compile air emission accounts ?
- What are the air emission accounts ?
- What is the scope of these accounts ?
- How to compile air emission accounts? (e.g. energy-approach)
- What data sources do you need ?
- What can you do with the air emission accounts ?
- Air emission accounts in the Netherlands
- Exercise





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Why you should care about peat bogs

With the power to release huge amounts of carbon and greenhouse gases, these mucky wetlands also help control floods and forest fires.



Air quality versus emissions to air

Concentrations of pollutants in the air

Statistics on air quality





Emissions (flows) of pollutants to the air

Air emission statistics and accounts

Why are air emissions important?

Contribute to to global warming

Carbon dioxide (CO2), Methane (CH4) Dinitrogen Oxide (or Nitrous Oxide) (N2O) Sulphur hexaflouride (SF6)

Negative effects on ecosystems and human health

- Sulphur Dioxide (SO2)
- Nitrogen Oxides (NOx)
- Particulate Matter (PM10 and PM2.5)
- Ammonia (NH3)

Policies to manage air emissions need reliable data on amounts produced and who releases them (and where).



Air emissions and SDGs



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What are the air emission accounts ?

- A statistical framework to organise data on air emissions
- Provides information on emissions released to the atmosphere by establishments and households as a result of production, consumption and accumulation processes
- Part of the SEEA Central Framework
- Allows monitoring of emissions and can be used as input for all kind of environmental-economic policies
- Implemented wordwide (in Europe: legal base)





Air emission account

Which pollutants?			1		Wh	o rele	ases	them	?		- [Where a	do the	ey go?
				Su	pply table for	air emissions						Use table emiss	for air ons	
				(Generation of	emissions	•			Accumulation		Flows to the environment		
				Industries—by ISIC				Households						
		Agriculture I ISIC A	Mining ISIC B	Manufactur- Ing ISIC C	Transport ISIC H	Other	Transport	Heating	Other	Emissions from landfill	Total supply emissions	Emissions released to the environment	Total use of emissions	
T	ype of substance	10,610,3	2 602 2	A1 A3A A	27.957.0	82 402 4	18 020 5	17 542 2	1 0/0 1	701.6	204 119	6 204 119.6	204 119 6	
	Methane	492.0	34.1	15.8	27 937.0	21.9	10 920.5	17 542.2	1 949.1	222.0	204 119	3 806.3	806.3	
	Dinitrogen oxide	23.7	51.1	3.5	0.8	2.6	1.0	0.2	0.1	0.1	32	0 32.0	32.0	
17	Nitrous oxides	69.4	6.0	37.9	259.5	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	
E	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	_L
	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	5
	Heavy metals													
	Persistent organic pollutants													
	Particulates (including PM10 and 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	

Air emission accounts – key characteristics

- Record all anthropogenic emissions
- Emissions from economic activities (production, consumption) → consistent with data of the national accounts
- Production activities classified by ISIC
- (For greenhouse gases) different from IPCC emissions



Economic boundary with respect to air emissions

Some air emissions will occur when economic units undertake activity in other countries.

Consistent with the general definition of the economic boundary <u>using the concept of residence</u>, <u>air emissions</u> <u>accounts</u> for a nation will <u>exclude</u> emissions released within a national territory by non-residents (such as tourists and foreign transportation operations), whereas the emissions abroad of resident economic units will be <u>included</u>.







Territory vs residence principle

	Residents	Non-residents	
National territory	Emissions on territory by resident units	Emissions on territory by non-residents (foreign, tourists, transport companies, embassies)	Emissions statistics (IPCC)
Rest of the world	Emissions by residents operating abroad (tourists, transport, companies etc.)		

SEEA air emissions accounts



What is included ?

- All emissions from combustion
- All emissions from waste incineration
- All emissions from conversion processes
- Emissions from lifestock, manure
- Emissions from landfills



What is excluded ?

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

- Transboundary flows of air emissions
- Capture of gases by the environment, for example, carbon captured in forests and soil
- Emissions such as unintended forest and grassland fires and human metabolic processes which are not the direct result of economic production
- Secondary emissions (when substances combine to create new substances in the environment)





IPCC versus air emission accounts



The **IPCC** (Intergovernmental Panel on Climate Change) has drawn up specific guidelines to estimate and report on national inventories of anthropogenic greenhouse gas emissions and removals

Differences between air emission accounts and IPCC totals

- Adjustment for the **residence principle**: air emission accounts follow the residence principle whereas national emission inventories follow a territory principle.
- National totals are defined differently in national emission inventories regarding international transport, e.g. emissions from international air transport are excluded in UNFCCC inventory totals whereas they are partly included in national inventory totals.
- Short cyclic CO2 is excluded from the IPCC totals

Bridge table

		2001	2005	2010	2011	2012	2015*		
		Mton CO ₂ equivalents							
1.	Stationary sources ¹⁾	184	180	183	169	168	168		
2.	Mobile sources on Dutch territory	40	41	41	42	41	41		
3.	Mobile sources according to IPCC	38	39	38	39	37	36		
4.	Short cyclic CO ₂	8	11	14	14	14	13		
5.	Total, IPCC (excl. LULUCF) ²⁾ = 1+3-4	213	208	208	194	191	192		
6.	Land Use, Land-Use Change and Forestry (LULUCF)	3	3	3	3	3	3		
7.	Total, IPCC (incl. LULUCF) = 5+6 (Kyoto-protocol)	215	211	211	197	195	195		
8.	Actual emissions in the Netherlands = 1+2	224	221	224	211	209	210		
9.	Residents abroad	26	26	25	25	26	26		
10	. Non-residents in the Netherlands	6	7	7	7	7	7		
11	. Total emissions by residents = 8+9-10	243	241	243	229	228	228		

2012 2017#



Compilation of the air emission accounts



Compilation

Two approaches:

1. Energy-first-Approach:



- \rightarrow Compile Energy Accounts using energy balance / energy statistics
- \rightarrow Compile net energy use accounts for air emissions
- → Calculate emissions: Emission = Fuel use * emission factor (by fuel type)

- 2. Inventory first approach:
 - \rightarrow Use data from national inventory plus auxiliary data



Or use and combine both and confront ...

Emission types

Can be derived from the energy accounts

1. Emissions from combustion

Combustion of fossil fuels for final demand Combustion of fossil fuels for production of electricity or heat Combustion of biomass (short cyclic)

- 2. Emissions from conversion processes (non-combustion) Conversion from fossil fuels (e.g. chemical processing) Conversion from non-fossil fuels (e.g. biofuels)
- 3. Other emissions

E.g. methane emissions from livestock and landfills, or emissions of particulate matter caused by braking of cars



Two main compilation issues



1. Correcting for the residence principle

 \rightarrow Adjustments for international transport

- 2. Assigning emissions to industry (NACE/ISIC)
 - \rightarrow Assigning emissions to industry and households



Data sources

- Existing energy accounts, energy balances and statistics
- Existing emissions inventories (e.g. IPCC reporting)
- \rightarrow If none, create an energy account, first!
- Auxiliary statistics
 - Economic statistics, waste statistics, traffic statistics, etc.
- Surveys
 - Only if necessary (e.g. to fill in gaps on household use of fuelwood)
 - Exploit financial and administrative data first!
- Administrative data
 - Expenditures on fuel (by type), consumption of fuel
- Conversion factors (by type of fuel)
 - Use "best" national factors or international data





Key questions you can answer with the air emission accounts

- How much air pollution is caused by economic activities ?
- Is this changing over time ?
- Who are the main polluters ?
- In what regions do these emissions occur ?
- Is there decoupling between emissions and economic growth ?
- Is the emission efficiency of the economy / industries improving ?



Air emissions in the Netherlands











Example: air emission accounts in the Netherlands

- Compiled annually by Statistics Netherlands
- Data reported to Eurostat (legal base)
- Time series 1990-2018
- 64 industries plus households
- Also data on quarterly basis
- Used a.o. for decomposition and footprint analysis





Organisational setting



Dissemination

- Official statistics at <u>www.cbs.nl</u>
- Emission data at <u>www.prtr.nl</u>
- Policy indicators at Environmental Data Compendium, e.g., www.compendiumvoordeleefomgeving.nl/indicatore n/en0165-Greenhouse-gas-emissions.html?i=41-205



Compilation of air emission accounts in the Netherlands





Data sources

- Main data source: emission inventory
- Additional data sources
 - \rightarrow Residence principle
 - International transport and tourism
 - Vehicles: transport statistics (kilometers driven abroad and in NL)
 - Inland shipping
 - International shipping: national accounts data
 - Air transport: KLM annual report + grossing up based on production statistics
 - →NACE/ISIC:
 - Energy accounts used (which is based on energy statistics)
 - E.g. to allocate natural gas consumption to industries/households



Dutch air emission account (2018)

Greenhouse gases (climate change)	3,640 1,038 0.2 0.0
	3,640 1,038 0.2 0.0
CO2 mln kgs 37,825 158,051 10,302 1,919 46,149 46,942 9,729 3,323 30,904 3,189	0.2 0.0
N2O mln kgs 0.6 28.6 21.2 0.0 4.7 0.4 0.9 0.0 1.0 0.1	0.7 0.7
CH4 mln kgs 20.5 576.5 520.8 21.1 15.4 3.4 5.4 0.1 1.4 0.3	o.o 0.2
Greenhouse gas equivalents xmln 38,952 182,588 29,911 2,458 48,783 47,150 10,139 3,475 31,546 3,212	3,946 1,045
Acidification	
NOx mln kgs 40.0 346.5 56.9 4.1 33.6 13.1 4.8 13.9 205.0 6.3	6.0 1.4
SO2 mln kgs 0.5 36.0 0.3 0.2 19.3 3.8 0.9 0.0 11.4 0.0	0.2 0.0
NH3 mln kgs 15.0 117.2 113.5 0.0 1.6 0.0 0.3 0.1 0.8 0.5	0.2 0.0
Acidification equivalents mld acid-	
equivalents 1.8 15.5 7.9 0.1 1.4 0.4 0.2 0.3 4.9 0.2	0.1 0.0
Ozone layer depletion 1 000	
CFK12-equivalents CFK12-	
equivalents 0.0 58.8 0.0 0.0 0.0 0.0 33.8 25.0 0.0 0.0	0.0 0.0
(Other) air pollution	
CO mln kgs 386.0 226.2 10.2 0.6 119.2 6.6 3.8 6.4 47.4 24.4	5.0 0.8
NMVOC mln kgs 74.5 176.5 93.8 4.7 37.0 0.7 0.2 5.0 24.7 3.6	3.9 0.9
PM10 mln kgs 6.5 22.4 6.9 0.0 7.0 0.2 0.1 2.1 5.5 0.4	0.2 0.0

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Source: CBS

http://opendata.cbs.nl/statline/#/CBS/en/dataset/83300ENG/table?ts=1574322437892

Decoupling air emissions and GDP





Air emissions by sector





Greenhouse gas emissions: regional data





Decomposition analysis

% change w.r.t. 1995





---- Economic activity ---- Carbon dioxide emissions

Detailed guidance

ISSN 1977-0375



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EuroStat Manual for Air Emissions Accounts uses SEEA principles

Manual for Air Emissions Accounts



Thank you. Any questions?

