# Air Emission Accounts

Ole Gravgård

SEEA Training Seminar for the ECA
Addis Ababa 2-5 February 2015

STATISTICS DENMARK

# Flows of air emission

- 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.

- $CO_2$, $SO_2$, $NO_x$, $CH_4$, $N_2O$, $SF_6$, $NH_3$, $PM_{10}$, 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

Table 3.7

SUPPLY

USE

| | Supply table for air emissions | | | | | | | | | Use table for air emissions | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Generation of emissions | | | | | | | | Accumulation | Total supply of emissions | Flows to the Environment | Total use of emissions |
| | Industries | | | | | Households | | | Emissions from landfill | | Emissions released to the environment | |
| | Agriculture | Mining | Manufacturing | Transport | Other | Transport | Heating | Other | | | | |
| **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 | 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 | 259.5 | 89.0 | 38.0 | 12.1 | 1.3 | 0.3 | 513.6 | 513.6 | 513.6 |
| Hydroflourocarbons | | | 0.3 | | 0.4 | | | | | 0.7 | 0.7 | 0.7 |
| Perflourocarbons | | | | | | | | | | | | |
| Sulphur hexaflouride | | | | | | | | | | | | |
| 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 |

# Note 1

All actual $CO_2$ emissions should be included in the accounts – also $CO_2$ 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.

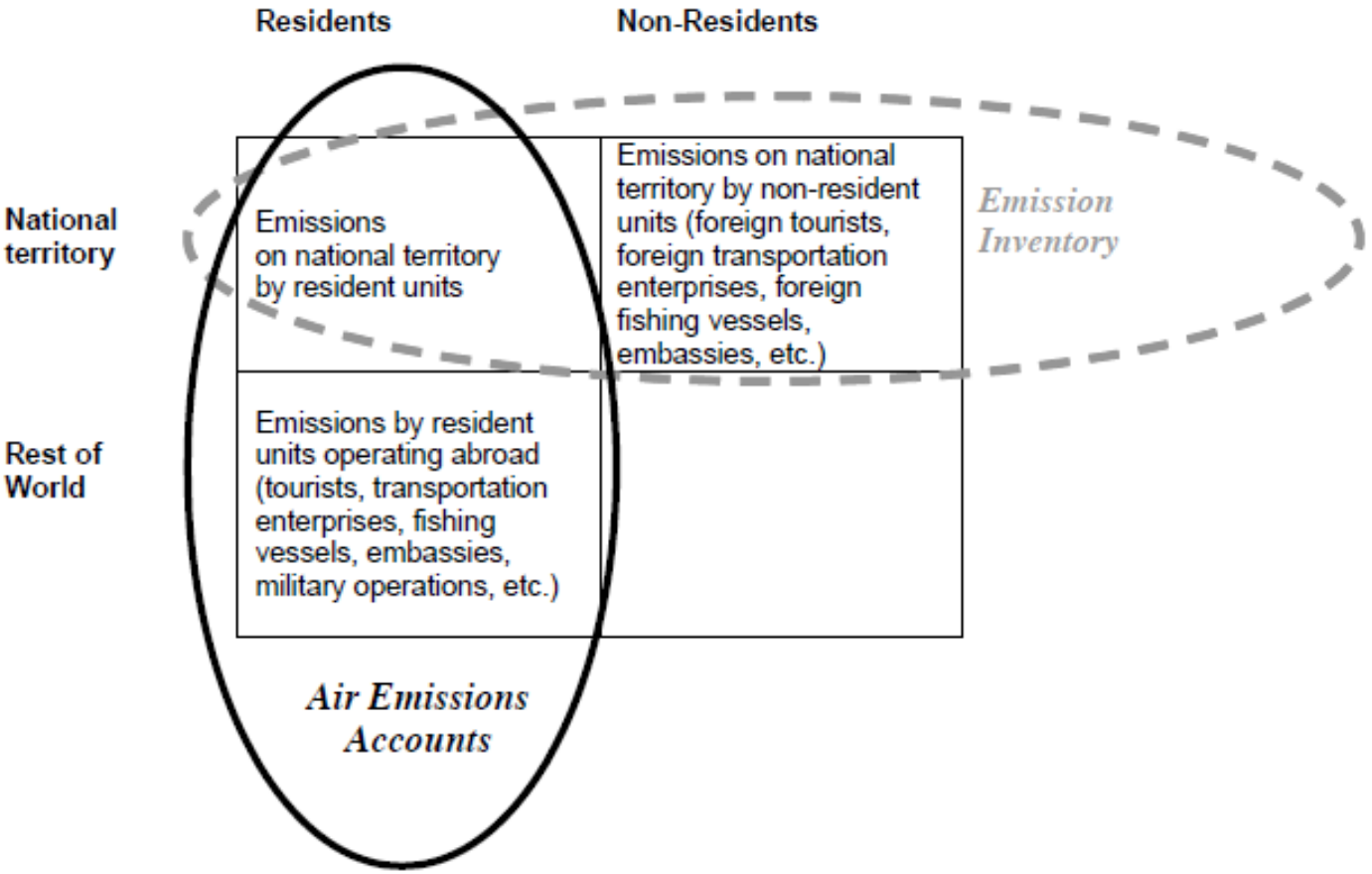
# Example air emission - Denmark

**Air Emission Accounts by industry and type of emission Denmark 2012**

| | Carbon dioxide incl. biomass (CO2), 1000 tonnes | Carbon dioxide excl. biomass (CO2), 1000 tonnes | Carbon dioxide from biomass (CO2), 1000 tonnes | Suphur dioxide (SO2), tonnes | Nitrogen oxides (NOX), tonnes | Ammonia (NH3), tonnes | Nitrous oxide (N2O), tonnes | Methane (CH4), tonnes | Non-methane volatile organic compounds (NMVOC), tonnes | Particulate matter < 10 µm (PM10), tonnes | Sulphur hexafluoride (SF6), tons CO2-equivalents |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 93 274 | 78 117 | 15 156 | 233 261 | 1089 108 | 76 222 | 21 557 | 262 535 | 108 838 | 48 188 | 117 852 |
| Households | 12 083 | 7 903 | 4 180 | 1 608 | 20 164 | 1 501 | 319 | 6 438 | 29 527 | 17 391 | 0 |
| Total industries | 81 190 | 70 214 | 10 976 | 231 652 | 1068 945 | 74 721 | 21 238 | 256 097 | 79 311 | 30 796 | 117 852 |
| A Agriculture, forestry and fishing | 2 528 | 2 264 | 264 | 1 336 | 19 908 | 73 447 | 17 515 | 200 933 | 4 258 | 7 176 | 0 |
| B Mining and quarrying | 1 932 | 1 777 | 155 | 180 | 7 380 | 0 | 37 | 2 663 | 3 982 | 116 | 0 |
| C Manufacturing | 6 537 | 5 801 | 736 | 4 999 | 12 331 | 379 | 101 | 2 606 | 31 492 | 811 | 66 369 |
| D_E Utility services | 24 017 | 14 599 | 9 419 | 2 833 | 15 111 | 703 | 917 | 48 443 | 1 681 | 797 | 11 036 |
| F Construction | 1 509 | 1 444 | 65 | 9 | 7 451 | 64 | 52 | 52 | 2 711 | 869 | 40 447 |
| G_I Trade and transport etc. | 42 969 | 42 793 | 176 | 222 148 | 1001 308 | 74 | 2 532 | 1 220 | 33 525 | 20 602 | 0 |
| J Information and communication | 101 | 96 | 5 | 5 | 304 | 4 | 3 | 11 | 92 | 21 | 0 |
| K Financial and insurance | 65 | 62 | 3 | 8 | 180 | 3 | 2 | 7 | 29 | 11 | 0 |
| LA Real estate activities and renting of non-residential buildings | 97 | 91 | 6 | 1 | 403 | 3 | 3 | 4 | 47 | 23 | 0 |
| LB Dwellings | 39 | 37 | 2 | 0 | 145 | 1 | 1 | 3 | 18 | 11 | 0 |
| M_N Other business services | 403 | 381 | 22 | 11 | 1 430 | 17 | 13 | 29 | 393 | 105 | 0 |
| O_Q Public administration, education and health | 846 | 727 | 119 | 98 | 2 489 | 19 | 57 | 109 | 863 | 230 | 0 |
| R_S Arts, entertainment and other services | 148 | 142 | 6 | 23 | 505 | 6 | 5 | 17 | 220 | 25 | 0 |

# Note 2

Use Residence approach (*not* Territorial approach)



| Area needing adjustment: | Countries that may consider corrections for these areas |
|---|---|
| International water transport | Countries with large ocean transport fleets such as: Norway, Greece, Denmark, the Netherlands, United Kingdom, South Korea, Japan |
| International air transport | Most countries but especially those with airport "hubs": Netherlands, UK, Germany, Italy, France, Denmark |
| International road transport | Countries where companies operate transport services abroad (mostly lorries and coaches registered abroad) |
| Fishing vessels | Countries whose fishing vessels are active in areas far from national fishing areas such as: Portugal, Spain, Norway, Ireland, Iceland, Russia |
| Tourism (private car driving) (non-resident units on national territory) | Countries that are attractive destinations for relatively large numbers of foreign tourists such as: Malta, Cyprus, Spain, France, Italy, Switzerland, Austria, UK |
| Tourism (private car driving) (resident units operating abroad) | Countries whose resident often leave the national territory on holidays using their own vehicles: Belgium, Luxembourg, The Netherlands, Slovenia |
| Emissions from land transport that do not involve fuel purchases | Geographic location as a "transit country" – driven through without purchasing fuel: Switzerland, Slovenia, Belgium, Germany |
| Fuel "tourism" (often induced by differences in tax levels between adjacent countries) | Countries where non-resident travel across borders to purchase petrol and diesel: Luxembourg, Sweden and Denmark (from Norway) |
| Transportation in pipelines | When pipelines are located in international territories – such as the sea floor there may be some issues related to residence and how the energy use in the pipelines is recorded. The energy use in the non-resident pipelines should be coordinated with how this is treated in the National Accounts. Relevant for Norway, the Netherlands, and potentially Denmark and Iceland in the future |
| Embassies, consulates and other extraterritorial enclaves | Nearly all countries have embassies within the national boundaries. In the National Accounts the economic activities of these areas are considered as non-resident units on the national territory. For Air Emissions Accounts this activity is of minor importance and is not included in corrections although technically it should be included. |
| Military establishments and military "actions" on national territory | For countries that host large military bases for other countries, corrections for this activity as non-resident units on the national territory should be considered although often a lack of data often due to the confidentiality of the data do not allow for corrections to be made. The same applies to military actions/wars on national territories. |

Source: Eurostat: Manual for Air Emissions Accounts

# 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 bridgetable - Denmark 2012

| | 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 |

www.statbank.dk/MRO1

# Note 3

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.

# Note 4

- 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 refrigirators, 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 emissions accounts

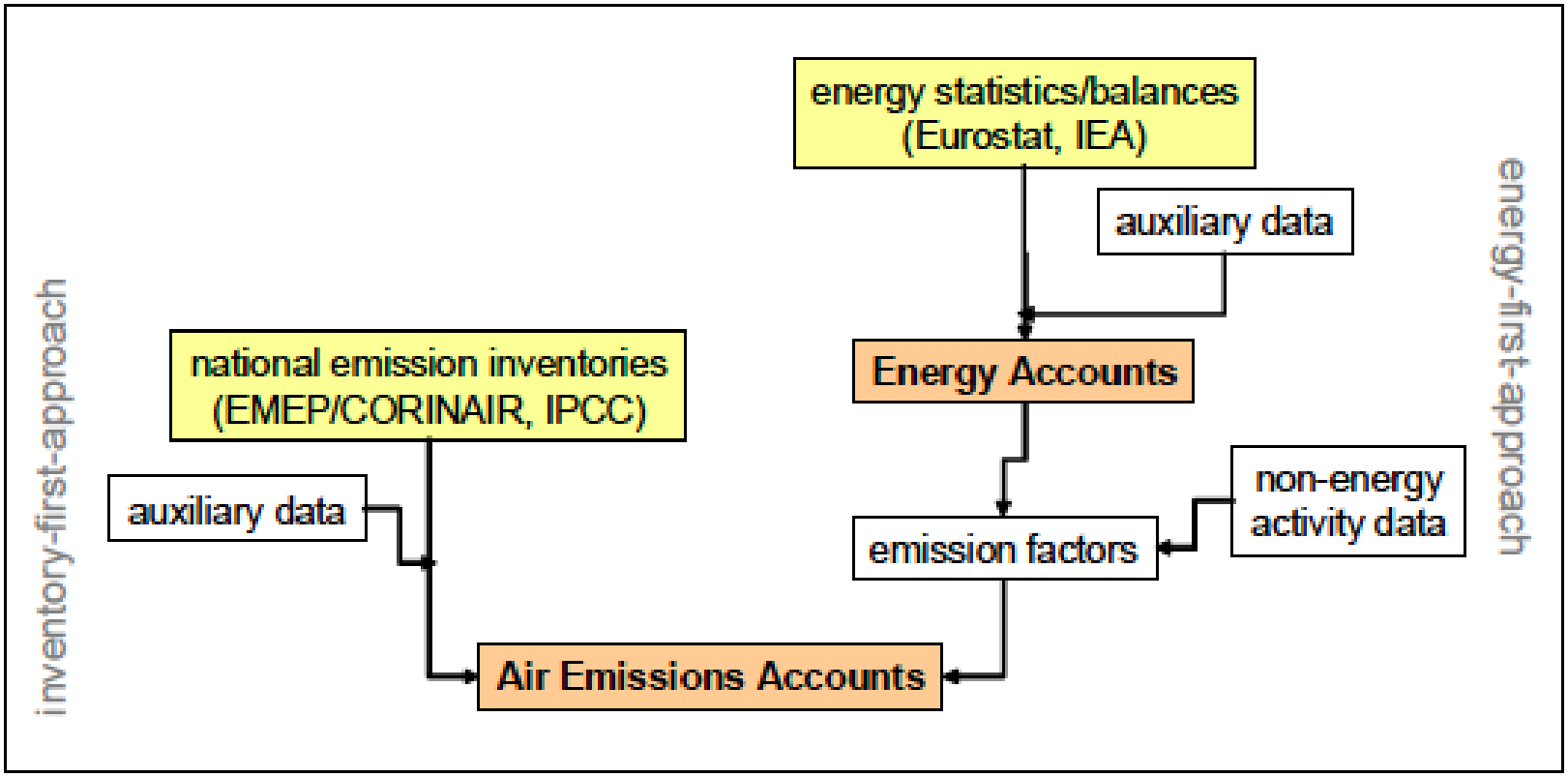
- The compilation of Air Emissions Accounts starts from existing data, namely data on air emissions, energy use and/or other parameters.

- 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”

# Two approaches: ”Inventory first” and ”Energy first”



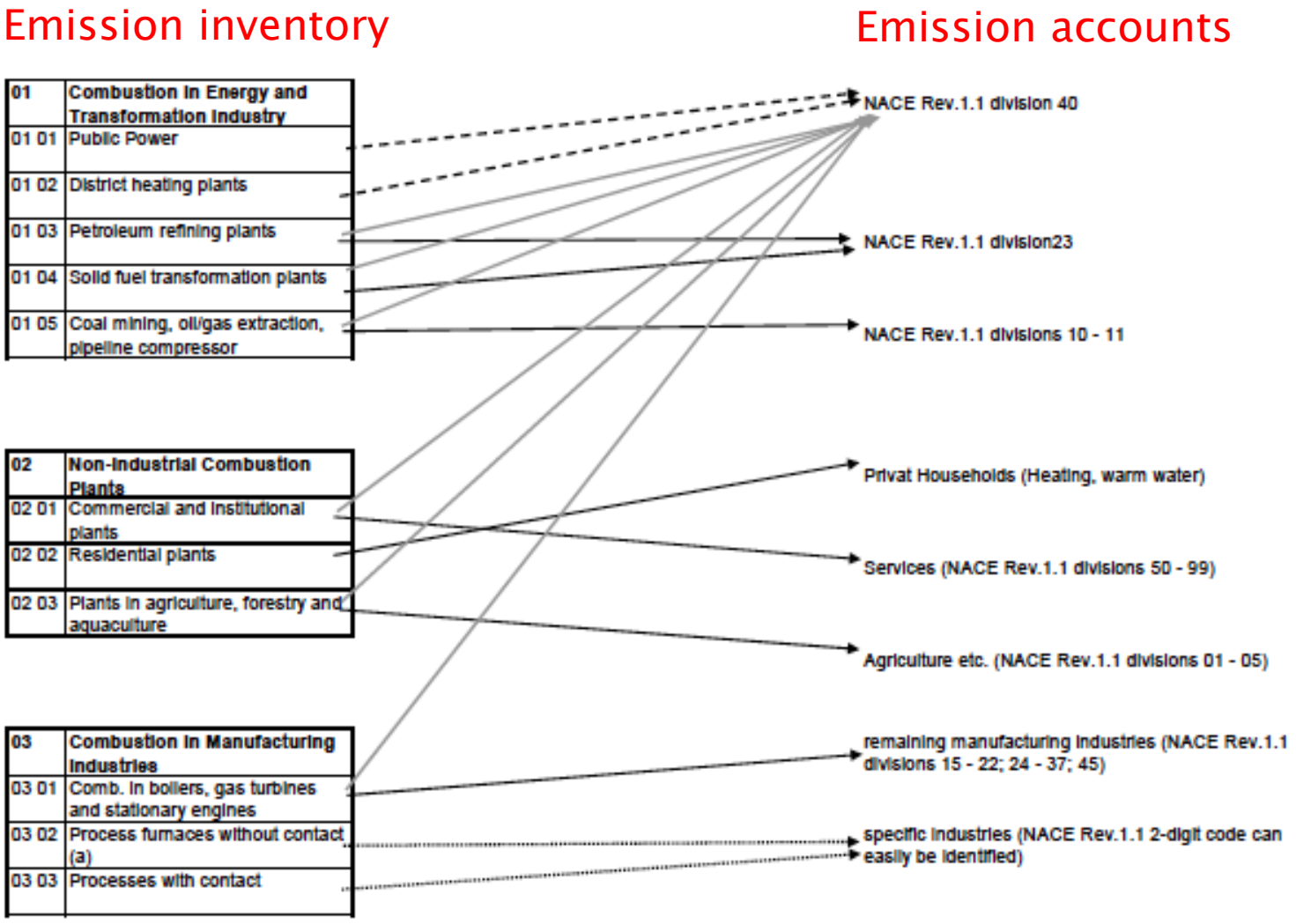

Source: Eurostat: Manual for Air Emissions Accounts

# ”Inventory first” appraoch

- The “inventory first-approach” starts from existing national emission inventories (e.g. related to United Nations Framework Convention on Climate Change, cf. IPCC Guidelines for National Greenhouse Gas Inventories

- It re-arranges those data to a format compatible with National Accounts.

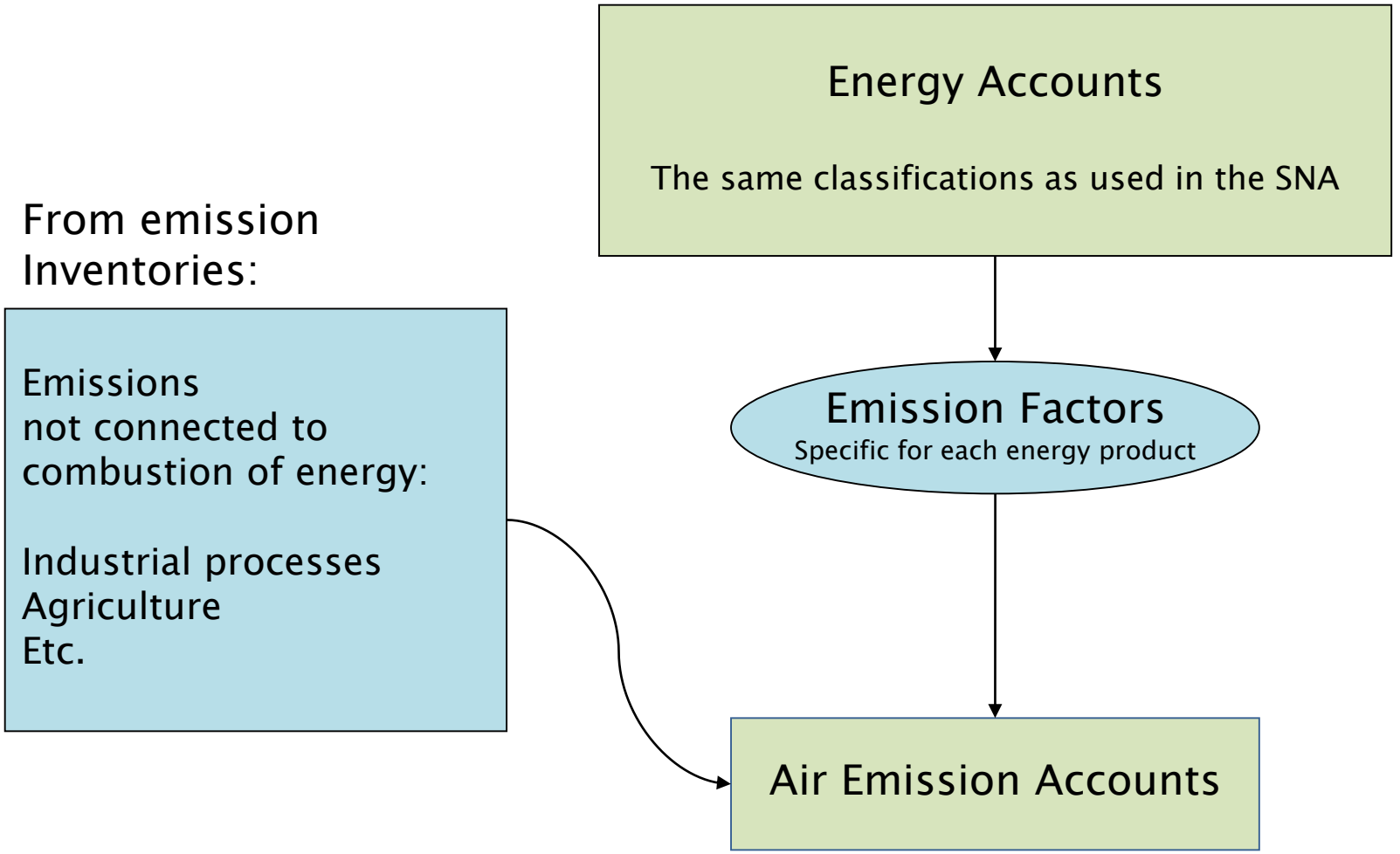
# ”Inventory first” appraoch



# ”Energy first” appraoch

- The “energy-first-approach” starts from energy statistics/balances which are re-arranged to Energy Accounts from which air emissions are calculated using certain emission factors.

# ”Energy first” appraoch



Guide to implementation: