Introduction to air emission accounts

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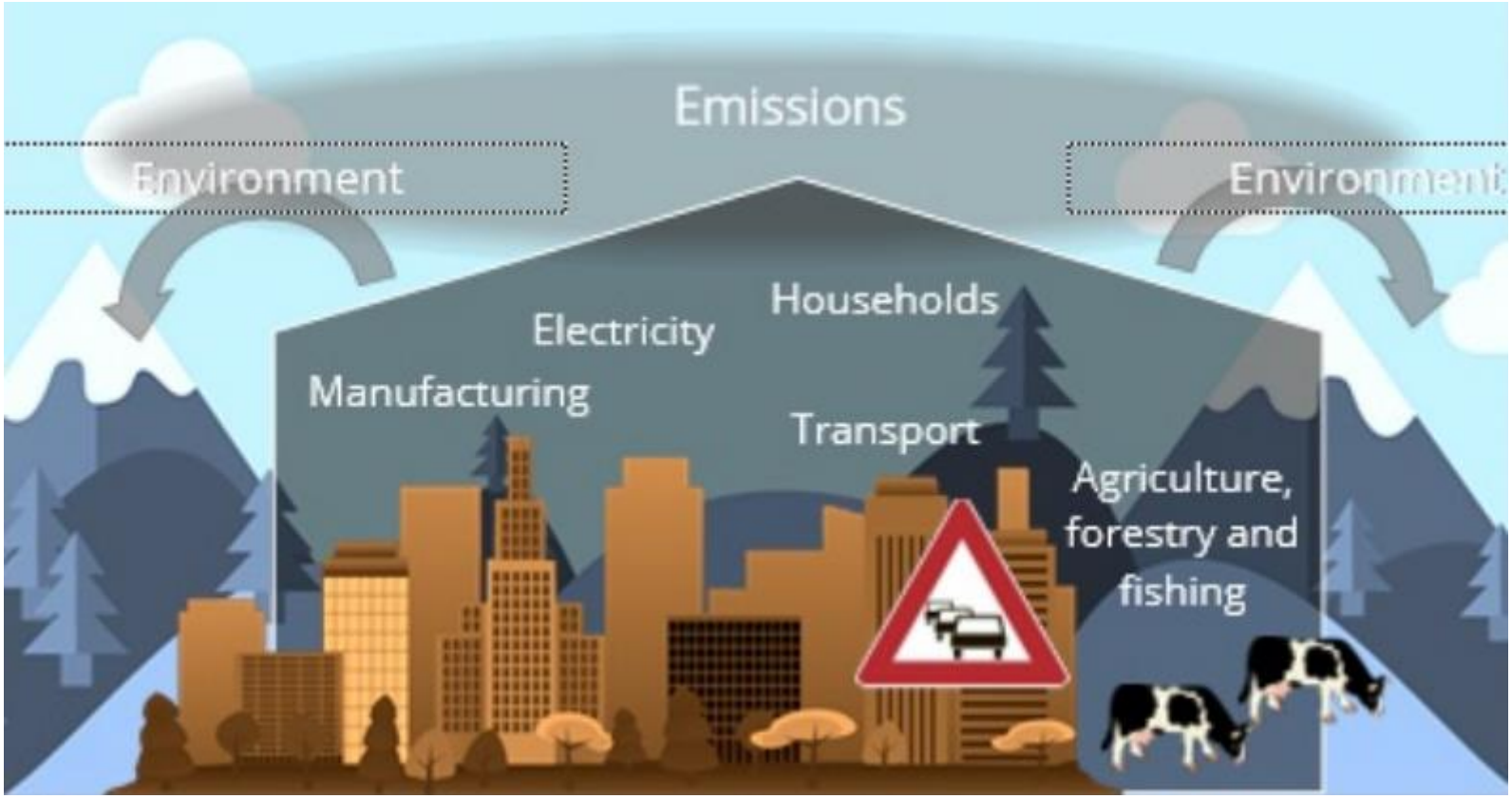
Air emission account: overview



Air emission account: what are we measuring and how

Emissions of greenhouse gases:

- Carbon dioxide (CO_2)
- Nitrous oxide (N_2O)
- Methane (CH_4)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Nitrogen trifluoride (NF_3)
- Sulphur hexafluoride (SF_6)

Air pollutants:

- Sulphur oxides (SO_x)
- Carbon monoxide (CO)
- Nitrogen oxides (NO_x)
- Ammonia (NH_3)
- Non-methane volatile organic compounds (NMVOCs)
- Coarse particulate matter (PM_{10} $PM_{2.5}$)

Emission = Activity Data * Emission Factor

Global warming potential of air emissions – CO2 equivalents

The Global Warming Potential (GWP) of different substances is quantified by multiplying the emssions by factors expressing the relative warming impact when compared to carbon dioxide (CO2)

	Carbon dioxide (CO_2)	GWP for CO_2=1
+	Methane (CH_4)	* GWP for CH_4
+	Nitrous oxide (N_2O)	* GWP for N_2O
+	Perfluorocarbons (PFCs)	* GWP for PFCs
+	Hydrofluorocarbons (HFCs)	* GWP for HFCs
+	Sulphur hexafluoride (SF_6)	* GWP for SF_6
+	Nitrogen trifluoride (NF_3)	* GWP for NF_3
	Sum = Total GHG emissions	

Current weigthing factors for a 100 years time horizon:

* CO2: 1
* CH4: 25
* N2O: 298
* HFCs: from hundreds to thousands.

Air emission account: a sample

Who releases them?

Pollutants

Air emissions account *(tonnes)*

Supply table for air emissions

	Generation of emissions								Accumulation	
	Industries—by ISIC					Households				
	Agriculture ISIC A	Mining ISIC B	Manufacturing ISIC C	Transport ISIC H	Other	Transport	Heating	Other	Emissions from landfill	Total supply of emissions
Type of substance										
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
Methane	492.0	34.1	15.8	0.8	21.9	2.4	15.5	1.7	222.0	806.3
Dinitrogen oxide	23.7		3.5	0.8	2.6	1.0	0.2	0.1	0.1	32.0
Nitrous oxides	69.4	6.0	37.9	259.5	89.0	38.0	12.1	1.3	0.3	513.6
Hydrofluorocarbons			0.3		0.4					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
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
Sulphur dioxide	2.7	0.4	28.0	62.4	8.1	0.4	0.4	0.1	0.0	102.5
Ammonia	107.9		1.7	0.2	0.9	2.3	11.4	1.2	0.2	125.9
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

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Air emissions accounts – characteristics

- Record all emissions related to economic activity
- Emissions are recorded consistent with national accounts´ principles and classifications
- Production activities classified by ISIC, etc.
- Residence principle
  - *Exclude* emissions released within the national territory by non-residents
  - *Include* emissions abroad of resident economic units.
    - Example: Emissions from air transport: Emissions of a flight of AirAstana from Almaty to Bishkek is recorded in the Kazakhstan accounts because Air Astana is resident in Kazakhstan

What is in and what is out?

Include

Flows of air emissions from the economy into the environment, such as:

- **All emissions from combustion of fuels** including biomass when it is use as fuel (e.g. wood > heating)
- **Flaring and venting** of e.g. natural gases
- **Emissions from livestock**
- **Emissions from manure** collected and spread on agricultural land (dissipative use)
- **Emissions from landfills** and waste incineration
- **Leakages from accumulations** (durable goods like refrigerators, landfills, etc.) should be recorded as they occur and attributed to the owner of the goods at the time of the leakage
- All emissions **from conversion processes**

Exclude

Flows of air emissions within the environment, or within the economy such as:

- **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**
- **Secondary emissions** results from processes in the environment
- Gaseous and particulate substances generated through economy activity **that are captured for use in other production processes** (e.g. methane captured in a landfill to generate electricity)

Air emissions accounts – some further notes

- SEEA CF air emissions accounts include CO_2 emissions from burning of biomass even if it is often regarded as being neutral in relation to global warming
- However, it is recommended to distinguish CO2 emissions from the burning of biomass from the emissions from burning of fossil fuels.

Air emissions accounts – some further notes

Air emissions from transport activities:

- From transport service industries (sea, air, land)
- From all other industries when they use their own cars and lorries
- From households when they use their cars, etc.

Remember the residence principle:

- Include air emissions from residents transport activities abroad
- Exclude air emissions from non-residents

Land use, land use change, and forestry (**LULUCF- sector**)

Emissions (+) and uptake (-) of carbon dioxide from land (forest, crop lands, grasslands, wetlands, etc.) are **reported under LULUCF according to the IPCC guidelines.**

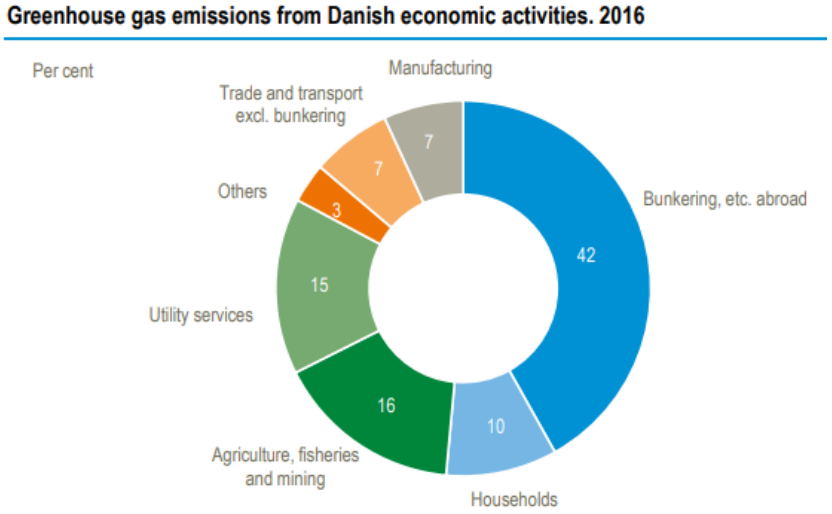
LULUCF emissions are not specifically mentioned in SEEA CF, and are generally **not included in air emissions accounts**

However, there is a lot of interest in LULUCF and it **may be included in separate tables**

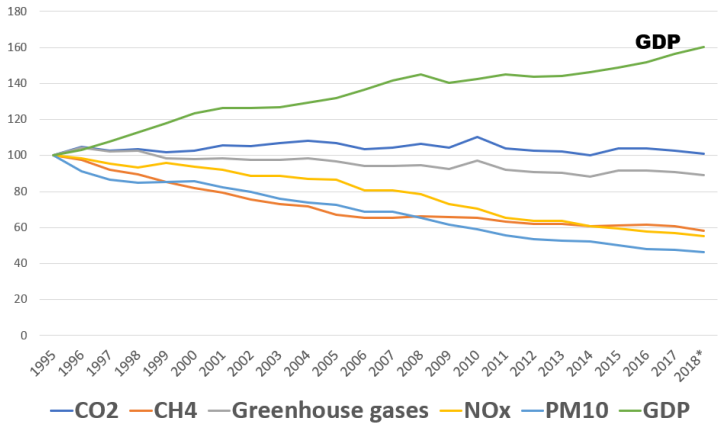
An issue for upcoming revision of SEEA CF

Key questions you can answer with the air emissions accounts

How much air pollution is caused by each economic activity – industries and households ?



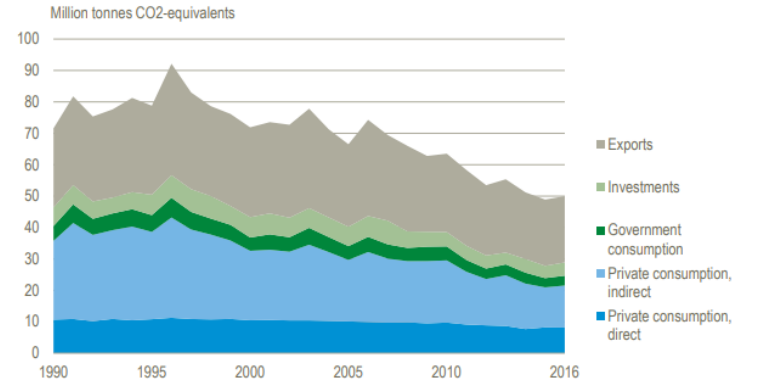
Is the emission efficiency of the economy / industries improving ?



Combinining air emissions accounts and input-output modelling

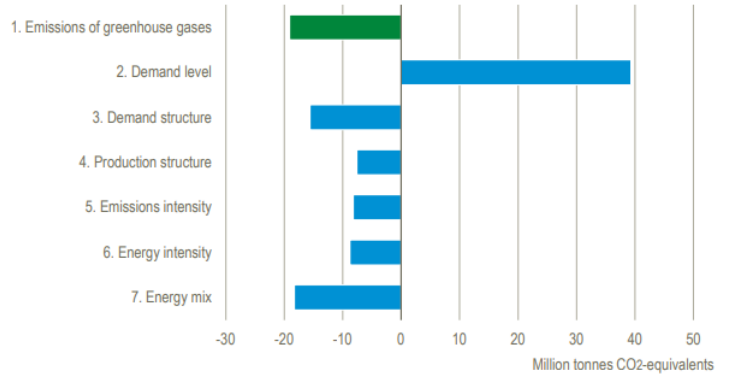
Air emissions footprints from private consumption and exports, etc.

Greenhouse gas emissions generated by different types of demand



Structural decomposition analyses, i.e. analysis of the reasons for changing levels of air emissions

Changes in greenhouse gas emissions by industries from 1990 to 2016 broken down by underlying factors



Indicators based on the air emissions accounts

- GHG emissions from the national economy
- GHG emissions from households
- GHG emissions from industries (ISIC / national accounts classification)

- Composite indicator: GHG intensity of production activities

$$\text{GHG emission intensity (in kt/currency)} = \frac{\text{GHG emissions of all industries (in kt } CO_2\text{)}}{\text{GDP (in currency)}}$$

Air emissions accounts versus air emissions inventories

Air emissions inventories: A database that lists, by source, the amount of air pollutants discharged into the atmosphere during a year

- **UN Framework Convention on Climate Change, UNFCCC – IPCC guidelines**
  - **Greenhouse gases** CO_2, N_2O, CH_4, HFCs, PFCs, SF_6

- **Convention on Long-range Transboundary Air Pollution, LRTAP (UNECE)**

  Air pollution – acid rain, eutrophication, and ground-level ozone formation

  - SO_2, NO_x, NH_3, CO, NMVOC, particulate matter, heavy metals, persistent organic pollutants

SEEA air emissions accounts builds on data from air emissions inventories, but there are *important differences between the accounts and UNFCCC and CLRTAP inventories*

Air emission account: relationship with inventory

Inventories	Accounts
Territorial principle	Residence principle
Emissions are assigned to **the country where the emission takes place**.	Emissions are assigned to **the country where the company causing the emission is based**.
Emissions are assigned to **technical processes** (e.g. combustion in power plants, solvent use).	Emissions are classified by **economic activity** (using the classification, as used in the system of national accounts).
Emissions from international **shipping and aviation** are assigned to the countries **where the associated fuel is purchased** regardless of where the purchasing company is based.	Emissions from international **shipping and aviation** are assigned to the countries **where the airline/shipping company is based**, regardless of where the emission takes place.

From air emissions to inventories

Table 5.1 **Bridge table for CO_2 emissions - UNFCCC method and the green national accounts**

		1990	1995	2000	2005	2013	2014
		million tonnes					
1	Total emissions: UNFCCC method	54.2	62.1	55.0	52.2	42.2	38.0
2	CO_2 from biomass used as fuel	4.6	5.6	6.8	10.7	15.0	14.9
3	Total emissions abroad (international transport)	9.4	11.4	19.6	34.4	34.0	33.0
	Of which: ships:	9.2	10.9	19.1	32.3	30.9	30.0
	aircrafts:	0.3	0.4	0.5	1.6	1.8	2.0
	vehicles:	0.0	0.0	0.0	0.5	1.3	1.0
4	Other differences in emissions from transport and cross-border trade	2.5	1.8	2.0	0.8	0.9	0.7
5 (=1+2+3+4)	Total emissions from Danish economic activities, incl. biomass	70.7	81.0	83.4	98.1	92.0	86.6
6	Total emissions from Danish economic activities, excl. biomass	66.2	75.3	76.5	87.4	77.0	71.7

Thank you

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