Compilation Guide (2013) for Eurostat's Air Emissions Accounts (AEA)

revision of part B of the Manual for Air Emissions Accounts (AEA) – 2009 edition

Version: April 2013

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Glossary

UNECE   The United Nations Economic Commission for Europe (UNECE) is one of 5 regional commissions of UN. It brings together 56 countries and its major aim is to promote pan-European economic integration. The UNECE region covers more than 47 million km2 and is home of about 20% world population. UNECE negotiated 5 environmental treaties, including Convention on Long-range Transboundary Air Pollution (CLRTAP).

CLRTAP   The Convention on Long-range Transboundary Air Pollution (CLRTAP) has been established by UNECE. CLRTAP entered into force 1983. The Convention which has 51 Parties was the first international legally binding instrument to deal with air pollution on regional bases. The aim of the Convention is that Parties shall endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution by developing policies and strategies to combat the discharge of air pollutants through exchanges of information, consultation, research and monitoring.

EMEP   European Monitoring and Evaluation Programme provides scientific support to the LRTAP Convention on: Atmospheric monitoring and modelling, emission inventories and emission projections, and integrated assessment modelling. The EMEP programme is carried out in collaboration with a broad network of scientist and national experts.

CEIP   The EMEP Centre on Emission Inventories and Projections (CEIP)[1] hosted by the Umweltbundesamt (the Austrian Environment Agency), started on 15 January 2008. The CEIP builds on the work of EMEP; maintains and further develops emission database and provides support to the Parties, modellers and UNECE secretariat.

IPPC   The Intergovernmental Panel on Climate Change (IPCC)[2] is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.

UNFCCC   United Nations Framework Convention on Climate Change[3] is an international environmental treaty to "stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty was established in 1992 and entered into force 1994. The UNFCCC has been ratified by 195

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[1] http://www.ceip.at/
[2] http://www.ipcc.ch/index.htm
[3] http://unfccc.int/2860.php

parties. The UNFCCC is also the name of the United Nations Secretariat that support the operation of the convention, situated in Bonn, Germany.

Kyoto protocol	The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. Under the Protocol, countries' actual emissions have to be monitored. Reporting is done by Parties by submitting annual emission inventories and national reports under the Protocol at regular intervals.

Post Kyoto:

The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. The detailed rules for the implementation of the Protocol were adopted at COP 7 in Marrakesh, Morocco, in 2001, and are referred to as the "Marrakesh Accords." Its first commitment period started in 2008 and ended in 2012. In Doha, Qatar, on 8 December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;

- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and

- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

On 21 December 2012, the amendment was circulated by the Secretary-General of the United Nations, acting in his capacity as Depositary, to all Parties to the Kyoto Protocol in accordance with Articles 20 and 21 of the Protocol.

During the first commitment period, 37 industrialized countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first.

ESA	European System of National and Regional Accounts
SNA	UN System of National Accounts
SEEA-CF	UN System of Environmental Economic Accounting – Central Framework
SNAP	Selected Nomenclature for Air Pollution is a classification to facilitate the source sector split.

CRF   Common Reporting Framework is the classification used to report data to the UNFCCC

NFR   Nomenclature For Reporting is the classification used to report data to the CLRTAP

CORINAIR   Coordination of Information on the environment was a programme to establish an inventory of emissions of air pollutants in Europe.

EEA   European Environment Agency

NACE   Statistical classification of economic activities in the European Community

CPA   Statistical classification of products by activities

Foreword

This compilation guide for Eurostat's Air Emissions Accounts (AEA) accompanies the 2013 version of Eurostat's electronic questionnaire on AEA and is supposed to support compilers in national statistical institutes (NSIs).

It is widely based on Part B of the former Manual for Air Emissions Accounts (2009 edition). Major adjustments of this compilation guide were necessary due to the revision from NACE Rev.1.1 towards NACE Rev.2. This relates in particular to the so-called "inventory-first-approach" (see chapter 5) and the correspondence between NACE 2-digit divisions and the various source codes (SNAP, CRF, NFR) employed in the compilation of national inventories for greenhouse gases and air pollutants (see Annex 1).

Further revisions were necessary due to the adoption of the System of Environmental-Economic Accounting Central Framework (SEEA-CF) in 2012. These relate mainly to alignments of terminology and how Eurostat's Air Emissions Accounts (AEA) are conceptually embedded in the overall SEEA-CF.

This compilation guide has been prepared under the lead of Eurostat E.2 (David Biddle, Stephan Moll) supported by an expert team from Statistics Sweden (Nancy Steinbach, Fredrik Kanlén, Anders Wadeskog and Mårten Berglund) to whom Eurostat would like to express its gratitude.

1. Introduction

1.1 Aim of this document

Air Emissions Accounts (AEA) is one of several physical modules of Eurostat's programme on European environmental economic accounts. It is covered by Regulation (EC) No. 691/2011 on European environmental economic accounts[4].

Eurostat's Air Emissions Accounts record and present data on physical flows of gaseous or particulate materials ('air emission'). They record national economies' emissions to air in a breakdown by emitting economic activity as delineated in the European system of national and regional accounts (ESA). Economic activities comprise production and consumption and follow the so-called residence principle.

Eurostat links the Air Emissions Accounts to the ESA supply and use tables[5] in order to estimate 'embodied' emissions associated with imports and exports to the EU economy[6].

This document presents practical guidance for the compilation of Eurostat's Air Emission Accounts (AEA) and is hence primarily addressing compilers in national statistical institutes (NSI). It serves as a support to the Regulation (EU) No 691/2011 of the European Parliament and of the Council of 6 July 2011 on European environmental economic accounts[7] under which 2013 is the first mandatory reporting year. This document shall provide guidance for filling out the electronic questionnaire which Eurostat sent out by end of April 2013.

1.2 Scope of this document

The remaining sections in this chapter 1 briefly provide conceptual basics (SEEA) and some specific conventions applied in Eurostat's Air Emissions Accounts. Chapter 2 is a summary of the general compilation sequence and chapter 3 introduces important definitions and classifications. Chapter 4 presents the general format of Eurostat's AEA (reporting tables in electronic questionnaire).

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[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011R0691:EN:NOT

[5] Eurostat (2008): Eurostat Manual of Supply, Use, and Input-Output Tables – 2008 edition. Methodologies and Working Papers, Luxembourg: Office for Official Publications of the European Communities, 2008

[6] See e.g. http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Carbon_dioxide_emissions_from_final_consumption

[7] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011R0691:EN:NOT

The compilation of Air Emissions Accounts generally 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 the European System of National and Regional Accounts (ESA).

For compiling Air Emissions Accounts, two main compilation approaches can be distinguished.

- The "inventory-first-approach" starts from existing national emission inventories and re-arranges those data to a format compatible with National Accounts[8]. The "inventory-first-approach" is presented in detail in chapter 5. For each inventory source code (SNAP[9], CRF[10], and NFR[11]) this guide aims at giving as precise as possible recommendations on how to re-assign these air emissions to National Accounts categories of economic activities, i.e. industries (according to the NACE classification[12]) and private households.

- The "energy-first-approach", described in chapter 6, starts from energy statistics/balances which are re-arranged to Energy Accounts from which air emissions are calculated using certain emission factors. It is less settled in methodological terms and each country applies its individual methodological steps depending on the varying primary statistical sources employed. Hence, chapter 6 is more general in describing the compilation process.

- A third approach – not described in the compilation guide but also a possibility – is the combined use of both inventory data on emissions and energy statistics.

Due to different (measurement or accounting) principles the national totals recorded in inventories related the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention of Long Range Transboundary Air Pollution (CLRTAP) will differ from the national totals in Eurostat's Air Emission Accounts. These differences are recorded and presented in so-called bridging items tables which are described in chapter 7.

1.3 Conceptual foundations

The System of National Accounts (SNA) and its European version (ESA) as well as the System of Environmental-Economic Accounting Central Framework (SEEA CF) adopted in 2012 provide the overarching conceptual frameworks in which Eurostat's Air Emissions Accounts are embedded.

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[8] As reported under the Kyoto protocol as well as to the Convention on the Long-range Transboundary Air Pollution

[9] Selected Nomenclature for sources of Air Pollution - developed as part of the CORINAIR project for distinguishing emission source sectors, sub-sectors and activities by the European Environment Agency's European Topic Centre on air emissions

[10] Common Reporting Format used for the reporting of air emissions to the United Nations Framework Convention on Climate Change (UNFCCC)

[11] Nomenclature For Reporting - is a classification system developed by the UNECE for reporting to the convention on Long Range Transboundary Air Pollution (CLRTAP)

[12] Statistical Classification of Economic Activities in the European Community, NACE Rev. **2**

Eurostat's Air Emissions Accounts belong to physical flow accounts (see chapter 3 SEEA-CF) which provide a general accounting framework for recording the physical flows between environment and economy (natural inputs, residuals) as well as the physical flows within the economy (products) as a result of production, consumption and accumulation processes. The physical flow accounting framework is based on the approach of physical supply and use tables (see SEEA-CF, chapter 3.2).

Eurostat's Air Emissions Accounts can be regarded as a partial and simplified physical supply table (see SEEA-CF §§3.235-3.239 and Table 3.6.1). They record the flows of residuals (i.e. gaseous and particulate substances) released to the environment (i.e. atmosphere) by industries and private households as a result of their production, consumption and accumulation processes.

The Eurostat Air Emissions Accounts supply table deviates conceptually slightly from the SEEA-CF Table 3.6.1. The Eurostat supply table does not consider any heading for accumulation. Accumulation and production processes are lumped together under the industry respectively undertaking these processes. For example, gaseous emissions from landfills are recorded under the heading of the waste management industry.

1.4 General principles

As all residuals, air emissions are incidental and undesired outputs from elements of the economic system (production and consumption). Further, air emissions in Eurostat's Air Emissions Accounts relate to those physical flow of gaseous or particulate materials that origin in the economic system (production or consumption processes) and which are released into the atmosphere and remain suspended in the air for a substantial time period. Most of those residuals are in a gaseous state but small particulates (PM2.5 and PM10) and heavy metals are solids that are effectively suspended in the atmosphere for substantial times and have certain behaviours that are similar to gases.

The list of gaseous and particulate materials which could be recorded theoretically is large. In Eurostat's Air Emissions Accounts only a selected number of environmentally most relevant residual materials is asked for; comprising greenhouse gases as well as emissions of air pollutants such as e.g. SO_2, NO_x, PM10 etc. The list of gaseous and particulate materials (next to their measurement units) is provided in chapter 4.

Residence principle
Some air emissions will occur when economic units undertake activity in other countries (SEEA-CF §3.240). One of the underlying principles deriving from national accounts and SEEA-CF is that the relevant flows (i.e. air emissions) are attributed to the country of residence of the producing or consuming unit (SEEA-CF § 3.121). This differs from the territory principle of recording that is applied in national inventories for greenhouse gases

and air pollutants. More details on these adjustments for the residence principle are given further below (sections 2.1, 5.1, 5.2, 6.3.1, chapter 7).

Exclusion of intra-environment flows of gaseous and particulate substances

The nature of air emissions means that it is quite possible for air emissions released in one country to be carried through the atmosphere into the territory of another country. These flows are out of scope of Eurostat's Air Emissions Accounts (see SEEA-CF §3.241) as they are flows that take place within the environment. Excluded are also capture or embodiment of gases by the natural environment, for example carbon captured in natural forests and soils (SEEA-CF §3.242).

1.5 Specific principles and conventions for Eurostat's Air Emissions Accounts

Although the SNA/ESA as well as the SEEA-CF give clear guidance on where to draw the economic boundary, there remain some border cases in the case of air emissions which are addressed in the following and for which certain accounting conventions have been established.

These cases have in common that they relate to air emissions from certain origins (agricultural soils, humans, cultivated plants and forests, animals, and landfills). The general question arises, whether these origins or sources of emissions are regarded as being part of the economic system or part of the environmental system? If they are part of the economic system, they should be recorded following the general rules of national and environmental-economic accounts. If they are part of the environmental system, they should not be recorded.

The first rule is to apply national accounts principles; this implies that any release of residual gaseous and particulate materials into the atmosphere activated by human/economic activity should be recorded and included in Eurostat's Air Emissions Accounts (e.g. theoretically including human breathing and evapotranspiration).

However, as a second rule – due to practical considerations – only those air emissions are considered which are actually recorded in emission inventories and considered when deriving national totals. In other words, for practical reasons only those emissions are considered in Eurostat's Air Emissions Accounts for which data are available and used to derive national totals based on the emission inventories (e.g. human evapotranspiration is excluded for this reason).

The deviations from the first rule are mostly due to practical reasons, i.e. the difficulties in developing estimates for certain types of emissions not included in the official emission inventories. As figures are roughly estimated these estimates can introduce large sources of error in the Air Emissions Accounts.

Air emissions from (and up-take by) cultivated plants and forests

Gaseous and particulate substances are released (and adsorbed) by cultivated plants and forests. Emissions inventories (UNFCCC, CLRTAP) do partly record these flows under the heading of "land use, land use change, and forestry" (LULUCF) (see also further below section 5.12). However they are excluded from the emission inventory totals and hence not subject to the policy targets. The exclusion from the inventory totals is also due to the uncertainty of the estimates of these flows.

According to the SEEA emissions from cultivated plants, soil and forests should be included in air emissions accounting if they directly result from economic production, consumption and/or accumulation processes (SEEA-CF §3.243).

In Eurostat's Air Emissions Accounts these emissions are excluded (see also section 5.12, basically the entire CRF/NFR source code 5 is excluded) due to difficulties in quantifying those in Europe. In other words, carbon sequestrations in forests are not to be subtracted from the total emissions to air by forestry. Similarly, 'natural' emissions from managed forests (e.g. NMVOC emissions from living trees) are not to be reported here.

Further exceptions are made with regards to water (evapotranspiration) and oxygen (photosynthesis). In general, water and oxygen are not accounted for in Eurostat's Air Emissions Accounts and hence emissions of those substances from cultivated plants and forests are hence not considered.

Air emission from agricultural soils (including sludge/manure spreading)

Air emissions from agricultural soils – as a consequence of soil cultivation and harvest, fertilizer and manure application, and animal excreta (e.g. CRF/NFR codes 4.B, 4.C, 4.D) – are considered in Eurostat's Air Emissions Accounts as data are available in emission inventories and included in their national totals.

Emissions of gaseous substances from humans and domesticated animals

Human bodies are the source of emissions of water (evapotranspiration) and carbon dioxide. Both are not accounted for in Eurostat's Air Emissions Accounts due to the lack of data. Although in principle, these would belong to the flow of gaseous substances from the national economy to the environmental system.

Emissions of gaseous substances originating from domesticated animals comprise water (evapotranspiration), carbon dioxide and methane from enteric fermentation taking place in the digestive system of ruminant animals. Only methane emissions from ruminant animals are accounted for in Eurostat's Air Emissions Accounts as data are available in emission inventories.

Exclusion of captured gaseous and particulate substances (e.g. landfill gas)

In some situations the gaseous and particulate substances generated through economic activity may be captured for use in other production processes (for example, the capture of methane gas in landfill sites to generate energy) or may be transferred between economic units for use in production or for storage (for example, the storage of carbon). These intra-economy flows are excluded from Eurostat's Air Emissions Accounts (see also SEEA-CF §3.234).

Flaring and venting

The flaring and venting of residual gaseous and particulate materials into the air is recorded in emission inventories and takes place in conjunction with certain economic activities, namely, in oil refineries (SNAP code 09 02 03 => NACE Rev.2 division 19), chemical industries (SNAP code 09 02 04 => NACE Rev.2 division 20), and oil extraction (SNAP code 09 02 06 => NACE Rev.2 division 06). Hence, flaring and venting is also recorded in Eurostat's Air Emissions Accounts.

2. General compilation guidelines

Like most Environmental Accounts, Air Emissions Accounts are also developed from a variety of existing primary data (e.g. emission inventories, energy statistics) and compiled according to specific accounting rules, definitions and requirements. This conversion and re-arranging process requires that the existing data are made consistent with principles and classifications of the ESA; in particular with the system boundaries of the National Accounts.

Some general issues should be noted:

- Emissions should be recorded at the time that the emission takes place.
- In contrast to the SEEA-CF recommendation, emissions from cultivated plants, soil and forests are excluded (all items under CRF/NFR code 5 are excluded, even if they originate from cultivated nature)..
- Emissions from landfills are only considered and accounted for if they are actually released to the atmosphere (i.e. excluding captured gases).
- Emissions from non-economic agents, such as forest fires, wetlands or volcanoes are excluded from scope.
- Emissions from cultivated livestock due to digestion (primarily methane) are included within scope as well as emissions from manure management (all items under CRF/NFR code 4 are included if they are related to economic activities of resident units).
- Secondary emissions due to natural processes in the atmosphere are not included.
- Flaring and venting are included.
- CO_2 emissions from biomass are included in the Air Emission Accounts as a separate item.

In developing Air Emissions Accounts there are two main starting points as regards to the main data sources: national emission inventories or energy statistics/balances (see Figure 1). Accordingly two generic compilation approaches are distinguishable: "inventory-first-approach" and "energy-first-approach". Deciding whether to start with energy or emissions data is typically determined by what data can be obtained and what type of cooperation with national experts can be established.

Figure 1: Schematic overview on two generic compilation approaches for Air Emissions Accounts
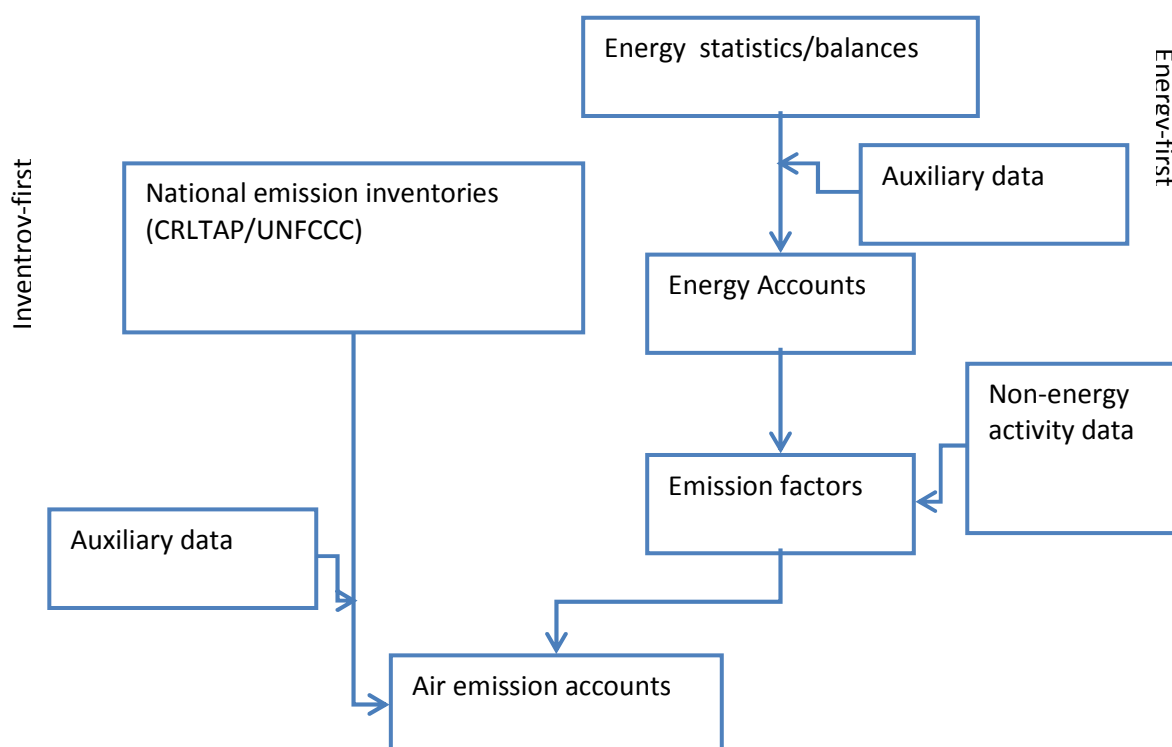
In the "energy-first-approach" energy data are the starting point (see chapter 6 for further details). First, emission-relevant energy use needs to be assigned to economic activities as defined by NACE and households and then emissions are calculated using emission factors. The adjustments for the resident principle also need to be made for energy use. If Energy Accounts are already available, then the energy use data have already been allocated to industries and households and system boundaries of the energy balances have been adjusted according to the resident principle. Then industry specific emissions factors can be used to calculate emissions. The non-energy related emissions (industrial processes, solvent and other volatile organic products, agriculture and landfills) then need to be included as well.

In the "inventory-first-approach" national emission inventories form the starting point (see chapter 5 for further details). Then adjustments for the resident principle are typically made first and then the emissions are allocated to the economic activities (industries according NACE classification and private households).

But regardless of the starting point and compilation approach, there are two steps required when compiling Air Emissions Accounts on the basis of emissions inventories or energy statistics/balances. These two generic compilation steps are:

1. Adjusting the system boundaries to correspond with those of National Accounts (geographic versus economic system definition), and
2. Assigning the environmental data to economic activities (industries and households) actually inducing respective energy uses and/or air emissions.

And regardless of the starting point, allocating data to economic activities requires the use of auxiliary data to help distribute the data from one classification system to another. Typically one tries to find a relationship – a distribution key – between the two categories that is as close as possible to the data to be distributed. If nothing specific can be found then employment or production output is sometimes used as a last resort.

2.1 Adjusting the system boundaries

There are two issues to clarify first hand regardless of approach;
- The geographical boundaries of a country
- Economic definition of a country.

Energy statistics/balances and emission inventories use a geographic or national territory definition of a country whereas National Accounts are based on the resident principle which is the basis for the economic definition of a country. To understand this difference we have to understand the meaning of a "resident unit".

The following figure illustrates the differences between an economic and a geographic definition of a country and helps to show the resident principle. Basically, to convert from a geographically defined system (shown as a grey dashed area) to an economically defined system (the area shown with a solid black line) the air emissions of non-resident units operating on the national territory need to be removed and the air emissions from resident units operating in the rest of the world need to be added. Typically the biggest piece of these necessary adjustments relates to international transport – land, water, and air. In addition, some other, often more minor adjustments are related to tourism and fishing vessels. However the relative importance of these activities depends on the structure of the countries' economies.

Figure 2: Differences between geographic and economic definitions of a country

	Residents	Non-Residents
National territory	Emissions on national territory by resident units	Emissions on national territory by non-resident units (foreign tourists, foreign transportation enterprises, foreign fishing vessels, embassies, etc.)
Rest of World	Emissions by resident units operating abroad (tourists, transportation enterprises, fishing vessels, embassies, military operations, etc.)	

Air Emissions Accounts

Emission Inventory

Source: adapted from draft SEEA-Energy (UN 2013)

When making the conversion from one system definition to the other it is important to focus on adjusting for the quantitatively big items and not to lose too much time and resources by tackling items that are theoretically correct but quantitatively of minor importance.

Over time, the theoretically correct but of minor importance can be addressed as a national compilation system for Air Emissions Accounts develops and is improved. Addressing these items systematically within the statistical systems of a country can lead to improvements of both the physical statistics and perhaps also improve the economic data thus leading to overall improvements in consistency in the National Accounts and Environmental Accounts.

It is important to find out from the national accountants exactly what is adjusted for in the National Accounts – private households' tourism and international transportation are good topics with which to begin. A good rule of thumb is: if the national accountants do not adjust for something, then neither should the Air Emissions Accounts. But always ask why the national accountants do not include these adjustments so you understand their reasoning and to avoid surprises. It is also helpful to find out the quantitative order of magnitude of the economic adjustments because this provides an indication of the importance of the adjustment and can be used as guidance for setting priorities with regards to making adjustments in the Air Emissions Accounts.

How to prioritise an adjustment issue is not always easy. Looking at the structure of the national economy, the taxation system, transportation, fishing and tourism statistics plus the geographic location of a country can often give good input into this evaluation.

By looking at the structure of the national economy evaluations regarding the size of certain industries can be important. Identifying the size and trends of the water transport (NACE 50), land transport and transport via pipelines (NACE 49), air transport (NACE 51) and fishing and aquaculture (NACE 03) based on economic statistics can be helpful. If these industries are large and/or growing then a closer examination is warranted.

The national infrastructure and geographic location can also be important. For example, large airports with high numbers of international flights, large ports where ocean going vessels bunker fuels and large fishing fleets that bunker fuels in other countries are all important to examine in greater detail and decide if corrections are needed. The following list (Table 1) provides some additional examples of corrections that could be considered important to the countries listed, which then may choose to make adjustments when establishing their Air Emissions Accounts. This is *not* an exhaustive list and gives only examples.

Table 1: Overview of issues and countries where adjustments from geographic to economic system definition are likely to occur

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 residents 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.

Publications such as Eurostat's *Panorama on Tourism*[13] or the Tourism Satellite Accounts (TSA) in Europe[14] can be helpful in making evaluations regarding adjusting for tourism activities especially since there is country

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[13] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-30-08-550/EN/KS-30-08-550-EN.PDF

[14] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-10-031/EN/KS-RA-10-031-EN.PDF

specific information. The *Panorama on Transport*[15] can also be helpful to identify trends but there is not much country specific information. These summary publications only help to describe the overall picture and trends. It is necessary to find national detailed data helping to make the corrections needed in the Air Emissions Accounts.

The important thing in this evaluation process is to avoid "surprises" of emissions that are actually of significance but that have not been adjusted or accounted for.

2.2 Assigning the air emission data to economic activities

The environmental statistics that are used as primary source (i.e. energy statistics/balances and emission inventories) to create Air Emissions Accounts typically use their own classification systems. Those deviate from classification systems for economic activities (production and consumption) as applied in National and Environmental Accounts.

In Air Emissions Accounts, emissions are recorded by economic activity entities – i.e. sub-categories of the total economy – which actually emit the emissions in the course of their production and consumption activities. The economic activities are classified according to the classifications typically employed by National Accounts. This requires a re-assignment of air emissions (or energy use) from the classification system as used in emission inventories (or energy statistics/balances) to the classification system as employed in National Accounts. That is, compilers of Air Emissions Accounts need to devise a way to re-assign environmental statistics from their original groups to economic activities according to the standard economic classifications (NACE[16] for production activities and COICOP[17] for household consumption activities).

The key to shifting from environmental to economic classifications is, first, to fully understand the relevant principles underlying the recordings of production and consumption activities in the framework of National Accounts (see chapter 3).
Transportation is one important example where the environmental classification and groups significantly deviate from the standard economic ones. In energy statistics/balances and emission inventories transport is grouped according to several transport modes and technologies (e.g. road transport is classified into motor vehicle classes). In National Accounts transport is assigned to the entity undertaking transport in the course of its production or consumption activities. For instance, driving a car may be related to private households' leisure as well as to the provision of health services (ambulance).

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[15] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-DA-07-001/EN/KS-DA-07-001-EN.PDF

[16] Statistical Classification of Economic Activities in the European Community, NACE Rev. 2

[17]   Classification of Individual Consumption by Purpose

To convert from one classification system to another, some type of conversion key or correspondence table must be established that helps to re-assign the emission or energy data from the one to the other classification system. To establish this conversion key (correspondence tables) certain auxiliary information is used. The auxiliary information may comprise certain physical data, employment data and/or monetary data that provides additional information that helps make a link between the categories of the original data and the standard economic classifications. Specific recommendations for such a conversion table from national emission inventories to Air Emissions Accounts are provided in Annex 1. 0.

In general, two cases of assignment can be distinguished in such conversion keys (correspondence tables):

- a *one-to-one* correspondence between an original environmental category and an economic category;
- a *one-to-several* correspondence between an original environmental category and a number of economic categories.

3. Definitions and classifications

This section introduces the relevant National Accounts (ESA) concepts and principles for assigning air emissions to economic activities. In Air Emissions Accounts, the term *economic activity* is used to denote production and consumption activities. Broadly, production activities relate to industries and consumption activities relate to private households. The economic activities constitute the origins of air emissions; i.e. Air Emissions Accounts record air emissions by economic activities from which air emissions are directly originating.

Economic activities in the context of Air Emissions Accounts comprise

- production and accumulation activities by industries and
- consumption activities by private households;

as those constitute the origins of air emissions in a national economy. As a general rule, Eurostat's Air Emissions Accounts record all emissions released into the atmosphere arising from the economic activities of a national economy.

3.1 Production activities by industries

Air Emission Accounts do not differ from the National Accounts in the way the allocation of emission should be performed. That is, each industry produces its typical product and from that production the emissions stem. Actually, the output of the main product is characterising the industry (as the principal activity, including ancillary activities). The output of secondary products is recorded within the relevant industry in question. For example, butter is a primary product of the dairy industry, as well as cream, yoghurt, cheese, and other dairy products. Production of those dairy products constitutes the principal activity in the dairy industry and would be the primary output. The production of non-dairy products (such as e.g. electricity and heat, or restaurant services) would be the secondary output of the dairy industry. Similarly, the production of dairy products in other industries would be their secondary output.

Within the wider system of National Accounts, it is the input-output framework which constitutes an appropriate way of portraying in detail the production and consumption activities of a given national economy (see ESA95 paragraphs 1.02 and 9.01 ff). One of the main objectives of Eurostat's engagement in Air Emissions Accounts is to relate them to the input-output framework and to create simplified integrated environmental and economic accounts. Therefore, it is important that the definitions and classifications of economic activities as employed in Eurostat's input output framework[18] are the same as in Air Emissions Accounts.

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[18] The ESA input-output framework is laid down in: Eurostat (2008): Manual of Supply, Use and Input-Output Tables, 2008 edition, ISSN 1977-0375, Office for Official Publications of the European Communities: Luxembourg.
http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1073,46587259&_dad=portal&_schema=PORTAL&p_product_code=KS-RA-07-013

However, depending on how the national Supply and Use tables are constructed, the Air Emission Accounts needs to adhere. For example, assume that the waste management industry[19] – as a secondary activity – produces electricity and heat (e.g. from waste incinerators) and this secondary output is recorded in the waste management industry's column in the Supply Table. Then, the air emissions associated with the secondary activity, i.e. electricity and heat production, also have to be recorded under the waste management industry in the Air Emissions Accounts. Compilers of Air Emissions Accounts should be aware of this. A more detailed explanation is given in Annex 2.

3.2 Consumption activities by private households

In addition, the *economic activities* as defined in Air Emissions Accounts comprise *consumption activities by private households*. Private households constitute significant origins of direct air emissions (e.g. emissions of CO_2 from central heating boilers).

Air emissions by households are to be accounted for in a way that indicates when household consumption is *directly* responsible for environmental pressures, avoiding double counting of air emission data from production activities by industries. Therefore, when households carry out polluting activities themselves, e.g. fuel consumption when heating homes or petrol use when driving a car which is associated with air emissions, the corresponding environmental data are to be reported under the relevant household consumption activity.

In Eurostat's Air Emissions Accounts, consumption activities by private households are sub-divided into three intuitive sub-classes, reflecting the relevance in regards to air emissions:

- Transport: This category includes all emissions related to the combustion of fuels used as propellant by resident households. Transport emissions are allocated to private households only when they arise from the use of private motor vehicles; emissions caused by public transport are to be assigned to the relevant transportation industry. Emissions from household's use of small leisure boats should also be classified here since this activity is usually related to a type of transportation activity.
- Heating (incl. cooking): This category covers emissions from the combustion of fuels for heating houses and flats by households, as well as from fuels used for cooking and producing hot water. Heating emissions are allocated to private households when they use the fuels themselves, e.g. gas for central heating boilers and cooking ovens. Emissions from the production of electricity purchased by households are not allocated to private households but to the electricity producers.
- Others: This category relates to direct air emissions by private household for other purposes than transport and heating. It includes e.g. solvent emissions from paints, aerosols from sprays and emissions from open fires (for leisure or burning garden refuse), lawn mowers, hedge clippers and other gardening equipment.

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[19] Which is part of NACE Rev.2 division 38 " Sewage and refuse disposal, sanitation and similar activities"

Air emissions directly induced by private households are closely linked to the consumption of certain products, most importantly fuels. Hence, direct air emissions by private households can also be related to economic classifications.

In ESA use tables, products purchased (final use) by households are classified using CPA, which is the standard statistical classification of products by activity in the European Economic Community.

In addition, private household's consumption activities can be categorised according to different purposes. Here the statistical system offers a classification called COICOP: Classification Of Individual COnsumption Purposes (UN, 2000).

Consumption activities by private households, in economic terms, can be cross classified using both classifications. The result is a product by purpose matrix, showing which products have been purchased by private households for which purposes.

In a matrix cross-classified this way, the three intuitive categories of household consumption applied in Eurostat's Air Emissions Accounts can be defined unmistakably:

- Transport emissions by private households relate to the purchase of '*refined petroleum products*' (CPA code 19.20) for the purpose of '*fuels and lubricants for personal transport equipment*' (COICOP code 07.2.2).
- Heating emissions by private households relate to the purchase of '*refined petroleum products*' (CPA code 19.20) and 'fuel wood' (CPA code 02.10.1) for the purpose of 'electricity, gas and other fuels' (COICOP code 04.5).
- Other emissions by private households relate to the purchase of all products for all kinds of purposes, except the ones mentioned above for transport and heating.

4. Eurostat's Air Emissions Accounts

This chapter introduces the general format of representation of Eurostat's Air Emissions Accounts. The SEEA-CF recommends recording flows of air emissions in a combined supply and use table (see SEEA-CF Table 3.6.1). The Eurostat format is slightly deviating as it only includes a supply table in the annual questionnaire. Further, the accumulation column in the SEEA-CF Table 6.3.1 is removed from the Eurostat supply table. Emissions from landfill are recorded under the heading of the waste management industry.

The Regulation of the European Parliament and of the Council on European environmental economic accounts 691/2011of which Air Emission Accounts is part, set out the following variables:

- 14 air pollutants
- A*64 aggregation level of NACE rev. 2 (level of detailed breakdown for industries)

In addition, data shall be produced for:

- Household air emissions (broken down by 3 purposes);
- Bridging items. By bridging items is meant reporting items which clearly reconcile the differences between the air emissions accounts reported under this Regulation and those data reported in official national air emission inventories.

Since 2013, Eurostat is conducting a mandatory annual survey on Air Emissions Accounts covered by Regulation (EU) 691/2011. Eurostat uses an electronic questionnaire (reporting tables) to collect AEA data from NSIs. The most recent version (2013-survey) asks for 14 air emissions (greenhouse gases and air pollutants) by economic activities. The latter comprises – on the lowest level of disaggregation – 64 industries (NACE Rev.2 divisions; mainly 2-digit level, see Annex 2) and three categories of private household's consumption functions (see Annex 3). Furthermore it asks for so-called bridging items.

Eurostat's electronic questionnaire is an MSEXCEL® workbook comprising 14 data sheets – one for each of the 14 air emissions. Table 2 shows these 14 gaseous and particulate materials next to their measurement units.

Table 2: List of air emissions collected via Eurostat's electronic questionnaire for Air Emissions Accounts

gaseous or particulate substances	code	measurement unit
carbon dioxide without emissions from biomass)	CO_2	1000 metric tonnes
carbon dioxide from biomass	biomass CO_2	1000 metric tonnes
nitrous oxide	N_2O	metric tonnes
methane	CH_4	metric tonnes
hydrofluorocarbons	HFC	metric tonnes CO_2-equivalents
perfluorocarbons	PFC	metric tonnes CO_2-equivalents
sulphur hexafluorides	SF6	metric tonnes CO_2-equivalents
nitrogen oxides	NOx	metric tonnes NO_2-equivalents
sulphur dioxide	SO_2	metric tonnes SO_2-equivalents
ammonia	NH_3	metric tonnes
non-methane volatile organic compounds	NMVOC	metric tonnes
carbon monoxide	CO	metric tonnes
particulate matter<10 micrometres	PM10	metric tonnes
particulate matter<2.5 micrometres	PM2.5	metric tonnes

Countries are requested to separately report emissions of CO_2 from biomass (wood and wood waste, charcoal, bio-alcohol, black liquor, landfill gas, household waste, etc.) used as fuel. The emissions of CO_2 from biomass are not included in the total CO_2 emissions in greenhouse gas emissions inventories reported to the UNFCCC, they are reported only as a memo item. For the purposes of air emissions accounts these emissions should be reported separately from non-biomass CO_2.

Figure 3: General scheme of one data sheet in Eurostat's electronic questionnaire for Air Emissions Accounts (2010-survey)

air pollutant	1995	1996	…	years 2008	2009	2010	2011
Industries NACE based industry classification				Air emissions by industry			
Household, total - transport - heating - other				Air emissions by households			
Air Emissions Accounts (NAMEA) totals Less national residents Plus non-resident Less/plus other **Totals according UNFCCC or CLRTAP***				Bridging items			

*Total excluding bunkering, biomass, LULUCF.

Figure 3 shows the general scheme of the data sheet for one given air pollutant. The columns of such a data sheet represent the years, starting with 1995 and ranging to *n-2* (with *n* being the year of the survey). Row-wise, three data areas are distinguished:

- Air emissions by industries,
- Households' air emissions, and
- Bridging items.

5. Inventory-first-Approach: From national emission inventories to Air Emissions Accounts

In many countries national data for air emissions are available – so called *national emission inventories*. There are two types of national emission inventories:

1. Greenhouse Gas (GHG) Inventories (CO_2, N_2O, CH_4, HFCs, PFCs and SF6)
2. Air Pollutant Inventories (NOx, CO, NMVOC, SO_2, NH_3, 9 heavy metals, 17 POPs (persistent organic pollutants))

It is often the case that national emission inventories are the primary data source for compiling Air Emissions Accounts. This chapter focuses on this approach, referred to as "Inventory-first-Approach", and gives practical compilation guidelines for it.

GHG inventories aim at reporting emission data under the United Nations Framework Convention on Climate Change (UNFCCC)[20]. The principles and methodology to compile GHG inventories is laid down in the IPCC Guidelines of which two versions exist: 1996 and 2006. The GHG inventories reported until today are still following the revised 1996 IPPC guidelines[21] (in order to guarantee consistent time series and to monitor the Kyoto protocol). The 2006 IPPC guidelines[22] will enter into practice with a post Kyoto regime.
GHG inventories record the emissions of the 6 greenhouse gases by *sources* (and sinks). The sources are classified according to the *Common Reporting Format* (CRF).

Air pollutant inventories aim at reporting emission data under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (CLRTAP)[23] and the EU National Emission Ceilings Directive[24]. The principles and methodology to estimate air pollutant inventories are laid down in the *EMEP/EEA air pollutant emission inventory guidebook* (formerly referred to as the *EMEP CORINAIR emission inventory guidebook*)[25]. The European Environment Agency (EEA) publishes the Guidebook, with the UNECE's Task Force on Emission Inventories and Projections having responsibility for the technical content of the chapters.
Air pollutant inventories record the emissions of a wide range of substances from *sources* (and sinks). Today the sources are classified according to the *Nomenclature for Reporting* (NFR). In former times another classification

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[20] The UNFCCC reporting requirements, based on CRF (Common Reporting Format), covers emissions of the 6 greenhouse gases (CO_2, N_2O, CH_4, HFCs, PFCs and SF_6). Please note that HFCs and PFCs refer to a number of specific compounds of this type of chemical compound but are often referred to as "one" of the "6 greenhouse gases" although HFCs and PFCs are actually groups of gases and not a single gas.

[21] http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html

[22] http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

[23] ECE/EB.AIR/97, the CLRTAP Reporting Guidelines and the associated annexes are available online from the EMEP Centre on Emission Inventories and Projections (CEIP) website http://www.emep-emissions.at/.

[24] Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (the NEC Directive), OJ L 309, 27.11.2007, p. 22.

[25] See also http://www.eea.europa.eu/themes/air/emep-eea-air-pollutant-emission-inventory-guidebook/emep

was employed: *Selected Nomenclature for Reporting Air Pollutants* (SNAP). The SNAP97 classification is fully compatible with the CRF/NFR classification (see Annex 1) and respective cross-references will be given throughout the following subsections.

Subject of national emission inventory	International convention	Guidelines for compiling national emission inventories	Nomenclature and classification
Greenhouse gases (CO_2, N_2O, CH_4, HFCs, PFCs and SF6)	UNFCCC	IPCC guidelines 1996[26] IPCC guidelines 2006[27]	CRF* CRF*
Air pollutants (NOx, CO, NMVOC, SO_2, NH_3, 9 heavy metals, 17 POPs (persistent organic pollutants))	CLRTAP	EMEP/EEA air pollutant emission inventory guidebook 2009[28] EMEP/CORINAIR Emission Inventory Guidebook – 2007[29]	NFR* SNAP97 and NFR*

* NFR and CRF are compatible classifications, where the NFR is expanded for particular sources of air pollution.

It is important to note that national emission inventories have two conceptual features that are different from Air Emissions Accounts (AEA):

- they relate to the geographic territory of the reference country;
- they record emissions by sources (and sinks) which are broken down by means of technical process-oriented classifications[30];

By contrast, a basic feature of Air Emissions Accounts is that:

- they should relate to the domestic economic activities, i.e. the activities of resident economic units taking place as part of the national economy (resident principle);
- the data breakdown needs to be consistent with the classifications adopted for economic activities (i.e. NACE Rev.2).

Hence, when compiling Air Emissions Accounts following the "Inventory-first-Approach" two main adjustments to the emissions inventory data are needed:

1. The emissions caused by resident economic units have to be estimated starting from the emissions caused by all (economic and non-economic) emission sources on the geographic territory;
2. The inventory data following a process-oriented classification (CRF, NFR, SNAP) need to be re-classified to economic activities (i.e. NACE Rev.2).

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[26] http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html

[27] http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

[28] http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009

[29] http://www.eea.europa.eu/publications/EMEPCORINAIR5

[30] CRF/NFR (Common Reporting Format / Nomenclature For Reporting) and SNAP

5.1 Summary of system boundary adjustments

Starting from the inventories' emissions, the calculation of resident units' emission data requires to:

a) exclude the emissions and the absorption of emissions by non-economic agents (nature);

b) include CO_2 emissions from biomass as a separate item

c) estimate and add the emissions of residents operating abroad for transport activities (driving, shipping or flying) as well as fishing;

d) estimate and deduct the emissions of non-residents operating in the country for transport activities (on land, on water and in the air) as well as fishing.

Estimates of c) and d) – to be preferably carried out for each specific transport mode – are most likely to be based on auxiliary data, particularly energy use and transport statistics. A prerequisite for the calculation, including the choice of the most appropriate auxiliary data, is the detailed knowledge of how the inventories' emission estimates are made by the responsible experts.

The described adjustments are likely to result, at least for some pollutants, in a significant difference between the total reported for the international conventions and the totals in the Air Emissions Accounts. Part of the compilation effort is specifically addressed at providing the data users with a tool, in the form of a Bridging items Table, which itemises the differences, for each air pollutant, between the two totals; guidelines for filling in the Bridging items Table are provided in chapter 7 (Bridging items table).

Now that the system boundaries have been adjusted from a geographic definition to an economic definition, the next step is to assign the emissions to the different industries and to households depending on which entity is directly inducing the air emissions. This assigning to economic activity units is described in detail in the next section.

5.2 Adjusting totals

Emission totals in Air Emissions Accounts do not equal the sum of all process emissions included in the national emission inventories. In fact, in order for the emission data to be consistent with the National Accounts' resident principle, some adjustment of the basic data is needed.

Accounting for emissions that stem from economic production as well as consumption activities means, first, that any possible emissions from non-economic agents (e.g. nature) possibly covered in the national emission inventory as well as nature's absorption of substances are excluded. When countries use the EMEP/EEA air emission data as their main source of data, it needs to be understood that this system uses a classification according to the process-based SNAP97 classification, and that not covering nature's emissions/absorption

implies the exclusion of all SNAP97 processes belonging to source category 11, as category 11 refers to emissions from non-economic agents and the absorption of emissions. If the CRF/NFR classification adopted in the international reports is the starting point, sector 5 'land use change and forestry' should be excluded instead. On the other hand, since all of the emissions caused by economic activities are relevant for the Air Emissions Accounts, CO_2 emissions from biomass (wood and wood waste, charcoal, bio-alcohol, black liquor, landfill gas, household waste, etc.) used as fuel – which are reported only as a memorandum item for the international conventions but excluded from official calculation of total CO_2 emissions – should be included in the Air Emissions Accounts.

Table 3 provides a general overview of the types of adjustments that need to be made in order to adjust from a geographic definition to an economic definition (residence principle), for the case of transport.

Table 3: General procedures for adjusting for transport emissions

Type of transport activity		General procedure for adjusting for transportation activities

Land transport	Road transport	1st step is to split between passenger and freight transport
		
		2nd step: for each group one needs to adjust, hence need to identify:
		(a) Domestic journeys by resident units
		(b) Domestic journeys by non-resident units
		(c) International journeys by non-resident units
		(d) International journeys by resident units
		    i. outbound
		    ii. inbound and entirely abroad

	Railways	Relates only to industry and not households – some consideration should be made regarding the adjustment for the resident principle if there are substantial operations of domestic trains internationally or non-resident trains on the national territory
	Pipelines	Relates only to industry and not households – The amount of energy used in transporting petroleum, natural gas and water in pipelines is substantial. Although these are fixed installations there may be some unclear issues regarding residence when these are located in international waters as well as import or export issues regarding the energy used to move products in the pipeline.

Water transport		1st step is to split between private boats used by households from transport carried out as (principal, secondary or ancillary) economic activity.
		If household emissions can be estimated then if possible a split between transportation uses by households and recreational uses should be attempted. Usually this is not possible so the emissions from leisure boats used by households are simply assigned to households in the category "transport." Since most household uses of leisure boats are within the national territorial waters usually there is not a need to adjust for the resident principle for households – or the adjustment would be very minor.
		
		2nd step: for water transport economic activity (shipping) the bunkering of fuels by the following units needs to be identified and the emissions from the bunkered fuels needs to be used to adjust the Air Emissions Accounts appropriately:
		(a) Journeys by resident units within the national territorial waters
		(b) Journeys by non-resident units within the national territorial waters
		(c) International journeys by non-resident units that have bunkered fuel in the national territory
		(d) International journeys by resident units
		    i. Outbound
		    ii. Inbound, and
		    iii. Entirely abroad

Type of transport activity	General procedure for adjusting for transportation activities

Air transport	It is assumed that private use of aircraft is so minimal that is it is not worth adjusting for this activity.
	
	For air transport economic activity the bunkering of fuels by the following units needs to be identified and the emissions from the bunkered fuels needs to be used to adjust the Air Emissions Accounts appropriately:
	(a) Journeys by resident units within the national territory
	(b) Journeys by non-resident units within the national territory
	(c) International journeys by non-resident units that have bunkered fuel in the national territory
	(d) International journeys by resident units
	    i. Outbound
	    ii. Inbound, and
	    iii. Entirely abroad

A general approach on how to treat transport related emissions and their allocation to appropriate NACE can be found in Annex 4.

5.3 Compilation steps

Emission inventories' data need to be re-classified to National Accounts' classification of economic activities (NACE).

This section starts with an overview of the general compilation steps when assigning inventory emission data to economic activities and households in the inventory-first-approach. Then several specific sections (5.4 to 5.12) follow outlining in more detail the assignment procedure from SNAP source categories to NACE Rev.2.

Most important are section 5.4 (combustion) and section 5.8 (road transport). Annex 1 provides a "SNAP-NACE Rev.2. correspondence table" giving a detailed overview on how each single SNAP process relates (and may be assigned) to industries (NACE Rev.2 divisions) and household activities. This correspondence-table also includes the CRF/NFR codes.[31]

The general procedure in the 'inventory-first approach' is to assign national emission inventory data to economic activities (NACE divisions) and private households' activities. As a general principle, the emissions of each SNAP97 process are to be assigned to the economic activity (i.e. industries in the ESA supply tables) and/or household activity producing these particular emissions.

In the "inventory-first" compilation process, three main compilation steps or stages can be identified (see also Figure 4):

A) Understanding emission inventory data for each single SNAP process

B) Understanding how economic activities are recorded in ESA Supply Tables

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[31] Common Reporting Format / Nomenclature For Reporting (CRF/NFR)

C)   Assignment of air emission data of single SNAP processes to economic activities and private households' activities

Figure 4: Three main compilation steps in the "inventory-first" approach
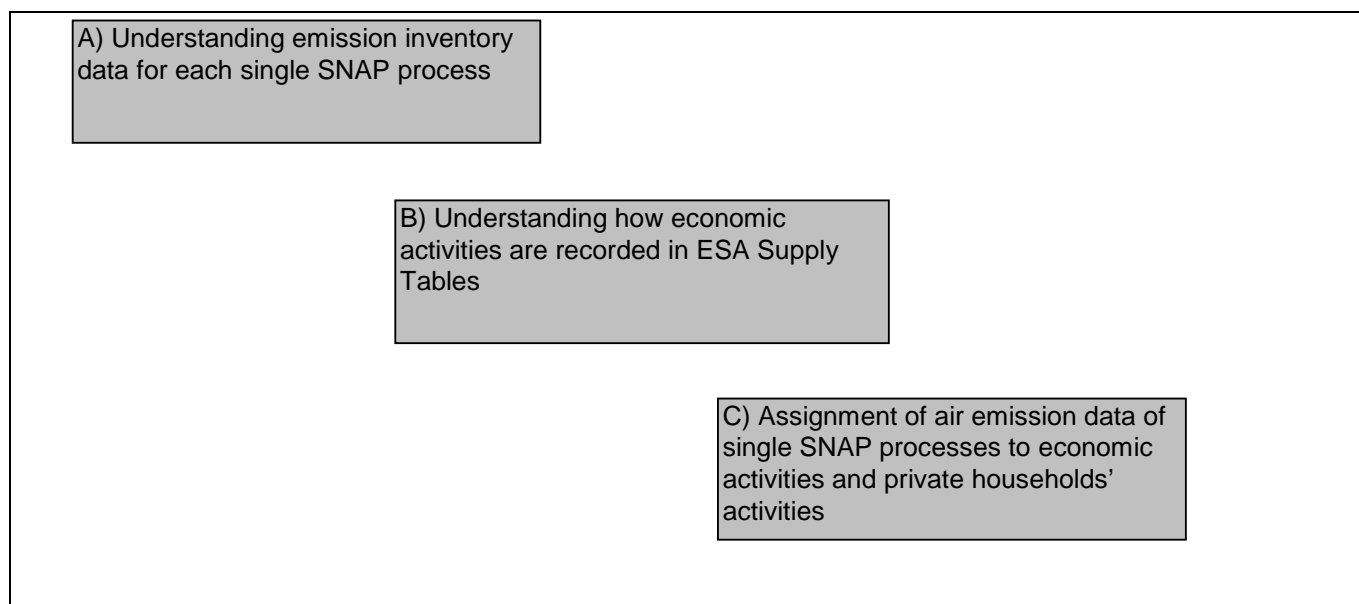
These three compilation steps are now explained in general.

A) Understanding emission inventory data for each single SNAP process

Before assignment, national emission inventory data for each SNAP code[32] need to be understood fully. The EMEP/EEA Emissions Inventory Guidebook[33] is the principal source to look up how the single SNAP processes (6-digit level) are defined. In addition, it is highly recommended to consult the national experts who are responsible for compilation of national emission inventories. This consultation is necessary to fully understand how national emission inventory data are generated and what basic assumptions and data are behind the inventory data. This helps to achieve a proper understanding where air emissions of single SNAP processes are actually assumed to take place. In addition, national inventory experts may provide additional valuable information maybe being even more detailed than the 6-digit SNAP process level.

Some countries may have set up their national emission inventories employing country-specific classifications of processes/sources. These country-specific classifications should be compatible at least with CRF/NFR – even though at aggregated levels – due to internationally harmonised reporting obligations.

B) Understanding how economic activities are recorded in ESA Supply Tables

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[32] The SNAP97 classification comprises about 500 processes (6-digit code) which are clustered to groups (4-digits) and categories (2-digits).

[33] The 2007-version can be found on http://reports.eea.europa.eu/EMEPCORINAIR5/en/page002.html

The next challenge is to identify the correct economic activity to which the SNAP-coded emissions are to be assigned to. Towards this end, it is necessary to fully understand how economic activities are recorded in the input-output framework of the European System of Accounts (ESA)[34] . As mentioned above, Eurostat will assign air emissions as reported in Air Emissions Accounts to the economic data in the supply table which is reported separately by countries to Eurostat. At its core, the supply table shows the domestic production of products (rows) by industries (columns)[35].

It is emphasised that the most important issue for the compilers of Air Emissions Accounts is to find out how the *industries*, i.e. column headings in the supply table, are delineated. In general, the ESA distinguishes three types of activities of industries:

- principal activity,
- secondary activity,
- ancillary activity.

It is highly recommended to contact and consult those national accountants in charge of compiling supply tables in your country to obtain the necessary information for the following step of assigning SNAP-based emission inventory data to NACE Rev.2 industries recorded in ESA supply tables. In addition, a good understanding of the supply table may also be helpful in critical allocation cases where emissions of one single SNAP process need to be distributed over a number of NACE Rev.2 industries.

C) Assignment of air emission data of single SNAP processes to economic activities and private households' activities

Once one has fully understood the emission inventory data and identified where relevant economic activities are recorded in the ESA supply tables, one can start assigning the SNAP-based air emission to the economic activity.

For many of the SNAP processes at the most detailed 6-digit level this assignment is straightforward (one-to-one correspondence). However, there are also cases where emissions from one single SNAP process need to be distributed over several economic activities. This "distribution" needs to be based on additional information (i.e. "helping" or auxiliary statistics). Depending on the availability of auxiliary information, several approaches are possible and the "best approach" will depend on the country specific availability of auxiliary information.

The following subsections provide detailed compilation guidance for SNAP groups. Each subsection starts with an overview of the quantitative importance in terms of contribution to total air emissions of the respective SNAP group. Furthermore, each section is structured along the three main steps (A, B, C; see above).

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[34] For details see the published "Eurostat Manual of Supply, Use and Input-Output Tables" (Eurostat 2008)

[35] This part of the supply table – showing what is produced by whom – is termed 'production matrix'.

5.4 Combustion processes - SNAP 01, 02, and 03
(CRF/NFR 1.A.1, 1.A.2, 1.A.4, and 1.A.5)

These three SNAP categories

  01 Combustion in energy and transformation industries,

  02 Non-industrial combustion plants, and

  03 Combustion in manufacturing industry

are related to all sorts of combustion. They are of very high importance (more than half) in terms of contribution to total national emissions for SO_2 and CO_2. They are also of high importance (more than 25%) for NOx and CO.

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 01 01 and SNAP 01 02 (CRF/NFR 1.A.1.a)	SNAP 01 03 (CRF/NFR 1.A.1.b)	SNAP 01 04 and SNAP 01 05 (CRF/NFR 1.A.1.c)	SNAP 02 01 (CRF/NFR 1.A.4.a; 1.A.5.a)	SNAP 02 02 (CRF/NFR 1.A.4.b)	SNAP 02 03 (CRF/NFR 1.A.4.c)	SNAP 03 (CRF/NFR 1.A.2)
CO_2	29	4	2	5	12	2	16
N_2O	4	0	0	0	2	1	2
CH_4	0	0	0	0	2	0	2
SO_2	53	9	1	2	4	NE	15
NOx	17	2	1	2	5	NE	15
NH_3	0	0	0	0	0	0	0
NMVOC	1	0	0	0	9	NE	2
CO	2	0	0	1	23	NE	13

Source: EEA greenhouse gas data viewer and air pollutant emissions data viewer

A) Understanding the emission data of SNAP categories 01, 02 and 03

The 6-digit processes in SNAP categories 01, 02, and 03 comprise emissions from combustion plants to generate power and heat (or both), namely boilers[36], gas turbines[37], and stationary engines[38] (Note: process furnaces are recorded separately under SNAP group 04). Emissions considered in these three SNAP groups are released by controlled combustion processes (boiler emissions, emissions from the combustion chamber of gas turbines or stationary engines) taking into account primary reduction measures, such as furnace optimisation inside the boiler or the combustion chamber, and secondary reduction measures downstream the boiler or the combustion chamber. Solid, liquid or gaseous fuels are used, where solid fuels comprise coal, coke, biomass and waste (as far as waste is used to generate heat or power). (see EMEP/CORINAIR Emission Inventory Guidebook 2007 documents B111 and B112[39]).

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[36] A *boiler* is a closed vessel in which water or other fluid is heated. The heated or vaporised fluid exits the boiler for use in various processes or heating applications.

[37] A gas turbine extracts energy from a flow of hot gas produced by combustion of gas or fuel oil in a stream of compressed air. It has an upstream air compressor (radial or axial flow) mechanically coupled to a downstream turbine and a combustion chamber in between. Energy is released when compressed air is mixed with fuel and ignited in the combustor. The resulting gases are directed over the turbine's blades, spinning the turbine, and mechanically powering the compressor. Finally, the gases are passed through a nozzle, generating additional thrust by accelerating the hot exhaust gases by expansion back to atmospheric pressure.

[38] A stationary engine is an engine whose framework does not move. It is normally used not to propel a vehicle but to drive a piece of immobile equipment such as a pump or power tool. E.g. a stationary diesel engine to co-generate heat and power.

[39] http://reports.eea.europa.eu/EMEPCORINAIR5/en/page002.html

The further subdivision into 4-digit SNAP groups and 6-digit SNAP processes is based on two criteria:

a.) The economic sector (incl. households) concerning the use of energy (mainly to subdivide to 4-digit level)

- public power and co-generation,
- district heating,
- commercial and institutional combustion,
- industrial combustion in boilers,
- residential combustion,
- agriculture, forestry and fishing

b.) The technical characteristics (mainly to further subdivide to 6-digit level)

- with respect to boilers, the thermal capacity,
- other combustion technologies (gas turbines, stationary engines).

Table 4 (taken from EMEP/EEA Guide 2009) gives a good overview of how the SNAP processes in groups 01, 02, and 03 are delineated.

Table 4: Delineation of combustion processes (SNAP categories 01, 02, and 03)

NFR code	SNAP97 codes	Thermal capacity [MW_{th}]	Public power and cogeneration plants	District heating	Industrial combustion and specific sector	Commercial and institutional combustion	Residential combustion	Agriculture, forestry and fishing	Gas turbines	Stationary engines
1.A.1.a	01 01 01		X							
1.A.1.a	01 02 01			X						
1.A.1.b	01 03 01				X					
1.A.1.c	01 04 01	≥ 300			X					
1.A.1.c	01 05 01				X					
1.A.4.a	02 01 01					X				
1.A.2.a-f	03 01 01				X					
1.A.1.a	01 01 02		X							
1.A.1.a	01 02 02			X						
1.A.1.b	01 03 02				X					
1.A.1.c	01 04 02	≥ 50 and < 300			X					
1.A.1.c	01 05 02				X					
1.A.4.a	02 01 02					X				
1.A.4.b.i	02 02 01						X			
1.A.4.c.i	02 03 01							X		
1.A.2.a-f	03 01 02				X					
1.A.1.a	01 01 03		X							
1.A.1.a	01 02 03			X						
1.A.1.b	01 03 03				X					
1.A.1.c	01 04 03				X					
1.A.1.c	01 05 03	< 50			X					

NFR code	SNAP97 codes	Thermal capacity [MW$_{th}$]	Public power and cogeneration plants	District heating	Industrial combustion and specific sector	Commercial and institutional combustion	Residential combustion	Agriculture, forestry and fishing	Gas turbines	Stationary engines
1.A.4.a	02 01 03					X				
1.A.4.b.i	02 02 02						X			
1.A.4.c.i	02 03 02							X		
1.A.2.a-f	03 01 03				X					
1.A.1.a	01 01 04								X	
1.A.1.a	01 02 04								X	
1.A.1.b	01 03 04								X	
1.A.1.c	01 04 04	not relevant							X	
1.A.1.c	01 05 04								X	
1.A.4.a	02 01 04								X	
1.A.4.b.i	02 02 03								X	
1.A.4.c.i	02 03 03								X	
1.A.2.a-f	03 01 04								X	
1.A.1.a	01 01 05									X
1.A.1.a	01 02 05									X
1.A.1.b	01 03 05									X
1.A.1.c	01 04 05	not relevant								X
1.A.1.c	01 05 05									X
1.A.4.a	02 01 05									X
1.A.4.b.i	02 02 04									X
1.A.4.c.i	02 03 04									X
1.A.2.a-f	03 01 05									X

Source: EEA: EMEP/EEA Guidebook 2009, appendix A, p.68 x=indicates relevant combination

B) Understanding, where the relevant economic activities are recorded in National Accounts

In general, the SNAP codes 01, 02, and 03 concern combustion plants, i.e. facilities where power (electricity), heat or even both (CHP[40]) is generated. However, the SNAP codes in general give no or at least very little indication whether electricity and/or heat is generated. Rather, the SNAP codes (on the 4-digit level) seem to indicate in which characteristic types of industries the several combustion processes are taking place actually. However, the question arises regarding where those characteristic types of industries – as indicated by the titles of the SNAP codes – are actually recorded in the ESA supply tables?

As mentioned earlier, the national accountants do split institutional units (e.g. enterprises) into local KAUs and re-group those to rather homogenous industries of the same kind-of-activity, i.e. columns in the supply tables.

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[40] Combined Heat and Power

Assume that a petroleum refinery enterprise is operating a combustion plant to produce electricity and heat for own use and for selling the surplus on the markets. Most likely, the related emissions are recorded under SNAP code 0103.

The national accountants, however might have identified this production activity as a secondary activity of the refinery enterprise and might have singled out the related economic statistics to a local KAU; which they then group to the industry-column with NACE Rev.2 industry code 35 ("electricity, gas, steam hot water and air conditioning supply") in their ESA supply table. If this is the case, the emissions from SNAP 0103 are to be assigned to the industry with NACE Rev.2 industry code 35; although the title of the SNAP code 0103 suggest an assignment to the NACE Rev.2 industry code 19 ("manufacture of coke and refined petroleum products").

Therefore, it is of utmost importance to know how the ESA supply tables are generated with respect to those economic activities that involve combustion as defined in SNAP categories 01, 02, and 03.

One may assume that in most countries national accountants have singled out local KAUs in most institutional units as far as they produce electricity as a secondary product. Indeed, this is obvious from a look at the ESA supply tables published by at Eurostat[41]. The product-row for CPA code 35 shows mainly a significant sized entry in the cell related to the industry-column with NACE Rev.2 industry code 35. If at all, there are only a few cells in the CPA-35-product-row off the NACE Rev.2-35-industry-column. This provides evidence for the assumption that in most cases electricity and heat production has been identified as a secondary activity and local KAU in most enterprises and has been re-grouped to the industry-column with NACE Rev.2 industry code 35 in the ESA supply tables.

However, this might be mainly valid for electricity as it has been identified and singled out as a secondary product. Furthermore, combustion processes are also employed by enterprises to generate ancillary products/services, particularly for heating of own buildings and warming of tap-water. In ESA supply-tables, these ancillary activities are recorded together with the principal activity on the main diagonal; i.e. cannot be identified and separated as local KAUs.

Seemingly, combustion as an ancillary activity occurs in all industries and private households (dominantly for heating of buildings and warming of tap-water). Evidently, combustion emissions from such ancillary activities are to be assigned to the causing industry-column in the ESA supply table which then coincides with the industry suggested by the SNAP title.

C) Guidance for assignment of air emission data of SNAP categories 01, 02, and 03 to NACE Rev.2 industries

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[41] See http://epp.eurostat.ec.europa.eu/portal/page/portal/esa95_supply_use_input_tables/introduction

For assigning combustion-process-related emissions (as provided by SNAP categories 01, 02, and 03) to industries (as recorded in ESA supply tables' columns) it is of utmost importance to understand and know what kind of functional services and product outputs are associated with the respective SNAP combustion process.

Five general groups of functional services and product outputs may be associated with SNAP combustion processes:

- electricity
- heat
- heating of buildings (space heating)
- warming of tap-water (water heating)
- (production) process-specific outputs (e.g. steel)

Unfortunately, many of the SNAP processes under SNAP categories 01, 02 and 03 are defined and delineated from a technical-physical viewpoint and do not reveal what kind of functional service and/or product output is actually associated with the respective SNAP process. For instance, SNAP group 02 01 (commercial and institutional plants) does not reveal whether the respective combustion processes are aimed at producing electricity or aimed at heating buildings and warming tap-water or even both (i.e. combined heat and power). This information however, is needed in order to find out the correct industry to which emissions from this SNAP group should be assigned. The national air emission experts should be contacted in order to obtain further information on the combustion-associated functional services and product outputs. In some countries, this information might be available in the data underpinning the SNAP-inventories.

If once the functional services and/or product outputs associated with SNAP combustion processes have been identified, the next questions arises: where in the ESA supply tables are the respective generations of functional services and product outputs recorded? It is recommended to contact the National Accounts experts in your country responsible for compiling the ESA supply tables. In general, the ESA may treat (and accordingly record) the five combustion-related functional services and product outputs as (see also Annex 2):

- principal activity,
- secondary activity,
- ancillary activity.

Table 5 provides an overview on how the five combustion-related functional services and product outputs (that can be associated with combustion processes) can be cross-tabled with the three ESA activity types; and gives some examples:

Table 5: Overview on how functional services and outputs of SNAP combustion processes can be cross-tables with three ESA activity types

		5 functional services and product outputs potentially associated with SNAP-combustion-processes (SNAP categories 01, 02, and 03)				
		Electricity	Heat	Heating buildings	Warming tap-water	Production process-specific outputs
Types of activities recorded in ESA supply tables	Principal activity	e.g. electricity production by public power plants i.e. NACE Rev.2 industry code 35	e.g. heat production by public heat-only boiler station for district heating i.e. NACE Rev.2 industry code 35			e.g. furnaces employed by respective industries (e.g. steel i.e. NACE Rev.2 industry code 24)
	Secondary activity	e.g. electricity production by refinery industry i.e. NACE Rev.2 industry code 19	e.g. heat production by waste incineration plant i.e. NACE Rev.2 industry code 38			respective industries (e.g. NACE Rev.2 industry code 19)
	Ancillary activity			assumingly by all NACE Rev.2 divisions	assumingly by all NACE Rev.2 divisions	

Figure 5 provides another presentation of possible assignments from SNAP combustion groups (4-digit level) to NACE Rev.2 divisions.

SNAP 01: includes combustion processes in the energy industry (NACE Rev.2 industry code 35) and – what energy and emission experts call – the energy transformation sector, which is mainly refinery (NACE Rev.2 industry code 19) and apparently also the coal mining and oil extracting industries (NACE Rev.2 industry codes 05-06).

Emissions from SNAP 01 01 'public power plants' and 01 02 'district heating plants' are clearly related to the principal activities of NACE Rev.2 industry 35 (dashed arrows).
One may assume that electricity production as secondary activities in the transformation sectors (SNAP 01 03 to 01 05, respectively NACE Rev.2 industry codes 19 and 05-06[42]) has been re-grouped to industry-column with NACE Rev.2 industry code 35 in the ESA supply table. Hence, the electricity production related part of emissions in those SNAP codes 01 03 to 01 05 should be actually assigned to NACE Rev.2 industry code 35 (see grey arrows in Figure 5).

However, the emissions related to combustion processes in SNAP 01 03 to 01 05 aiming at heating buildings and/or providing warm tap-water are most likely ancillary activities in the ESA logic and have hence to be assigned to the industry columns NACE Rev.2 industry codes 19 and 05-06[43] respectively in the ESA supply table (see black arrows in Figure 5).

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[42] Note that in the NACE A*64 breakdown employed in AEA questionnaire the four mining divisions 05-08 are merged into one code B.
[43] Note that in the NACE A*64 breakdown employed in AEA questionnaire the four mining divisions 05-08 are merged into one code B.

Figure 5: Assignments of 4-digit SNAP processes of groups 01, 02, and 03 to NACE Rev.2-based industries as recorded in ESA supply tables and private households
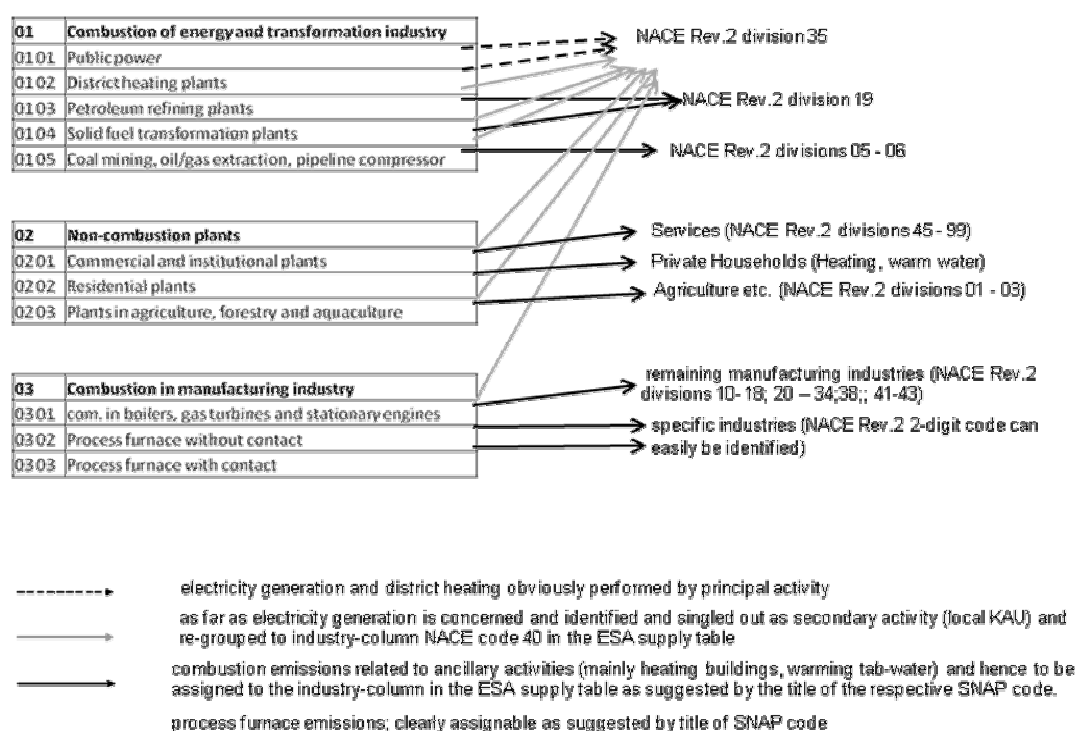
SNAP 02: includes "non-industrial" combustion processes (we do not know whether for electricity or heat). Most likely, this relates only to the service industries (NACE Rev.2 industry codes 45 to 99), the agriculture/forestry/fishery-industries (NACE Rev.2 industry codes 01 to 03) and the private households (residential). Most likely, combustion processes in manufacturing (i.e. NACE Rev.2 industry codes 10-33) are not concerned under this SNAP 02 group but under the following SNAP group.

Again, emissions related to electricity production as secondary activity in these SNAP processes needs to be separated and assigned to NACE Rev.2 industry 35 if National Accounts do so[44] (see grey arrows in Figure 5). All other emissions related to combustion processes aiming at heating of buildings and warming tap-water may be assumed as ancillary activity and hence be assigned to the industries with respective NACE Rev.2 industry codes (black arrows in Figure 5).

SNAP 03: includes "combustion in manufacturing". A general interpretation here is that all the manufacturing industries are concerned (generally ranging from NACE Rev.2 industry codes 10 to 33). NACE Rev.2 code 19 (Manufacture of coke, and refined petroleum products are excluded as those activities are already covered under SNAP group 01 (see above).

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[44] It is likely that the compiler of Air Emissions Accounts is able to get this information from the national accountants providing the supply- and use tables.

SNAP 03 01 concerns 'combustion in boilers, gas turbines and stationary engines'. Here, one may assume again that several outputs are generated: electricity, heat or both. In the case of electricity, if this secondary activity has been identified as a local KAU in the ESA supply tables, the emissions from SNAP 03 01 related to electricity might have to be assigned to the industry column with NACE Rev 2.0 industry code 35 (grey arrow in Figure 5). As far as the combustion processes in 03 01 are related to heating of buildings and warming of tap-water, they may be regarded as ancillary activity of the respective NACE Rev.2 industry and related emissions are to be assigned to the very same industry (black arrow in Figure 5). Emissions from SNAP codes 03 02 and 03 03 are process specific and should be assigned to respective NACE Rev.2 industries as suggested by the name of the respective 6-digit SNAP-code (see dotted arrows in Figure 5). For instance, emissions from SNAP 03 03 02 'Reheating furnaces steel and iron' are obviously to be assigned to the industry-column with NACE Rev.2 industry code 24 ('manufacture of basic metals').

However, deviations from these general rules are possible[45] and can only be detected if one

i. consults the national experts responsible for compilation of national emission inventories in order to find out exactly how the emissions related to SNAP groups 01, 02, and 03 are compiled in the respective country; and

ii. consults the ESA supply-table in order to identify and separate combustion emissions related to principal, secondary and ancillary activities.

In summary, the compilers of Air Emissions Accounts are challenged with two main problems related to SNAP groups 01, 02, and 03:

1) The distinctions between "grey" and "black" arrows in Figure 5). That is, sorting out what part of the SNAP emissions is due to electricity generation which might have been singled out as secondary activity (i.e. local KAU and hence showing up in industry column with NACE Rev.2 industry code 35 in the ESA supply table) and what part is non-electricity (i.e. related to heating of buildings, warm water etc.) which is most likely regarded as an ancillary activity and hence related emissions should be assigned to, for example, NACE Rev.2 industry-column 19 in the example of SNAP codes in group 01 03.

2) The problem of splitting/distributing emissions from one single SNAP code to several NACE Rev.2 industries – such as the problem of how emissions from SNAP 02 01 need to be distributed over the service industries NACE Rev.2 industry codes 45 to 99 as shown by the black arrows in Figure 5.

Ad 1) Distinguishing between electricity related and non-electricity related emissions from combustion ("grey" versus "black" arrows in Figure 5) for SNAP groups 01 03, 01 04, 01 05, 02 01, 02 03, and 03 01:
The primary approach is to contact the national air-emission experts and talk with them about how they actually compile the emissions under these SNAP codes. Check with your national emission experts whether they have

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[45] In Italy, for instance, emissions from power-related combustion in refinery industry, recorded under SNAP 01 03, were an integrated process of refineries (i.e. a secondary activity) up to the year 1999; afterwards, this part of refineries became in most cases a separate power producing unit, recorded as NACE Rev.1.1 40; so the emissions from the year 1999 onwards need to be split among NACE Rev.1.1 23 and 40 while they have to be placed entirely under NACE Rev.1.1 23 before 1999.

more detailed information on the combustion processes' purpose, i.e. electricity, district heating, space heating, water heating etc.[46]

Ad 2) Distributing single SNAP processes over a number of NACE Rev.2 industries

Yet, there are several SNAP processes (on the 6-digit level) that need to be distributed over a number of NACE Rev.2 divisions (with #-flag in Annex 1).

Quantitatively the most important cases are:

- combustion in commercial and institutional plants (SNAP 02 01 => NACE Rev.2 industry codes 45 to 99) and

- boiler etc. combustion in manufacturing industries (SNAP 03 01 => NACE Rev.2 industry codes 10-18 +20-33 + 38 + 41-43).

For these cases, one needs to employ additional auxiliary information in order to perform this distribution. Data on energy use are a good statistic to be used as auxiliary information if available. Further possible approaches are presented in the following.

SNAP 01 05 01-05 : distributions between NACE Rev.2 industry 05 and NACE Rev.2 industry 06[47]

Identify what kind of combustion processes could take place in the two industries:

- NACE Rev.2 industry code 05 'Mining of coal and lignite; industry code 08.92 extraction of peat'

- NACE Rev.2 industry code 06 'Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying'

If in your country these industries generate electricity as a secondary activity (such as on the oil platforms in the North Sea), this should be known by likely both, the national accountants in charge of compiling the ESA supply table (since they have most likely singled out this activity as a local KAU) and eventually the experts calculating the respective air emissions for these SNAP processes (since they might have used the electricity generated as an activity variable for their calculations). In both cases, knowledge might exist on how much electricity is produced by NACE Rev.2 industry 05 and how much by NACE Rev.2 industry 06 giving you an indication for the distribution of air emissions amongst those two mining industries.

Otherwise, a good assumption is:

01 05 01	Combustion plants >= 300 MW (boilers)
01 05 02	Combustion plants >= 50 and < 300 MW (boilers)
01 05 03	Combustion plants < 50 MW (boilers)
01 05 04	Gas turbines

are mainly used for electricity and is hence more likely assignable to NACE Rev.2 industry 35, and

01 05 05	Stationary engines

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[46] E.g. in Germany air emission inventory data have specifications more detailed than the 6-digit level providing also the information of whether electricity, heat or combined heat and power are produced in a given combustion process.

[47] Note that in the NACE A*64 breakdown employed in AEA questionnaire the four mining divisions 05-08 are merged into one code B.

are mainly used for ancillary activities. If available, you may use the consumption of energy to split the emissions. Furthermore, you may use production output (physical volume) or employment as auxiliary information to make the split between NACE Rev.2 industry 05 and NACE Rev.2 industry 06.

SNAP 02 01 01-06 distributions between NACE Rev.2 divisions 45 to 99
In the majority of cases, combustion in the service industries (NACE Rev.2 divisions 45 to 99) would be associated with heating of buildings and warming of tap water. However, it might be that electricity generation might be derived from secondary activities in these industries as well (e.g. from decentralised small combined heat and power plants). National accountants might help you to find out this information.

It might be assumed that bigger plants, i.e.

02 01 01	Combustion plants >= 300 MW (boilers)
02 01 02	Combustion plants >= 50 and < 300 MW (boilers)

and

02 01 04	Stationary gas turbines

are operated for larger scaled electricity and heat productions and should hence be identified by national accountants as local KAUs which might have been re-grouped to the industry column with NACE Rev.2 industry code 40 in the ESA supply tables.

For the remaining emissions, most likely stemming from

02 01 03	Combustion plants < 50 MW (boilers)
02 01 05	Stationary engines
02 01 06	Other stationary equipments (n)

employment is an appropriate auxiliary parameter to perform the distribution among the NACE Rev.2 industries.

SNAP 02 03 01-05 distributions between NACE Rev.2 divisions 01, 02 and 03
In a first step, the "grey" arrows in Figure 5 need to be identified (versus the "black" arrows in Figure 5). Presumably, agriculture (NACE Rev.2 industry code 01) is the industry bearing the highest likelihood of employing larger combustion plants for electricity production (e.g. biogas fuelled combined heat and power). But also forestry (NACE Rev.2 industry code 02) could potentially employ (combined) power plants. Again, the national accountants responsible for the compilation of ESA supply tables might provide some information with regards to secondary activities in generating electricity in these industries.

Otherwise, auxiliary data is needed to perform the distribution of SNAP 02 03 05 emissions among the three NACE Rev.2 industries: e.g. fuel use (if available) or employment.

SNAP 03 01 01-06 distributions between NACE Rev.2 divisions 10, 12-18, 20, 22-32, 38, 58

In a first step, the "grey" arrows in Figure 5 need to be identified (versus the "black" arrows in Figure 5). After separating electricity-related emissions and assigning them eventually to NACE Rev.2 industry code 35, the remaining emissions need to be distributed over NACE Rev.2 industries 10-18, 20-34;38 and 41-43.

Most likely, emission data are also available following the CRF/NFR 4-digit codes which are in this particular case more detailed facilitating the assignments:

1.A.2.a = iron & steel (NACE Rev.2 industry codes 24-25)

1.A.2.b = non-ferrous metals (NACE Rev.2 industry codes 24-25)

1.A.2.c = chemicals (NACE Rev.2 industry codes 20-22)

1.A.2.d = pulp. Paper, print (NACE Rev.2 industry codes 17-18)

1.A.2.e = food, beverages, tobacco (NACE Rev.2 industry codes 10-12)

1.A.2.f = other manufacturing & construction (NACE Rev.2 industry codes 13-16; 23;29-33;38; 41-43)

The NACE Rev.2 industry codes given in brackets already indicate the first step assignment. The further breakdown needs auxiliary information preferably energy use or some physical parameter characterising production volume.

SNAP 03 02 05 distribution between NACE Rev.2 divisions 23 and 24

Presumably, this is not of quantitative importance – you may use output (monetary or better physical output if available) or employment as auxiliary information to do the splitting.

SNAP 03 03 12 distribution between NACE Rev.2 divisions 10-11, 23 and 24

This assignment/distribution should be based on information revealing which industries are actual producing limes (if available). Otherwise, the default assignment should be to NACE Rev.2 industry code 23.

SNAP 03 03 13 distribution between NACE Rev.2 divisions 19 and 41-43

If information is available assign the emissions according to where asphalt concrete is produced; otherwise the default assignment should be NACE Rev.2 industry code 41-43..

SNAP 03 03 26 distribution between NACE Rev.2 divisions 10, 12-18, 20, 22-32, 38, 58

If emission data are available at all for this SNAP code; then, the national emission experts should know where it comes from exactly.

5.5 Production processes - SNAP 04
(CRF/NFR 1.B.1.b, 1.B.2.a, 2.A, 2.B, 2.C, 2.D)

Emissions related to production processes are of significant importance (above 5% of national totals) in the cases of N_2O (in chemical industry), CH_4 (in refinery industry), NMVOC (refinery industry and others), and CO (metal industries).

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 04 01 (parts of CRF/NFR 1.B.2.a)	SNAP 04 02 and SNAP 04 03 (CRF/NFR 2.C)	SNAP 04 04 and SNAP 04 05 (CRF/NFR 2.B)	SNAP 04 06 (CRF/NFR 2.A and 2.D)
CO_2	1	2	1	3
N_2O	0	0	14	0
CH_4	12	0	0	0
SO_2	4	2	2	2
NOx	0	1	0	1
NH_3	NE	0	1	0
NMVOC	8	0	2	7
CO	0	9	0	0

Source: EEA greenhouse gas data viewer and air pollutant emissions data viewer

A) Understanding the emission data of SNAP category 04

This SNAP category 04 comprises emissions related to production processes in several industries (which can easily be derived from the names of the SNAP groups on the 4-digit level).

Production process related emissions occur in the following processes:
- *Refinery industry* (04 01): feed stock handling and storage; separation processes; petroleum conversion processes; petroleum treating processes; product storage and handling; auxiliary facilities.
- *Iron and steel industry* (04 02): coke ovens; blast furnace charging; pig iron tapping, oxygen furnace; electric furnace; rolling; sinter and pelletising, etc.
- *Non-ferrous metal industry* (04 03): aluminium production; ferro-alloys production; silicium production; magnesium production; nickel production, etc.
- *Inorganic chemical industries* (04 04): production of acid, ammonia, chlorine, fertilisers etc.
- *Organic chemical industries* (04 05): production of ethylene, propylene, PVCs, formaldehyde, ethylbenzene etc.
- *Wood, paper pulp, food, drink and other industries* (04 06): production of paper pulp, bread, wine, beer, cement, glass, limes, soda ash, etc.
- *Production of halocarbons and sulphur hexafluoride* (04 08)

B) Understanding, where the relevant economic activities are recorded in National Accounts

Production process' emissions may be assumed to be closely tied to the principal activity of the industry. As such they are typically identified from the respective SNAP group name. Hence, in most cases the related economic output from this principal activity should be recorded in the appropriate column of the ESA supply table.

C) Guidance for assignment of air emission data of SNAP category 04 to NACE Rev.2 industries

The assignment of production process emissions to NACE Rev.2 industries is in most cases a straight forward one-to-one assignment which is obvious from the respective SNAP group name (see greenish rows in Annex 1). There are a few cases (indicated in yellowish cells in Annex 1) where the assignment is less clear:

- SNAP 04 02 01 "coke oven (door leakage and extinction)" is related to coke oven furnaces which might be operated by the iron and steel industry (NACE Rev.2 industry code 24) or might be recorded under solid fuel transformation, i.e. refinery industries (NACE Rev.2 industry code 19).
- SNAP 04 06 14 'lime (decarbonising)' is typically assigned to NACE Rev.2 industry code 23 (default choice); however, lime may also be produced by the food industry (NACE Rev.2 industry code 10-11) and/or the steel industry (NACE Rev.2 industry code 24); not an "elephant," if you have data identifying this activity in the steel industry; otherwise assign emissions only to NACE Rev.2 industry code 23
- SNAP 04 06 16 'extraction of mineral ores' needs to be distributed over two NACE Rev.2 divisions, i.e. NACE Rev.2 industry code 07 and NACE Rev.2 industry code 08. This can be done by using the physical output (in tonnes) of both industries to calculate the distribution portions/weights. (Note that in the NACE A*64 breakdown employed in the AEA Questionnaire the 4 mining divisions 05-08 are grouped to one code B)

5.6 Extraction and distribution of fossil fuels - SNAP 05 (mainly CRF/NFR 1.B)

Emissions related to the extraction and distribution of fossil fuels are of significant importance in the case of CH_4 and NMVOCs.

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 05 (mainly CRF/NFR 1.B)
CO_2	1
N_2O	0
CH_4	12
SO_2	4
NOx	0
NH_3	NE
NMVOC	8
CO	0

Source: EEA greenhouse gas data viewer and air pollutant emissions data viewer

A) Understanding the emission data of SNAP category 05

This SNAP category comprises a variety of processes related to fossil fuel extraction, first treatment, storage and transportation/distribution.

B) Understanding, where the relevant economic activities are recorded in National Accounts

Emissions from fossil fuel extraction and distribution occur in a variety of NACE Rev.2 divisions. In most cases, the concerned industry's activity (which is identifiable from the SNAP process name) should be recorded in the appropriate industry-column of the ESA supply table.

C) Guidance for assignment of air emission data of SNAP category 05 to NACE Rev.2 industries

The assignment of emissions from this SNAP category to NACE Rev.2 divisions is in most cases a straight forward one-to-one assignment which is obvious from the respective SNAP process name (see greenish rows in Annex 1 correspondence-table).

There are a few cases (indicated in yellowish cells in Annex 1) where the assignment is less clear:

- SNAP 05 01 03 'storage of solid fuel': emissions may be distributed over the NACE Rev.2 divisions 19-20, 23,24, and 35. Here, the plausible assumption is made that those industries using coal will have to store coal, i.e. will maintain major storage facilities. Most likely, coal power plants have by far the biggest storage.
- SNAP 05 04 02 'other handling and storage (including pipeline)' may occur in, and hence may need to be distributed over, three NACE Rev.2 divisions:19, 49 and 52.
- SNAP 05 05 01 'refinery dispatch station': It seems likely that the dispatch activity that gives rise to the emissions is not a separate transport activity but rather an ancillary activity of the refinery company. Hence, assignment to NACE Rev.2 division 19.
- SNAP 05 05 02 'transport and depots (except 05.05.03)': It seems likely that the storage activity that gives rise to the emissions is not a secondary activity but rather an ancillary activity of the refinery company; hence assignment to NACE Rev.2 division 19.

5.7 Solvent and other product use - SNAP 06
(CRF/NFR 3.A, 3.B, 3.C, and 3.D)

Emissions from solvent and other product use are only relevant for the case of NMVOCs.

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 06 01 (CRF/NFR 3.A)	SNAP 06 02 (CRF/NFR 3.B)	SNAP 06 03 (CRF/NFR 3.C)	SNAP 06 04 (CRF/NFR 3.D)
CO_2				
N_2O				
CH_4				
SO_2				
NOx				
NH_3				
NMVOC	16	2	4	18
CO				

Source: EEA greenhouse gas data viewer and air pollutant emissions data viewer

A) Understanding the emission data of SNAP category 06

This SNAP category comprises all activities in which organic solvents are used and are emitted. Most solvents are part of a final product, e.g. paint, and will sooner or later evaporate. This evaporation of solvent is a major source of NMVOC emission. Estimating emissions from solvent use can be done in two ways: either by estimating the amount of (pure) solvents consumed or by estimating the amount of solvent containing products consumed (taking account of their solvent content).

B) Understanding, where the relevant economic activities are recorded in National Accounts

In most cases, the names of the SNAP processes suggest where the respective activity (solvent use or any other relevant product use) is assumed to take place.

C) Guidance for assignment of air emission data of SNAP category 06 to NACE Rev.2 industries

In most cases, the assignment is straight forward (see greenish cells in Annex 1 correspondence table). There are a few cases where emissions from one single SNAP process need to be distributed over more than one NACE Rev.2 division (#-flags in Annex 1 correspondence table):

- SNAP 06 01 07 'paint application – wood' and SNAP 06 04 06 'preservation of wood': Potentially, painting and preservation of wood may occur in two industries: NACE Rev.2 industry code 16and NACE Rev.2 industry code 31,. Compilers may use employment data to distribute between the two industries.

- SNAP 06 01 08 'other industrial paint application': This is a kind of residual item. It concerns paint applications in all remaining industries which are not covered by previous items. Potentially, emissions from this SNAP process need to be distributed over the following industries (NACE Rev.2 divisions): 17-18;58; 20, 22-24; 26-30.

  However, emissions may derive only from a limited number of industries. You have to contact your national air emission experts to find out which ones.

- SNAP 06 02 01 'metal degreasing': In principle, there are two NACE Rev.2 divisions concerned: NACE Rev.2 industry code 24 and NACE Rev.2 industry code 25.

- SNAP 06 04 07 'underseal treatment and conservation of vehicles': This activity may occur in three NACE Rev.2 divisions: 29-30 and 45. Most likely, it will occur in the manufacturing of vehicles, i.e. NACE Rev.2 industry codes 29-30, and less likely in repair of vehicles (NACE Rev.2 division 33;45). Contact your national emission experts as they may have used production statistics (i.e. industry classified data which may be confidential data) to calculate emissions under this SNAP process.

Assignment is assumingly difficult in the case of SNAP group 06 05 'use of HFC, N_2O, NH_3, PFC and SF_6'. Here, it is highly recommended to contact the national emission experts in order to find out what kind of activities they have considered. In the case of the fluorinated gases, refrigeration and air conditioning activities can be important.

5.8 Road transport - SNAP 07
(CRF/NFR 1.A.3.b)

Emissions from road transport are of extraordinarily high importance typically accounting for one fifth of total NMVOC-emissions, nearly one quarter of total CO_2 emissions, and around 40% of total NOx- and CO-emissions. Hence, a careful assignment to NACE Rev.2 divisions and private households is required – although the auxiliary information to do the assignments is unfortunately rather sparse.

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 07 (CRF/NFR 1.A.3.b)
CO_2	23
N_2O	7
CH_4	1
SO_2	1
NOx	40
NH_3	2
NMVOC	20
CO	41

Source: EEA greenhouse gas data viewer and air pollutant emissions data viewer

A) Understanding the emission data of SNAP category 07

Emissions from road transport cover emissions produced by the exhaust systems of road vehicles (SNAP groups 07 01 to 07 05) and non-exhaust emissions such as fuel evaporation from vehicles (SNAP group 07 06) and component attrition/wear (SNAP group 07 07).

The exhaust emissions are broken down into five vehicle categories (SNAP 4 digit level):

- Passenger cars (SNAP 09 01)
- Light duty vehicles <3.5t (SNAP 09 02)
- Heavy duty vehicles >3.5t (SNAP 09 03)
- Mopeds and motorcycles <50cm3 (SNAP 09 04)
- Mopeds and motorcycles >50cm3 (SNAP 09 05)

The further breakdown to the 6-digit level takes into account the different modes of driving (Motorway, rural, urban) which relates particularly to the different specific fuel consumption rates for the different modes.

The level of detail given by this SNAP classification of road transport is however not sufficient for actually calculating related emissions. The EMEP /EEA Guide proposes a more detailed vehicle category split as presented in Table 6.

National air emission experts most likely maintain more detailed data for representing road transport emissions. Your national air emission experts have set up a detailed data system and model to calculate emissions from road

transport for the specific case of your country. Hence, it is recommended to contact your national air emission experts in order to get a full overview of the emission calculations for road transport in your country.

Table 6: Vehicle category split as suggested in EMEP/EEA Guidebook

SNAP-like code	Activity	Driving Mode		
		Motorway	Rural	Urban
07 01	PASSENGER CARS			
07 01 01	Gasoline <1.4 l	07 01 01 01	07 01 01 02	07 01 01 03
07 01 02	Gasoline 1.4 l – 2.0 l	07 01 02 01	07 01 02 02	07 01 02 03
07 01 03	Gasoline > 2.0 l	07 01 03 01	07 01 03 02	07 01 03 03
07 01 04	Diesel < 2.0 l	07 01 04 01	07 01 04 02	07 01 04 03
07 01 05	Diesel > 2.0 l	07 01 05 01	07 01 05 02	07 01 05 03
07 01 06	LPG	07 01 06 01	07 01 06 02	07 01 06 03
07 01 07	Two Stroke Gasoline	07 01 07 01	07 01 07 02	07 01 07 03
07 01 08	Hybrids	07 01 08 01	07 01 08 02	07 01 08 03
07 02	LIGHT DUTY VEHICLE < 3.5 l			
07 02 01	Gasoline	07 02 01 01	07 02 01 02	07 02 01 03
07 02 02	Diesel	07 02 02 01	07 02 02 02	07 02 02 03
07 03	HEAVY DUTY VEHICLES			
07 03 01	Gasoline	07 03 01 01	07 03 01 02	07 03 01 03
07 03 02	Diesel < 7.5 t	07 03 02 01	07 03 02 02	07 03 02 03
07 03 03	Diesel 7.5 – 16 t	07 03 03 01	07 03 03 02	07 03 03 03
07 03 04	Diesel 16 – 32 t	07 03 04 01	07 03 04 02	07 03 04 03
07 03 05	Diesel > 32 t	07 03 05 01	07 03 05 02	07 03 05 03
07 03 06	Urban Busses	-	-	07 03 06 03
07 03 07	Coaches	07 03 07 01	07 03 07 02	07 03 07 03
07 04	MOPEDS & MOTORCYCLES < 50 cm^3	-	-	07 04 01 00
07 05	MOTORCYCLES			
07 05 01	Two Stroke > 50 cm^3	07 05 01 01	07 05 01 02	07 05 01 03
07 05 02	Four Stroke > 50 cm^3	07 05 02 01	07 05 02 02	07 05 02 03
07 05 03	Four Stroke 50 – 250 cm^3	07 05 03 01	07 05 03 02	07 05 03 03
07 05 04	Four Stroke 250 – 750 cm^3	07 05 04 01	07 05 04 02	07 05 04 03
07 05 05	Four Stroke > 750 cm^3	07 05 05 01	07 05 05 02	07 05 05 03

Source. EMEP/CORINAIR technical document B710

There are joint European efforts to harmonise data gathering and modelling related to road transport emissions. The EMEP/EEA Guide describes a certain methodology for calculating emissions from road transport[48]. This specific methodology has been implemented into the software tool COPERT 4 which is available at www.emisia.com/copert/
. It may be that your national air emission experts are using the COPERT model. However, it is also likely that in your country specific data systems and models exist.

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[48] EMEP/EEA Guidebook; part B, document 1.A3.b Road transport

Data systems and models for calculating emissions from road transport require a number of underpinning data and information, such as:

- Composition of national car fleet by several cohorts including vehicle category, age, engine (and fuel) type, norm concerning emission standards etc. and eventually also by operator/holder (i.e. private households, public authorities, commercial – eventually even by industry, etc.);

- Transport distances actually driven by aforementioned cohorts;

- Specific emission coefficients, broken down by aforementioned cohorts and degree of implementation of abatement technologies (e.g. additional particle filters).

B) Understanding, where the relevant economic activities are recorded in National Accounts

In the ESA supply tables, road transport maybe treated as principal, secondary or ancillary activity.

Road transport as a principal activity is given if the transport of passengers and freight is the actual service which constitutes the core business of an industry. This is obviously the case for the land transport industry (NACE Rev.2 division 49) including for example, taxi operations, bus transport companies, freight transport agencies etc. In the ESA supply table, road transport as a principal activity output is recorded in the industry-column of NACE Rev.2 industry code 49.

Road transport (mainly freight) may be treated as a secondary activity in industries which by nature of their core business need to transport things, such as construction (NACE Rev.2 division 41-43), postal services (NACE Rev.2 division 53) or wholesale services (NACE Rev.2 division 46). In the ESA supply table this might be recorded in the industry-column undertaking this secondary activity (i.e. the postal or wholesale service industries' columns) and the product-row with CPA code 49. Or, it might have been identified as local KAUs, singled out and re-grouped to the industry-column with NACE Rev.2 industry code 49 in the ESA supply table (and again product-row with CPA code 49). In order to find out, you should discuss this with your national accountants.

Road transport as ancillary activity may occur in all industries – from NACE division 01 to 99. It includes road vehicles operated by the respective industry, such as e.g. ambulances (NACE Rev.2 division 86,) or lorries such as in the construction industry.

Finally, road transport is undertaken by private households, i.e. private car driving.

C) Guidance for assignment of air emission data of SNAP category 07 to NACE Rev.2 industries

The assignment of road transport emissions is a difficult one. The assignment can only be done with the help of auxiliary data. The availability of the latter depends on your specific country situation. Hence, it is difficult to provide practical guidance so unfortunately, the following description remains rather abstract.

Note: For road transport emissions adjustment from territory system boundaries to the resident principle is required[49].

As a minimum point of departure for the assignment of road transport emissions is the SNAP 4-digit level, i.e. 5 categories of road vehicles. A further breakdown of vehicles by engine size and fuel (as given in Table 6) would be ideal. In any case, auxiliary information is needed to split emissions from the five SNAP groups to industries (NACE).

In general, it is recommended to first conduct the split – for each of the five vehicle categories – between:
- private households, and
- industries (all NACE Rev.2 divisions)

Subsequently, the industry related road transport emissions needs to be further divided into:
- land transport industry (NACE Rev.2 industry code 49)
- other industries (NACE Rev.2 industry codes 01 to 99, excl. 49)

In general, one may think of several solutions/approaches, depending on the auxiliary information available in your country. In the following, two approaches and a "fall-back option" are introduced. One may also combine two or all three approaches as appropriate.

1) Specific (national) emission model for road transport ("best choice solution"):

You may have at hand a national road transport data system or model that allows you to make all splits required, i.e. your national transport statistics system contains information on the owner of the road transport vehicle and respective quantities of kilometres driven. This enables you to broadly split between private and commercial transport, i.e. between private households and industries.

2) Detailed data on energy use from your National Accounts:

It might be that Energy Accounts are available in your country. Those might show the use of different energy commodities by NACE Rev.1.1 or Rev. 2.0 industries. The use of diesel and gasoline may be used to distribute road transport emissions over industries.

In any case, contact your national accountants. They may maintain some type of energy use monetary data. Often, national accountants maintain for internal use only comprehensive use tables – typically the use of 1000+ commodities broken down by industries. For each industry (NACE Rev.2 division and private households), the fuel use (differentiated by fuel type, i.e. diesel, gasoline, LPG, etc.) could be assigned to the five vehicle categories by employing certain auxiliary information such as e.g. mileages . The resulting percentage shares could be used to distribute emissions from SNAP groups (4-digits) accordingly.

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[49] Practical guidelines to Bridging items from territory to residence approach are presented in section 0.

3) Using the split of a similarly structured country ("fall-back option"):

If none of the above information is available in your country, you may use the percentages from a country with similar economic structures as your country.

The following Table 7 shows an example of how road transport emissions have been distributed across the NACE rev.1.1 industries and private households in the French Air Emissions Accounts in the year 2005. These data result from a model combining information on the fleet of vehicles and annual distances covered. Note that, for each SNAP code, the percentages apply for all pollutants concerned in road transport (i.e. CO_2, CH_4, NOx, SO_2, CO, NMVOC, and PM10).

Table 7: Distribution of road transport related air emissions over NACE rev.1.1 divisions and private households (in percent of respective SNAP group column total)

country: FR air pollutant: all year: 2006	SNAP group (vehicle category)							
	07 01 Passenger cars (r)	07 02 Light duty vehicles < 3.5 t (r)	07 03 Heavy duty vehicles > 3.5 t and buses (r)	07 04 Mopeds and Motorcycles < 50 cm3	07 05 Motorcycles > 50 cm3	07 06 Gasoline evaporation from vehicles	07 07 Automobile tyre and brake wear	07 08 Automobile road abraision
NACE 01	0.65%	2.90%	0.00%			0.77%	1.55%	1.55%
NACE 02	0.00%	2.66%	0.00%			0.31%	0.38%	0.38%
NACE 05	0.00%	2.66%	0.00%			0.31%	0.38%	0.38%
NACE 10	0.00%	0.37%	0.02%			0.05%	0.06%	0.06%
NACE 11	0.00%	0.37%	0.02%			0.05%	0.06%	0.06%
NACE 12	0.00%	0.37%	0.53%			0.05%	0.11%	0.11%
NACE 13	0.00%	0.22%	0.53%			0.02%	0.08%	0.08%
NACE 14	0.01%	0.27%	0.53%			0.03%	0.10%	0.10%
NACE 15	0.12%	2.26%	2.51%			0.33%	0.81%	0.81%
NACE 16	0.00%	0.09%	0.00%			0.01%	0.03%	0.03%
NACE 17	0.02%	0.27%	0.04%			0.03%	0.06%	0.06%
NACE 18	0.02%	0.16%	0.01%			0.02%	0.05%	0.05%
NACE 19	0.00%	0.16%	0.01%			0.01%	0.05%	0.05%
NACE 20	0.02%	0.27%	0.03%			0.03%	0.06%	0.06%
NACE 21	0.02%	0.29%	0.08%			0.04%	0.07%	0.07%
NACE 22	0.05%	0.16%	0.06%			0.04%	0.08%	0.08%
NACE 23	0.00%	0.37%	0.46%			0.05%	0.12%	0.12%
NACE 24	0.10%	0.27%	0.41%			0.09%	0.16%	0.16%
NACE 25	0.05%	0.27%	0.14%			0.06%	0.10%	0.10%
NACE 26	0.04%	0.27%	1.01%			0.05%	0.16%	0.16%
NACE 27	0.01%	0.27%	0.24%			0.03%	0.09%	0.09%
NACE 28	0.10%	0.27%	0.23%			0.09%	0.14%	0.14%
NACE 29	0.09%	0.61%	0.20%			0.10%	0.22%	0.22%
NACE 30	0.01%	0.55%	0.07%			0.03%	0.15%	0.15%
NACE 31	0.04%	0.55%	0.10%			0.05%	0.17%	0.17%
NACE 32	0.02%	0.16%	0.20%			0.02%	0.08%	0.08%
NACE 33	0.04%	0.61%	0.07%			0.06%	0.16%	0.16%
NACE 34	0.21%	0.15%	0.48%			0.16%	0.24%	0.24%
NACE 35	0.01%	0.72%	0.22%			0.02%	0.13%	0.13%
NACE 36	3.36%	2.61%	0.57%			2.51%	3.28%	3.28%
NACE 37	0.01%	1.38%	0.54%			0.15%	0.21%	0.21%
NACE 40	0.02%	0.37%	0.26%			0.06%	0.11%	0.11%
NACE 41	0.01%	1.38%	0.04%			0.15%	0.17%	0.17%
NACE 45	0.35%	13.85%	0.00%			1.08%	2.79%	2.79%
NACE 50	1.33%	4.88%	0.00%			1.27%	1.95%	1.95%
NACE 51	0.44%	2.44%	0.00%			0.48%	0.79%	0.79%
NACE 52	0.16%	2.44%	0.00%			0.29%	0.59%	0.59%
NACE 55	0.07%	0.73%	0.00%			0.14%	0.18%	0.18%
NACE 60	0.48%	2.75%	90.42%			0.79%	6.41%	6.41%
NACE 61	0.00%	0.72%	0.00%			0.02%	0.09%	0.09%
NACE 62	0.01%	0.72%	0.00%			0.02%	0.10%	0.10%
NACE 63	0.24%	2.10%	0.00%			0.33%	0.42%	0.42%
NACE 64								
NACE 65	0.11%	0.30%	0.00%			0.12%	0.10%	0.10%
NACE 66	0.02%	1.01%	0.00%			0.19%	0.16%	0.16%
NACE 67	0.04%	0.30%	0.00%			0.07%	0.07%	0.07%
NACE 70	0.14%	0.84%	0.00%			0.17%	0.21%	0.21%
NACE 71	3.62%	1.38%	0.00%			2.65%	2.68%	2.68%
NACE 72	0.06%	1.38%	0.00%			0.19%	0.21%	0.21%
NACE 73	0.01%	1.38%	0.00%			0.15%	0.17%	0.17%
NACE 74	0.41%	1.38%	0.00%			0.43%	0.43%	0.43%
NACE 75	0.13%	1.01%	0.00%			0.26%	0.22%	0.22%
NACE 80	0.14%	0.78%	0.00%			0.21%	0.25%	0.25%
NACE 85	0.22%	0.78%	0.00%			0.27%	0.30%	0.30%
NACE 90	0.02%	1.38%	0.00%			0.16%	0.17%	0.17%
NACE 91	0.03%	1.01%	0.00%			0.19%	0.17%	0.17%
NACE 92	0.04%	0.73%	0.00%			0.12%	0.16%	0.16%
NACE 93	0.02%	0.73%	0.00%			0.11%	0.15%	0.15%
NACE 95								
NACE 99	0.00%	1.01%	0.00%			0.17%	0.15%	0.15%
all industries	13.15%	70.24%	100.00%	0.00%	0.00%	15.65%	28.54%	28.54%
private households	86.85%	29.76%	0.00%	100.00%	100.00%	84.35%	71.46%	71.46%
total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: personal communication with Jean-Louis Pasquier (Commissariat général au développement durable - Service de l'observation et des statistiques)

In the French example, emissions recorded under SNAP 07 04 (Mopeds and Motorcycles < 50 cm^3) and 07 05 (Motorcycles > 50 cm^3) are entirely allocated to private households. Concerning SNAP 0703 (Heavy duty

vehicles > 3.5 t and buses) only own account transport of employees is taken into consideration, i.e. all emissions resulting from transport of goods are attributed to the road transport industry (NACE rev.1.1 60.2). These two issues will be further investigated further for the next data set to be prepared by the French authorities.

5.9 Other mobile sources and machinery - SNAP 08
(CRF/NFR 1.A.3.a, 1.A.3.c, and 1.A.3.d; and others)

Emissions from mobile sources such as railways and navigation are of importance in the case of NOx and SO2.

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 08 02 (CRF/NFR 1.A.3.c)	SNAP 08 03 and SNAP 08 04 (CRF/NFR 1.A.3.d)	SNAP 08 05 (CRF/NFR 1.A.3.a)
CO_2	0	1	1
N_2O	0	0	0
CH_4	0	0	0
SO_2	0	4	0
NOx	1	4	1
NH_3	0	0	0
NMVOC	0	2	0
CO	0	2	0

Source: EEA greenhouse gas data viewer and air pollutant emissions data viewer

A) Understanding the emission data of SNAP category 08
This SNAP category comprises emissions from internal combustion engines other than 'on-road' vehicles (treated in previous subsection) such as railways, air and water vehicles and 'off-road' machinery as used in several industries.

Particularly in the case of 'off-road' vehicles or machinery, there is a risk of overlapping with 'on-road' vehicles as covered under SNAP 07, e.g. fire engines, refuse collectors, sewage lorries, road tankers, etc. because it is not always clear whether or not these utility vehicles are part of national on-road vehicle inventories. The EMEP/EEA Guide proposes "to count these as on-road vehicles. In addition, some of the vehicles have a second combustion engine in order to operate their special equipment. These additional machines should fall under 'Off-Road' machinery. In some other cases, machinery is mobile in principle, but actually stays at the same site for long periods, or only is mobile within a small radius, e.g., some excavators and cranes. In this case, it is proposed to consider these machines here as 'Other Mobile Sources and Machinery'. Moreover, there are large mobile generator sets, e.g. above 1 MW, which are mobile but quite often not moved in reality. With regard to this equipment, there is a real risk of misallocation, because in many inventories such generator sets most likely fall into the categories of SNAP sectors 1, 2 or 3 under the item 'Stationary Engines'. A further risk of misallocation occurs in the sector 'Airports', because many of the ground activities covered there are carried out by 'off-road' machines and equipment, which fall into the category 0801. Therefore, there is a risk of double counting" (EEA 2007).

It is recommended to contact your national experts for air emission inventories in order to fully understand, which processes are covered.

Table 8: Proposal for a Reference List of 'Off-road' machinery, which should be, covered under SNAP codes 0801 to 0803 and 0806 to 0809

SNAP code	Name		Machinery included
080100	Military		
080200	Railways	01	Shunting locs
		02	Rail-cars
		03	Locomotives
080300	Inland Waterways:	01	Sailing Boats with auxiliary engines
		02	Motorboats / Workboats
		03	Personal Watercraft
		04	Inland Goods Carrying Vessels
080600	Agriculture:	01	2-wheel tractors
		02	Agricultural tractors
		03	Harvesters / Combines
		04	Others (sprayers, manure distributors, agriculture mowers, balers, tillers, swatchers)
080700	Forestry:	01	Professional Chain Saws / Clearing Saws
		02	Forest tractors / harvesters / skidders
		03	Others (tree processors, haulers, forestry cultivators, fellers/bunchers, shredders, log loaders, pilling machines)
080800	Industry:	01	Asphalt / Concrete Pavers
		02	Plate compactors / Tampers / Rammers
		03	Rollers
		04	Trenchers / Mini Excavators
		05	Excavators (wheel/crawler type)
		06	Cement and Mortar Mixers
		07	Cranes
		08	Graders / Scrapers
		09	Off-Motorway/Motorway Lorries
		10	Bull Dozers (wheel/crawler type)
		11	Tractors / Loaders / Backhoes
		12	Skid Steer Tractors
		13	Dumper / Tenders
		14	Aerial Lifts
		15	Forklifts
		16	Generator Sets
		17	Pumps
		18	Air / Gas Compressors
		19	Welders
		20	Refrigerating Units
		21	Other general industrial equipment (brooms, sweepers / scrubbers, Slope and brush cutters, pressure washers, past machines, ice rink machines, scrapers, blowers, vacuums)
		22	Other material handling equipment (conveyors, tunnel locs, snow clearing machines, industrial tractors, pushing tractors)
		23	Other construction work equipment (paving/surfacing equipment, bore/drill rigs, crushing equipment, concrete breakers/saws, peat breaking machines, pipe layers, rod benchers/cutters
080900	Household & Gardening:	01	Trimmers / Edgers / Brush Cutters
		02	Lawn Mowers
		03	Hobby Chain Saws
		04	Snowmobiles / Skidoos
		05	Other household and gardening equipment (wood splitters, snow blowers, chippers/stump grinders, gardening tillers, leaf blowers/vacuums)
		06	Other household and gardening vehicles (lawn and garden tractors, all-terrain vehicles, minibikes, off-road motorcycles, golf carts)

Source: EMEP/EEA Guidebook 2009

B) Understanding, where the relevant economic activities are recorded in National Accounts

In ESA supply tables, the employment of mobile sources as covered under SNAP category 08 may be treated as principal, secondary or ancillary activity.

The running of railway, water and air traffic may be regarded as principal activities of the respective transport service industries NACE Rev.2 industry code 49.1-49.2 'Passenger rail transport, interurban' and 'Freight rail transport', NACE Rev.2 industry code 50 'Water transport', and NACE Rev.2 industry code 51 'Air transport', and in the case of fishing vessels NACE Rev.2 industry code 03 'Fishing'.

Railway vehicles may also be employed by other industries as a secondary activity. Contact your national accountants to find out whether this is the case in your country and whether these secondary activities have been singled out as local KAUs and accordingly have been re-grouped in your national supply table.

The employment of 'off-road' machinery (SNAP groups 08 01, 08 06, 08 07, 08 08, and 08 09) should fall under ancillary activities of the respective industries which can be derived/identified from the titles of the respective SNAP processes.

C) Guidance for assignment of air emission data of SNAP category 08 to NACE Rev.2 industries
The assignment of emissions from other mobile sources to NACE Rev.2 industries is rather straightforward. In most cases single SNAP processes of this SNAP category can be assigned to one clear NACE Rev.2 industry or households (see Annex 1 correspondence table).

It is only SNAP group 08 08 'Industry' where the associated emissions need to be distributed over a number of NACE Rev.2 industries. Contact your national air emission expert in order to find out more about the processes recorded here. The construction industry may operate a significant share of that mobile 'off-road' machinery.

You may also use auxiliary data, such as e.g. employment and/or economic output, to do the distribution.

Note: For other mobile source emissions adjustments from territory approach to resident principle is required, particularly for air and water transport.[50]

5.10 Waste (SNAP 09)

Emissions from waste management are of high importance in the case of CH_4.

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 09 02	SNAP 09 04	SNAP 09 10

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[50] Practical guidelines to bridge from territory to residence approach are presented in section 0.

	SNAP 09 07 SNAP 09 09 (CRF/NFR 6.C)	(CRF/NFR 6.A)	(CRF/NFR 6.B and 6.D)
CO$_2$	0	0	0
N$_2$O	0	0	3
CH$_4$	0	27	3
SO$_2$			
NOx			
NH$_3$			
NMVOC			
CO			

Source: EEA greenhouse gas data viewer and air pollutant emissions data viewer

A) Understanding the emission data of SNAP category 09

This SNAP category comprises emissions from several waste treatments (incineration, landfill, other), burning of agricultural wastes and cremation. Table 9 provides some more detailed information on the single SNAP processes.

Table 9: Detailed information related to SNAP category 09 (Waste)

code	SNAP process	Descriptions from EMEP/EEA Guidebook 2009
09 02 01	Incineration of domestic or municipal wastes	Relates to the incineration of domestic or municipal wastes, often referred to as municipal solid waste (MSW). MSW is defined as a mix of unwanted waste material from households and commercial organisations.
09 02 02	Incineration of industrial wastes (except flaring)	Relates to the combustion of industrial waste (including hazardous or chemical waste). The definition of industrial waste varies, but the EMEP/EEA Guidebook assumes it to include all non-domestic chemical, hazardous and difficult wastes, and other industrial wastes. The composition of industrial waste varies considerably. Industrial waste includes any unwanted hazardous/chemical waste such as: acids and alkalis; halogenated and other potentially-toxic compounds; fuels, oils and greases; used filter materials, animal and food wastes. Industrial waste sources include chemical plant, refineries, light and heavy manufacturing etc. The number of large merchant incinerators of hazardous waste, operated by waste disposal contractors to receive a wide variety of wastes from different sources, is relatively small. Many industries have smaller hazardous/chemical waste incinerators constructed within their own site and intended for their use only. A large proportion of these handle only single streams of waste. There is little information on emissions from these smaller plants.
09 02 03	Flaring in oil refinery	Flares are commonly used during petroleum refining for the safe disposal of waste gases during process upsets (e.g., start-up, shut-down, system blow-down) and emergencies to combust the organic content of waste emission streams without recovering/using the associated energy. Blowdown systems are used at petroleum refineries (see SNAP Code 0401) to collect and separate both liquid and vapour discharges from various refinery process units and equipment. The gaseous fraction, that may represent a planned or unplanned hydrocarbon discharge, may be either recycled or flared. Flaring provides a widely-used safety mechanism and emission control option for blowdown systems when the heating value of the emission stream cannot be recovered due to uncertain or intermittent releases during process upsets/emergencies.
09 02 04	Flaring in chemical industries	n.a.
09 02 05	Incineration of sludge from waste water treatment	Volume reduction, by combustion, of sludge resulting from municipal waste water treatment (sewage).
09 02 06	Flaring in gas and oil extraction	Flaring is gas combusted without utilisation of the energy. SNAP 090206 include all flaring for extraction and first treatment of gaseous and liquid fossil fuels. Flaring in oil refineries and other industry is described in SNAP 09 02 03 and 09 02 04, respectively. Emissions to air from incineration after a well testing should be reported in SNAP 09 02 06 as well. This section also includes flaring in gas terminals. Gas is flared on oil and gas production installations for safety. The main reasons are lack of process or transport capacity for gas, a continuous surplus gas flow, start up, maintenance and emergency (need for pressure relief). The gas is led through a pipeline to a flare tip located high above and away from the platform. Well testing is performed as a part of the exploration activity. After a discovery the well is tested to check the production capacity and the composition of the reservoir fluid. Due to lack of treatment, storage and transport facilities the oil or gas extracted may be disposed by burning.

code	SNAP process	Descriptions from EMEP/EEA Guidebook 2009
09 02 07	Incineration of hospital wastes	Volume reduction, by combustion, of hospital wastes In some cases hospital waste is combusted in municipal waste incinerators, or in 'hazardous waste incinerators' along with hazardous/ chemical wastes from industrial processes. Users of this chapter should be aware of the potential for double counting of activity data with this chapter and the chapters on SNAP 090201 and SNAP 090202.
09 02 08	Incineration of waste oil	n.a.
09 04 01 09 04 02 09 04 03	Solid waste disposal on land	n.a.
09 07	Open burning of agricultural wastes	Covers the volume reduction, by open burning, of agricultural wastes. It does not include stubble burning, which is covered under SNAP code 100300, or forest fires, which is covered under SNAP code 110300. The open burning of rubber tyres or waste oil on farms has also not been included. Examples of agricultural wastes that might be burned are crop residues (e.g. cereal crops, peas, beans, soya, sugar beet, oil seed rape etc.) wood, leaves, animal carcasses, plastics and other general wastes. Straw and wood are often used as the fuel for the open burning of agricultural wastes. Poultry and animal excreta are difficult to burn except under controlled conditions.
09 09 01	Incineration of Corpses	This chapter covers the atmospheric emissions from the incineration of human bodies in a crematorium. The emissions associated with the combustion of support fuels during the cremation process are also included
09 09 02	Incineration of Carcasses	
09 10 01 09 10 02	Waste Water Treatment in Industry / in Residential/Commercial Sectors	The installations described are biological treatment plants. During the treatment process carbon dioxide, methane, and nitrous oxide can be produced.
09 10 03	Sludge Spreading	Emissions from the spreading of sewage sludge can be considered as a part of a wastewater treatment plant. The sludge produced in a wastewater treatment plant is either burned, mechanically dried or dried by spreading in the open air. Information on emissions from the latter process is scarce. Emissions to air include odours. Recent measurements indicate that some ammonia is also produced.
09 10 05	Compost production	In many areas organic domestic waste is gathered separately. Composting the organic waste produces a reusable product. The main emissions to be expected have to do with odour and abatement methods are directed at reducing the odour. Also a small amount of ammonia is produced.
09 10 06	Biogas production	n.a.
09 10 07	Latrines	Considers ammonia emissions from latrines which are storage tanks of human excreta, located under naturally ventilated wooden shelters. A latrine is a simple "dry" toilet built outside the house, usually in a backyard. A storage tank under the latrine can be a hole dug in the ground, or a concrete reservoir
09 10 08	Other production of fuel (refuse derived fuel,...)	n.a.

B) Understanding, where the relevant economic activities are recorded in National Accounts

In ESA, the several waste treatments covered in SNAP category 09 may occur as principal, secondary and/or ancillary activity. Waste treatment as a principal activity is undertaken by the industry with NACE Rev.2 industry code 38 ("Sewage and refuse disposal, sanitation and similar activities"). This industry also covers waste water management. Waste treatments may also be carried out by public authorities (e.g. NACE division 84) as a secondary activity.

Incineration of particular waste streams (e.g. industrial, hazardous, clinical etc.) and waste water treatment of specific industrial waste waters may occur as secondary activity in certain industries. Have a look at your ESA supply table. Check whether the commodity row with CPA code 90 has entries off the diagonal.

Cremation is a principal activity of industry with NACE Rev.2 industry code 96.03 ("Funeral and related activities").

In any case, it is recommended to contact your national accountants in order to identify exactly where the different waste treatment activities are recorded economically in your ESA supply tables.

C) Guidance for assignment of air emission data of SNAP category 09 to NACE Rev.2 industries

As regards waste incineration processes (SNAP 0902) and cremation (SNAP 0909) the related emissions are assigned to who owns the incinerator – can be municipalities, hospitals, industries and crematoriums (NACE 96) in the case of cremation; the specific NACE can in some cases be determined from the detailed calculations on which CORINAIR data are based; another possible source of information are the pollution permits that these types of facilities are typically required to obtain from the pollution control regulatory agencies.

Emissions from flaring are mostly caused by industry-specific processes such as 'flaring in oil refinery' (to be assigned to NACE 19), 'flaring in chemical industries' (20) flaring in gas and oil extraction (NACE 06).

Concerning solid waste disposal on land (SNAP 0904), emissions from landfills need to be distributed among those who own the landfills – can be municipalities or specific industries, the possible source of information being waste statistics). In both cases the actual NACE code of the industry owning the landfill is likely to be NACE 38 but could in principle be a different one.

Finally, the main possible sources of NACE-related information when assigning emissions arising from waste water treatment facilities (SNAP 0910) are similar to the case of waste incineration, i.e. the detailed calculations on which CORINAIR data are based, or the pollution permits that these types of facilities are typically required to obtain from the pollution control regulatory agencies.

5.11 Agriculture - SNAP 10
(CRF/NFR 4)

Emissions from agriculture are of extraordinarily high importance with almost two thirds of total N_2O-emissions, more than half of total CH_4-emissions and even 95% of total NH_3-emissions arising from agriculture activities.

Quantitative importance EU15, 2005 (in % of emission inventory totals):

	SNAP 10 01 SNAP 10 02 (CRF/NFR 4.D)	SNAP 10 03 (CRF/NFR 4.F)	SNAP 10 04 (CRF/NFR 4.A)	SNAP 10 05 SNAP 10 09 (CRF/NFR 4.B)	SNAP 10 06 (CRF/NFR 4.G)
CO₂	-	-	-	-	-
N₂O	59	-	-	7	-
CH₄	-	-	39	14	-
SO₂	-	-	-	-	-
NOx	-	-	-	-	-
NH₃	15	-	-	80	-
NMVOC	2	-	-	2	-
CO	0	-	-	0	-

A) Understanding the emission data of SNAP category 10

SNAP groups 10 01 and 10 02 comprise emissions from agricultural soils. SNAP group 10 03 relates to the emissions of ammonia from stubble burning, including the burning of crop residues and wastes from crops in situ. Most important are methane emissions from animal husbandry which originate from enteric fermentation (SNAP 10 04). Methane emissions from manure management are considered under SNAP group 10 05 whereas emissions of ammonia (NH_3) and nitrous oxide (N_2O) from manure management are covered by SNAP 10 09. SNAP 10 06 considers the emission of carbon species resulting from the application of pesticides and limestone to agricultural soils and plants.

B) Understanding, where the relevant economic activities are recorded in National Accounts

All activities related to SNAP 10 should be recorded under agriculture (NACE Rev.2 division 01).

C) Guidance for assignment of air emission data of SNAP category 10 to NACE Rev.2 industries

The assignment of emissions is straightforward to NACE Rev.2 division 01 "Crop and animal production, hunting and related services".

5.12 Other sources and sinks (SNAP 11)

All SNAP97 processes belonging to source category 11 'other sources and sinks' are excluded from Air Emissions Accounts as they refer to emissions from non-economic agents and the absorption of emissions. If the CRF/NFR classification adopted in the international reports is the starting point, category 5 'land use change and forestry' should be excluded instead.

SNAP code	SNAP label	CRF/NFR code and label	Description
SNAP 11 01	Non-managed broadleaf forests	not applicable	According to the EMEP/EEA guidelines for air pollutants, these four SNAP items comprise all types of foliar forest emissions, non-managed and managed, deciduous and coniferous. Forest foliage is primarily a source of emissions of VOC. Also foliar emissions of CH_4, N_2O and – to a minor extent – NH_3 arise from forests, managed and un-managed. Emissions from forest soils – managed and un-managed – are covered in the SNAP codes 11 01 17, 11 02 16, 11 11 17, and 11 12 16.
SNAP 11 02	Non-managed coniferous forests		
SNAP 11 11	Managed broadleaf forests	CRF/NFR code 5E 'Land Use Change and Forestry – Other'	According to the 1996 IPPC guideline, emissions of NMVOC from the trees in managed forests and N_2O or CH_4 emissions/removals from the soil of managed forests are reported under CRF 5E. Here, managed forests include all trees planted or managed by man.
SNAP 11 12	Managed coniferous forests		In a strict sense applying National Accounts, managed forests belong to the economy. As a convention, foliar forest emissions from managed forests are however excluded from Air Emissions Accounts due to the difficulties in estimating those.
SNAP 11 03	Forest and other vegetation fires	not applicable	According to EMEP/EEA guidelines, this item includes emissions (CO_2, NOx, NMVOC, CH_4, CO, N_2O, NH_3) from burning (naturally or man-induced) of non-managed and managed forests and other vegetation, excluding agricultural burning of stubble, etc.
			In a strict sense applying National Accounts, emissions from man-induced forest fires belong to the economy. As a convention, however, they are excluded from Air Emissions Accounts) due to the difficulties in estimating those.
SNAP 11 04	Natural grassland and other vegetation	n.a.	According to EMEP/EEA guidelines, this item includes NMVOC emissions from all types of grasslands and other types of vegetation (natural, semi-natural and in some

SNAP code	SNAP label	CRF/NFR code and label	Description
			cases cultivated) which do not fit easily into the forest classification. This includes especially the Mediterranean maquis/garrigue and other low scrub-type vegetation, heath land, tundra, etc.
			Not mentioned in 1996 IPCC guidelines.
			By convention, emissions under this item are excluded from Air Emissions Accounts as they are emitted by nature.
SNAP 11 05	Wetlands (marshes - swamps)	n.a.	According to EMEP/EEA guidelines, this item covers emissions of methane (CH_4) and to a lesser extent sulphur produced in naturally saturated soils, in areas either permanently or seasonally flooded with fresh water. Note that this chapter covers shallow lakes (110601), typically defined by depths of less than 2 m, as well as the wetland (1105) SNAP-codes. Lakes of greater than 2m depth should not generally be treated as wetlands. The chapter does not cover agricultural wetlands such as rice fields, though the biogeochemical processes are the same. The main emission, CH_4, is produced by anaerobic bacteria (methanogens) in the soil, diffused through soil water and transported to the atmosphere by plants, ebullition, or diffusion.
			By convention, emissions under this item are excluded from Air Emissions Accounts as they are emitted by nature.
SNAP 11 06	Waters	n.a.	According to EMEP/EEA guidelines, this item comprises natural emissions from waters. No methodologies included yet in the EMEP/EEA guidelines.
			By convention, emissions under this item are excluded from Air Emissions Accounts as they are emitted by nature.
SNAP 11 07	Animals	n.a.	According to EMEP/EEA guidelines, this item covers the emissions from wild-living animals. Both the emissions from the intestines and from excreta are included. Not covered are emissions from animal husbandry (SNAP 10.4: Enteric fermentation) or from pets, which are partly similar, but may be considered influenced by human behaviour in many respects. Still included here however are emissions from humans (breath, sweat, etc.; excreta are dealt with in SNAP 9.1.7, latrines, or 9.10.2, waste water treatment), as they do not appear anywhere else and should be perceived differently to other anthropogenic emissions.
			By convention, emissions under this item are excluded from Air Emissions Accounts as they are emitted by nature.
SNAP 11 08	Volcanoes	n.a.	According to EMEP/EEA guidelines, this item includes emissions from geothermal activities, both eruptive and non-eruptive. Sources include volcanoes, but also fumaroles, geysers, metamorphic degassing or other activities related to molten magma in the earth's crust. Heated magma under pressure contains gases like sulphur dioxide, carbon dioxide, hydrogen sulphide, mercury, and chlorine. These gases may be released when magma gets close to the surface and the pressure may be discharged. With respect to the different sources, non-eruptive volcanoes that outgas at relatively constant rates seem to be more important than those from sporadic eruptions, both for CO_2 [and SO_2. Some of the emissions may also be considered anthropogenic, when produced at geothermal power plants where artificial holes are drilled to obtain hot water from the earth's interior. These emissions however are treated in SNAP 0507 and are assumed to be rather small.
			By convention, emissions under this item are excluded from Air Emissions Accounts as they are emitted by nature.
SNAP 11 09	Gas seeps (Geological seepage)	n.a. ?	According to EMEP/EEA guidelines, this item comprises geologic emissions of methane which are an important global greenhouse-gas source. Significant amounts of methane, produced within the Earth crust, are released naturally into the atmosphere through faults and fractured rocks. Major emissions are related to hydrocarbon production in sedimentary basins (biogenic and thermogenic methane), through continuous exhalation and eruptions from more than 1200 onshore and offshore mud volcanoes, more than onshore 10000 seeps and through diffuse soil microseepage, and thousands of shallow marine seeps. Global emission estimates range from 40 to 60 Tg y-1, more than 8% of the total CH_4 emission, representing the second most important natural methane source behind wetlands.
			By convention, emissions under this item are excluded from Air Emissions Accounts as they are emitted by nature.
SNAP 11 10	Lightning	n.a.	According to EMEP/EEA guidelines, lightning and corona discharge during thunderstorm events cause atmospheric chemical reactions to take place at high voltages and high temperatures. These reactions cause the production of NOx in the atmosphere. Such production processes are, strictly speaking, not real emissions as the compounds involved (primarily N2 and O2) are not injected into the atmosphere but are present anyway. However as these processes cannot adequately be described by conventional atmospheric models on one hand, and their impact is eventually identical to those from (anthropogenic) emissions on the other hand, they are easy to be compared on the emission level and thus are frequently treated as such.
			By convention, emissions under this item are excluded from Air Emissions Accounts as they are emitted by nature.
SNAP 11 21	Changes in forest and other woody biomass stock	CRF 5A	No methodologies included yet in the EMEP/EEA guidelines.
			According to 1996 IPPC guidelines, this item covers emissions and removals of CO_2 from decreases or increases in biomass stocks due to forest management, logging,

SNAP code	SNAP label	CRF/NFR code and label	Description
			fuel wood collection, etc. The category is either a net source if biomass harvest/destruction exceeds re-growth in the inventory year, or a net sink if re-growth exceeds harvest/destruction. Include afforestation under CRF 5A5. By convention, emissions under this item are excluded from Air Emissions Accounts due to the difficulties in calculating those.
SNAP 11 22	Forest and grassland conversion	CRF/NFR 5B	No methodologies included yet in the EMEP/EEA guidelines. According to the 1996 IPCC guidelines, this category includes conversion of existing forests and natural grasslands to other land uses. Emissions of CO2, CH4, CO, N2O, NOx and NMVOCs from the burning and decay of biomass Forest and grassland conversion to permanent cropland or pasture is primarily an activity of the tropics. Tropical forest clearing is usually accomplished by cutting undergrowth and felling trees followed by burning biomass on-site or as fuel wood. Where conversion of forest and grassland to permanent cropland and pasture occurs outside the tropics, the basic calculations should still be the same. Carbon is also lost from the soils after conversion, particularly when the land is cultivated. Conversion of grasslands into cultivated lands also results in CO_2 emissions, mainly from soils. By convention, emissions under this item are excluded from Air Emissions Accounts due to the difficulties in calculating those.
SNAP 11 23	Abandonment of Managed Land	CRF 5C	No methodologies included yet in the EMEP/EEA guidelines. According to the 1996 IPCC guidelines, this item deals with net-CO_2 removals in biomass accumulation resulting from the abandonment of managed lands. Managed lands include: · Cultivated lands (arable land used for the cultivation of crops) · Pasture (land used for grazing animals) Carbon accumulation on abandoned lands is sensitive to the type of natural ecosystem (forest type or grasslands) which is re-growing. Therefore abandoned lands re-growing should be entered by type. For grasslands the default assumption is that net accumulation aboveground is zero. Because re-growth rates become slower after a time, the periods considered are: · Land abandoned during the 20 years prior to the Inventory Year (i.e., 1990) · Land abandoned between 20 and 100 years ago (i.e., before 1970 and after 1870) When managed lands are abandoned, carbon may or may not re-accumulate on the land. Abandoned areas are therefore split into those which re-accumulate carbon and those which do not re-growth or which continue to degrade. Only natural lands which are re-growing towards a natural state should be included. Lands which do not re-grow or degrade should be ignored in this calculation. By convention, emissions under this item are excluded from Air Emissions Accounts due to the difficulties in calculating those.
SNAP 11 24	CO_2 Emissions and removals from soil (except SNAP 10.06)	CRF 5D	No methodologies included yet in the EMEP/EEA guidelines. According to the 1996 IPCC guidelines, this item relates to estimates of net CO_2 emissions (sinks and sources) from three processes: 1) changes in carbon stored in soil and litter of mineral soils due to changes in land-use practices, 2) CO_2 emissions from organic soils converted to agriculture or plantation forestry, and 3) CO_2 emissions from liming of agricultural soils. At present, CO_2 emissions or uptake associated with naturally occurring carbonate minerals in soils are not included. By convention, emissions under this item are excluded from Air Emissions Accounts due to the difficulties in calculating those.
SNAP 11 25	Other	CRF/NFR 5E	No methodologies included yet in the EMEP/EEA guidelines. According to the 1996 IPCC guidelines, this item relates to emissions and removals (sources and sinks) of CO_2 from land use or land-use change activities which cannot be included under the categories provided above. Emissions of NMVOC from the living trees in managed forests and N_2O or CH_4 emissions/removals from the soil of managed forests are reported here. Managed forests include all trees planted or managed by man for profit, pleasure, wind or water-erosion protection etc. By convention, emissions under this item are excluded from Air Emissions Accounts due to the difficulties in calculating those.

6. Energy-first-Approach: Energy Statistics/Balances over Energy Accounts to Air Emissions Accounts

6.1 Summary

To summarise, the main steps needed to develop Air Emissions Accounts when using energy statistics as the starting point are:

- Adjust energy statistics from geographic system boundaries to system boundaries defined by the resident principle as used in the National Accounts;
- Assign energy use to industry NACE categories and households (taking into consideration if the industries are homogeneous or heterogeneous) using auxiliary information to re-assign energy use;
- Calculate emissions from energy use industry-by-industry (and households) with the help of emissions factors that are specific for the combination of energy carrier, industry and technological sources;
- Calculate emissions from non-energy sources;
- Systematically aggregate the emissions from combustion and non-combustion sources for each industry and households for each pollutant.
- Check that the differences between the accounts and inventories and known and only due to adjustments in system boundaries. If this is not the case, balance the accounts appropriately.

Assistance from the emission inventory national experts and the energy statistics national experts are vital for implementing this approach to developing Air Emissions Accounts.

6.2 Introduction

This Manual is focused on the development of Air Emissions Accounts and not Energy Accounts. However since some countries use energy statistics/balances as the starting point for their Air Emissions Accounts some brief guidelines regarding the conversion from energy statistics/balances to Energy Accounts and then to Air Emissions Accounts will be provided[51].

When starting with energy statistics/balances the system boundaries need to be adjusted from geographic/territorial boundaries to economic system boundaries based on the resident principle. And the energy use needs to be assigned to industries and households according to the standard industry classification (NACE). After the energy use (both combustion and non-combustion uses, i.e. catalysts) has been adjusted and assigned,

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[51] Specific guidance for developing energy accounts is being developed by the United Nations Statistical Division in a document known as SEEA-Energy.

then emissions are calculated on an industry-by-industry and household basis often using industry-specific and technology specific emission factors for each energy carrier.

In addition to energy related emissions, emissions from other sources need to be added in order to develop comprehensive air emission inventories and Air Emissions Accounts. The following list identifies the major components that need to be added to the emissions that are calculated from the energy information.

- Industrial processes (typically already identified by NACE since the local KAU often must report these point emissions to Pollution Control Authorities. The industry classification must somehow be associated with the reporting unit through a business register number or other identification).
- Solvent and other volatile organic product use need to be assigned to NACE – sales of these products gives amounts, and information to assign to industry/households typically comes from the use of surveys of industries or from sales data obtained by producers. National Accounts detailed supply and use tables may also be helpful in this process.
- Agriculture has its own NACE classification so what is needed is usually information regarding the number and types of animals and manure management information.
- Waste: Emissions from landfills are estimated based on the type of waste, landfill construction and other factors. These emissions are assigned to those who own the waste disposal sites, primarily municipalities although some privately owned landfills are assigned to the NACE of the owners. Emissions from waste water treatment and waste incineration also need to be included.

The following steps are needed to develop Air Emissions Accounts when using energy statistics/balances as the starting point:

1. Adjust energy statistics/balances from geographic system boundaries to energy "accounts" with system boundaries defined by the resident principle.
2. Assign energy use to industry NACE categories and households to arrive at Energy Accounts that are according to NACE categories and households.
3. Calculate emissions from energy use industry-by-industry (and households) with the help of energy carrier, industry and technology specific emissions factors.
4. Calculate emissions from non-energy sources and add to emissions from energy sources.

These steps may not necessarily follow directly after each other, for instance it may be the case that the energy use is assigned to industries first and then adjustments for system boundaries are made on an industry-by-industry level. The steps in the process are the important part – the order can vary.

Some countries have developed multi-purpose energy data systems where the data needed for different purposes is in a coordinated system (see section 8.2.3 and figure 17 for a brief description). In this case the emission accounts will not differ from the emissions inventory figures.

More likely, countries will have two different systems one leading to air emission inventories and the other to air emission accounts. If there are two systems then it is very important to compare the air emission accounts results with the air emission inventory results and make appropriate adjustments and balancing so that the only differences can be explained as the adjustments need for the different system boundaries. The balancing is needed because differences will arise due to the different ways the emissions factors are used in the calculations yielding accounts vs. the calculations resulting in the inventory systems. Finding and using the most relevant emission factors is a major task when developing the air emission accounts which should not be under estimated.

Figure 6: Schematic showing the steps for establishing Air Emissions Accounts when starting with energy statistics/balances
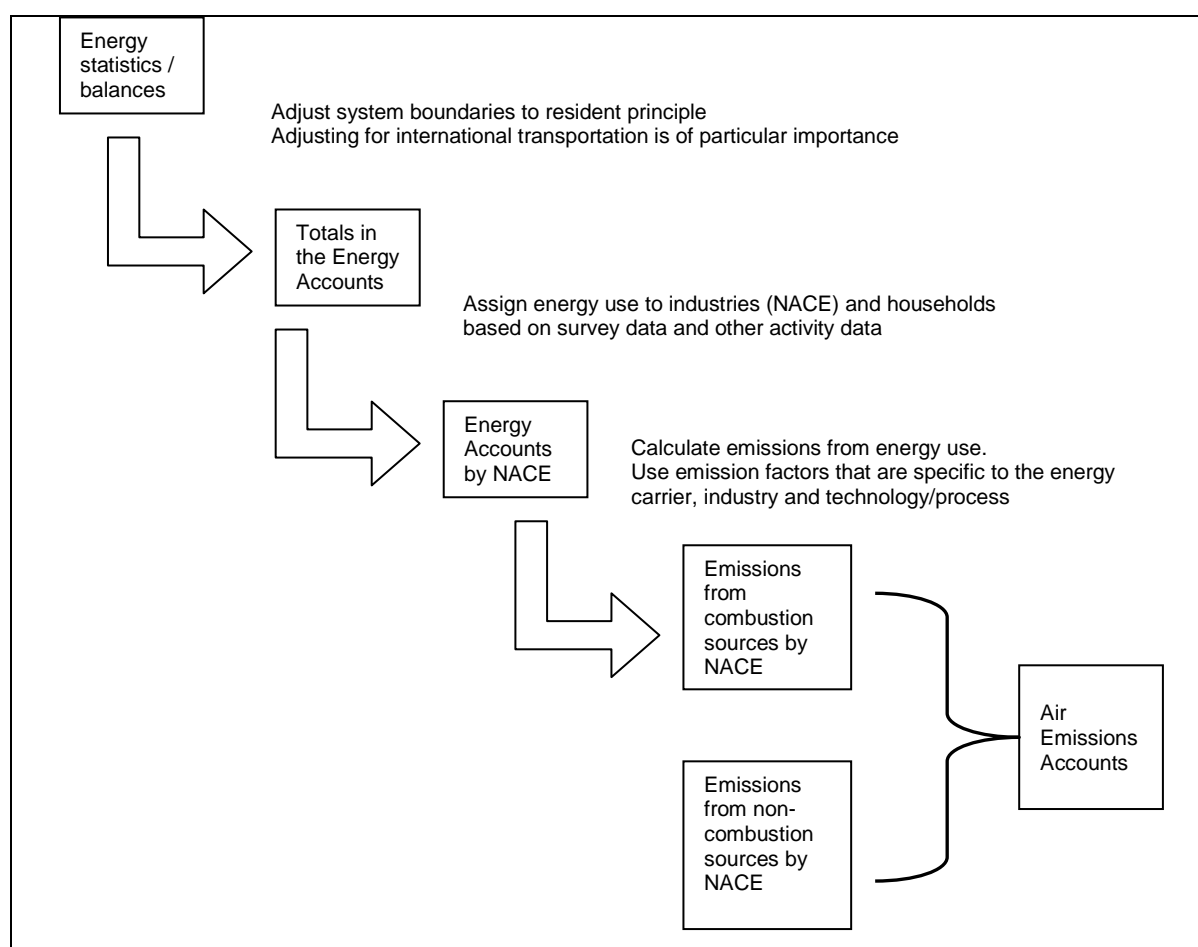
6.3 Energy Statistics/Balances to Energy Accounts

6.3.1 Adjusting system boundaries

The system boundaries for energy statistics/balances use a geographical definition of a country. This needs to be adjusted to an economic definition, i.e. non-resident units operating on the national territory need to be removed and the resident units operating in the rest of the world need to be added. Most of these adjustments are related to

international transportation, including land (including rail), water and air. See sections 0 and 0 for a discussion of this topic and how to approach adjusting system boundaries in more detail.

6.3.2 Assigning industries according to NACE and households

Energy use also needs to be reallocated to the industries/households that use the energy. In order to do this we need to know, or at least estimate in some way, the energy used by the different industries. Typically there is a combination of various methods and information sources that are used to develop the different energy statistics that are then used to create energy balances. In some countries there are specific energy use surveys to different industries and in the household budget surveys. Sometimes energy used measured in physical units is requested and sometimes purchases of energy in monetary units are requested. If monetary units are surveyed then this information is combined with pricing data to calculate energy use in physical units.

When surveys are used it can be possible to connect energy use to the industries (by NACE) and households especially if the industry classification of the unit being surveyed is known. It may be necessary to increase the sample size if energy use by detailed industry group (such as 2-digit NACE) is to be estimated and not just total energy use. Often total energy use is better known than industry-level consumption. So it is important to have a close cooperation with the persons responsible for energy statistics so that the energy data can be collected in a way that multiple uses of the data can be made.

When assigning energy use to industries and households it is important to do it in the same way that the economic activities are assigned to these categories since the point of Air Emissions Accounts is to have them correspond to the economic information from the National Accounts (heterogeneous or homogeneous industries).

6.3.3 Multi-purpose energy data system

One approach to developing a multi-purpose energy data system that can be used to develop both energy balances and Energy Accounts is schematically shown in Figure 7:

Figure 7: Schematic of multi-purpose energy data system for developing energy balances and energy accounts
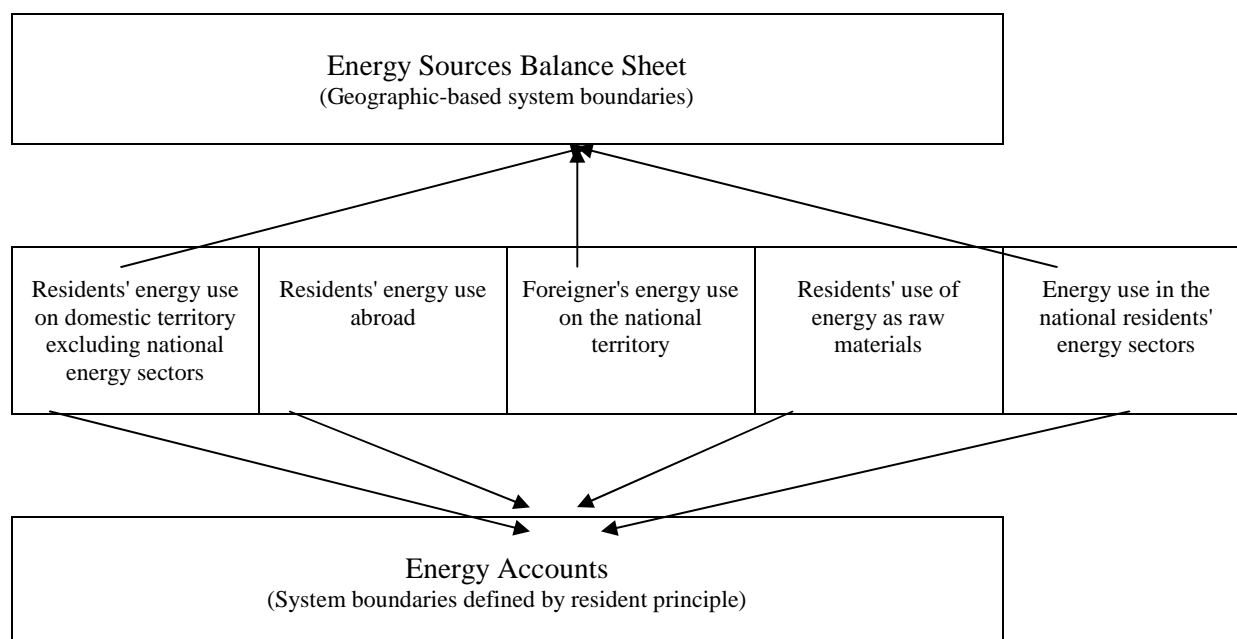
Source: adapted from Hass and Kolshus (2007)

By organising the energy data in this way the different portions of the data base can be combined depending on whether a geographic-based system boundary definition is used or whether the system boundaries are defined by the economic-based criteria of residence. This type of organisation also means that no double counting will occur when the different portions of the data are combined.

If each of the entries in the data system is also identified by energy carrier and by NACE industry classification (or households) then the process of developing energy accounts according to standard NACE industrial groups can be relatively straight forward.

6.4 Calculating Emissions

A general emission model using Energy Accounts as the starting point can be expressed as:

$$\text{Emissions (E)} = \text{Activity level (A)} \times \text{Emission Factor (EF)}$$

There are two major types of input needed: combustion and non-combustion emissions. The combustion related emissions use the Energy Accounts whereas the non-combustion emissions typically need to be obtained from the national emission inventories. Special attention must be given to the use of energy carriers for non-combustion industrial processes – such as their use as catalysts.

It should be noted that emission factors are regularly up-dated, both nationally, and internationally. For the most up-to-date emission factors, consult your experts on emission inventories.

6.4.1 Emissions from combustion

For emissions from *combustion*, the activity data concerns energy use. When starting with Energy Accounts the use of different forms of energy have already been allocated to industries and households. In order to calculate emissions to air, energy use must also be allocated to technical sources (e.g. equipment). After energy use has been allocated in this way, the Energy Accounts may be viewed as a cube in which the three axes are fuels, industries, and technical sources. The energy use data are then combined with a corresponding matrix of emission factors for each of the different types of pollutant.

In principle, there should be one emission factor for each combination of fuel, industry (and households), technical source, and pollutant. However it is often the case that an emission factor is used in more than one combination. Although there will be many empty cells in the matrix (due to no consumption in this combination) this organisation of the energy data and emissions factors allow for clearly defined data base to be developed. By organising the data in this systematic way it is possible to make emission calculations in a variety of different ways depending how the data are to be presented or reported.

The following Figure 8 shows the combinations of fuels and technical sources in the 2007 Norwegian Air Emissions Model. As mentioned, the majority of the cells are empty (indicated by "..") but this way of organising the data helps to keep a structured database.

	Direct fired furnaces	Gas turbines	Boilers	Small stoves	Flaring	Passenger car	Light duty vehicles	Heavy duty vehicles	Motorcycle	Moped	Snowscooter	Railway	Aviation jet/turboprop	Aviation helicopter	Aviation small craft	Ships	Small boats 2 stroke	Small boats 4 stroke	Equipment 2 stroke	Equipment 4 stroke, tractor
Coal	x	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Coke	x	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Petrol coke	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fuel wood	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wood waste	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Black liquor	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wood pellets	..	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wood briquettes	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Charcoal	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Natural gas	x	x	x	..	x	x	..	x	..	..	..	..	..	..	..	x	..	..	..	..
Refinery gas	x	..	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Blast furnace gas	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Landfill gas	..	..	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fuel gas	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
LPG	..	..	x	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Motor gasoline	..	..	..	..	..	x	x	x	x	x	x	..	..	..	..	..	x	x	x	x
Aviation gasoline	..	..	..	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..
Kerosene (heating)	..	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Jet kerosene	..	..	..	..	..	..	..	..	..	..	..	..	x	x	..	..	..	..	..	..
Auto diesel	..	..	x	..	..	x	x	x	..	..	..	x	..	..	..	..	..	x	..	x
Marine gas oil/diesel	x	x	x	..	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..
Light fuel oils	..	..	x	x	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	x
Heavy distillate	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..
Heavy fuel oil	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..
Municipal waste	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Special waste	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Source: Aasestad (editor) 2007, Statistics Norway

The Energy Accounts provide much of the activity data (amount of energy combusted) needed to calculate the emissions from combustion. To calculate emissions, specific emission factors are needed. Although there is default emission factors provided in the IPCC and EMEP/EEA guidelines, most countries have developed their own country-specific emission factors. Some emissions factors are given in mass (tonnes or kilograms or grams) of the pollutant per tonne (or Sm^3 natural gas) of fuel. This means that the energy accounts need to be in mass units (tonnes or in Sm^3 for natural gas) or need to be converted from energy units to mass units.

The emission factors need to be obtained from the air emissions inventory experts in your country so that the Air Emissions Accounts calculations are based on the same factors. If different emission factors are used this will bring a systematic source of error into the accounts. When trying to account for or "bridge" the differences between the inventory and accounts the difference arising from the different calculation method will need to be entered in the line for "other adjustments and statistical discrepancies" in the Bridging items Table (see chapter 7 describing the Bridging items Table).

Compilers should make sure that proper emission factors are available for the estimation of CO_2 from biomass (wood and wood waste, charcoal, bio-alcohol, black liquor, landfill gas, household waste, etc.) used as fuel, which is to be included in Air Emissions Accounts.

Some countries only distribute energy use to industries and not to technical sources as well. Although some fuel and industry combinations have only one technical source this can cause some difficulties determining which emission factor to use when more than one technical source is used in the industry. Again this may introduce a difference between the figures from the national emissions inventory and the Air Emissions Accounts which should be identified as such in the Bridging items Table.

In the United Kingdom, the Air Emissions Accounts compilers start with the energy data used in the National Atmospheric Emission Inventory (NAEI) which are allocated to technical sources and re-allocate the data into National Accounts categories – before estimating the corresponding emissions by applying the relevant emission factors. Many of these sources, approximately half of them, can be mapped directly to a unique economic category. For the other sources, the corresponding energy use has to be split into 2 or more industries or household consumption categories (ONS, 2002). Such an apportionment, which is usually based on additional (unpublished) estimates on energy used made by the UK's Department of Industry, is undertaken for each of the numerous types of "fuel"[52] registered in the NAEI. The result gives a sort of Energy Accounts by economic category and energy product. Then, for each of the pollutants taken into consideration, the relevant emission factor enables the corresponding air emissions to be calculated.

Generally speaking emissions from combustion contribute about 80 per cent of a country's total greenhouse gas emissions. The other approximately 20 per cent arises from non-combustion sources.

6.4.2 Non-combustion emissions

Non-combustion emissions are generally calculated in the same way as combustion emissions, i.e., by combining appropriate activity data with emission factors. Some non-combustion emissions are obtained from estimations and some are measured directly. The calculated or reported non-combustion emissions can then be fitted into the general data set using the parameters industry, source, and pollutant. Note that the fuel parameter is not relevant here.

In addition to energy related emissions, emissions from other sources need to be added in order to develop comprehensive air emission inventories and Air Emissions Accounts. The following list identifies the major components that need to be added to the emissions that are calculated from the energy information. Please note that this is NOT an exhaustive list.

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[52] In the NAEI, the category "fuel" corresponds to energy products actually used as fuel, i.e. of which the emissions result from their combustion, but it also corresponds to products such as solvent and other chemical products that are not energy products. The NAEI covers all emissions: those stemming from combustion as well as from volatile chemical evaporation and from other processes. However, for the British NAMEA, data on non-energy related emissions are produced similarly as for energy related emissions. Then, relevant "activity values" (purchases of emitting products, e.g. paints, varnishes, printing ink…) are used instead of energy values that are also to be attributed either to a unique or several economic categories, before being transformed into emission quantities thanks to (non-fuel) emission factors.

Some of the non-combustion emissions arise from the following activities:

- Industrial processes:

  There are a large number of industrial processes that need to be included but often there is a one-to-one correspondence between the emissions producing activity and the NACE classification. Therefore, a close cooperation with the emissions inventory experts is necessary to ensure that all of these different areas are covered and included.

  Some of the activities to be included are (some of the CFR codes are included in parentheses but many of these categories contain more than one process):

    o Cement production (CFR 2.A.1)

    o Lime production (CFR 2.A.2)

    o Limestone and dolomite use (CFR 2.A.3)

    o Rock wool production (CFR 3.D.3)

    o Glass and glass fibre production (CFR 2.A.7.d)

    o Ore mines (CFR 2.A.7.a)

    o Mining and extraction of stones and minerals

    o Construction and repairing of vessels (including sandblasting)

    o Production of inorganic and organic chemicals including for example, ammonia (CFR 2.B.1), nitric acid (CFR 2.B.2), other fertilisers (CFR 2.B.5.a), sulphuric acid (CFR 2.B.5.a), plastics, explosives, pigments, soap, paints and varnishes (CFR 3.A.1 and 3.A.2)

    o Metal production, such as, iron and steel, ferroalloys (CFR 2.C.2), aluminium (CFR 2.C.3), magnesium (CFR 2.C.5.e), nickel (CFR 2.C.5.c), and electroplating (CFR 2.C.5.e).

    o Emissions related to other products such as pulp and paper (CFR 2.D.1) beer, wine, spirits and bread (CFR 2.D.2) and cigarettes also need to be included

- Solvent and other volatile organic product use (such as in dry cleaning CFR 3.B.2 and domestic solvent use CFR 3.D.2) need to be assigned to NACE – sales of these products gives amounts, and information to assign to industry/households typically comes from the use of surveys of industries or from sales data obtained by producers. In any event, solvent use needs to be distributed using some type of distribution key – information about these products may be available from the supply and use tables or input-output tables of the National Accounts. See the description for SNAP 06 in the inventory-first methodology chapter 5 for additional guidance.

- Agriculture has its own NACE classification so assigning to NACE is no problem usually. The additional information needed is usually regarding the number and types of animals. This provides the "activity" data. Information about manure management is needed in addition in order to estimate

emissions from soils. This information can potentially be taken directly from the emissions inventory since it will be primarily assigned to the agricultural industry (CRF 4).

The only exception may be when households have substantial own-use production. Then the activity data would need to be divided between the agriculture industry (NACE 01) and households. Households may also differ in their manure management so emissions calculations for this may also differ. But again if households have substantial own-use production then the air emissions inventory experts will probably have the necessary knowledge for calculating and assigning this correctly.

- ▪ Waste: Emissions from landfills are estimated based on the type of waste, landfill construction and other factors. These emissions are assigned to those who own the waste disposal sites, often primarily municipalities although some privately owned landfills are assigned to the NACE of the owners if auxiliary production. Emissions from wastewater treatment and waste incineration also need to be included. See the description for SNAP 09 in the inventory-first methodology section 0 for additional guidance.

As this list shows, there are many non-energy related emissions that need to be added to the combustion emissions. This must be done in a systematic way and in cooperation with national emission inventory experts. Many of the emissions can be obtained directly from the emission inventories however some of these emissions will then need to be assigned to industries (NACE) and households using additional information – physical or monetary information.

In Denmark the non-combustion emissions are taken directly from the CORINAIR database (Jensen / Olsen, 2003) and would need to be distributed in the way described in the "inventory first" methodology described in chapter 5 for the non-combustion SNAP categories.

7. Bridging items Table

7.1 Introduction

Since air emission inventories are the figures for a country to avoid confusion one needs to be able to account for the differences between the national emission inventory data and the Air Emissions Accounts – this is called "bridging" between the two systems and a table has been developed as part of the formats for Eurostat's Air Emissions Accounts (see 0) to help countries account for the adjustments that have been made. This information also helps in making international comparisons because from examining the items included in this table it becomes fairly evident what is included and excluded in a country's reporting.

7.2 Bridging items concept

Emission totals in Air Emissions Accounts for a given country and pollutant are typically not equal to total emissions for the same country and pollutant reported to the main international agreements on air emissions. The observed difference mainly stems from the fact that Air Emissions Accounts, consistently with National Accounts, are based on the resident principle which is the basis for the economic definition of a country, whereas international agreements on air emissions use a geographic or national territory definition of a country (see also section 6.1).

As discussed in previous parts of the manual, converting from a geographically defined system to an economically defined system is one of the fundamental steps of building up Air Emissions Accounts. It mainly requires to remove from basic air emission statistics the air emissions due to non-resident units operating on the national territory and to add the air emissions due to resident units operating in the rest of the world. Typically these necessary adjustments relate to international transport – land, water and air - as well as to tourism and fishing vessels, the relative importance of these activities in the overall adjustment depending on the structure of the countries' economies.

The last section of Eurostat's electronic questionnaire, called 'bridging items', requires compilers to report, for a given country and for each pollutant, the link (or 'bridge') between total emissions in Air Emissions Accounts and total emissions reported by the country to the main international agreements on emissions of air pollutants and greenhouse gases. Making this quantitative bridge available is especially important for users as it helps to understand the causes and the magnitude of existing gap between two official statistics on air emissions.

Table 10 shows the detailed components of the bridging items section for a given pollutant 'x' as it appears in Eurostat's electronic questionnaire.

Table 10: Bridging items for pollutant x

Row	Item
1	**Total NAMEA air emissions (industry + households) of pollutant X**
2	<u>less National residents abroad</u>
2.1	- National fishing vessels operating abroad
2.2	- Land transport
2.3	- Water transport
2.4	- Air transport
3	<u>Plus Non-residents on the territory</u>
3.1	+ Land transport
3.2	+ Water transport
3.3	+ Air transport
4	<u>(+ or -) Other adjustments and statistical discrepancy</u>
5	**= 'Total emissions of pollutant X as reported to UNFCCC/CLRTAP**
6	Year of submission to UNFCCC/CLRTAP

Row 1, the starting point, relates to the 'NAMEA total', i.e. the Air Emissions Accounts total including emissions from production activities as well as households' emissions. By definition, for each pollutant, the total covers the emissions of resident economic units, i.e.:

- included are the emissions caused by resident economic activities operating abroad for international transport activities – by road, water and air – and fishing as well as by resident households' (mainly due to) driving abroad for tourism purposes;

- excluded are the emissions caused by non-resident economic activities operating in the country as well as by non-resident households' emissions (mainly due to) driving in the country for tourism purposes.

Row 5, relates to total air emissions of pollutant 'x' reported to the main international agreements on emissions of air pollutants and greenhouse gases subject to IPCC guidelines – CLRTAP (Convention on Long-Range Transboundary Air Pollution) with reporting to UNECE/EMEP and UNFCCC (United Nations Framework Convention on Climate Change). Row 6 identifies the specific reporting year to which data in row 5 refer to, generally the same year 't' in which the questionnaire is compiled.

The UNFCC/CLRTAP emissions total for pollutant 'x' broadly complies with a national territory definition of a country. According to the IPCC guidelines totals do not include:

- emissions from international sea traffic (associated with SNAP code 080404 for countries using CORINAIR inventories as main input data)

- emissions from international aviation (associated with SNAP codes 080502 and 080504 for countries using CORINAIR inventories as main input data)

Rows 2 to 4 show in detail the items that explain the difference between the Air Emissions Accounts total (row 1) and international agreements' total (row 5); they mostly relate to international transport/tourism emissions and fishing (rows 2 and 3); if additional corrections have been made then can be reported under "other adjustments and statistical discrepancy" (row 4).

As regards rows 2.1 to 2.4, compilers should report all emissions included in the Air Emissions Account total due to residents travelling abroad (both economic activities – international transport, fishing – and households – tourism), to be subtracted in order to derive the international agreements' total as they do not fit into a geographic definition of a country.

As regards rows 3.1 to 3.3, compilers should report all emissions - not included in the Air Emissions Account total - due to non-residents travelling on the territory (both economic activities and households). However, in order to correctly bridge the gap between row 1 and 5, non-residents emissions on the territory should only be reported in rows 3.1 to 3.3 if they are accounted for in the UNFCCC/CLRTAP totals. Since, according to the IPCC guidelines emissions from international air and sea traffic are not part of national totals, rows 3.1 – 3.3 should include:

- emissions from *national* sea traffic due to non-residents operating on the territory.
- emissions from *national* air traffic due to non-residents operating on the territory
- emissions from *national and international* road traffic due to non-residents operating on the territory

Table 11 summarises for each transport mode the differences in coverage between Air Emissions Accounts and IPCC Guidelines providing practical indications on compilers on what should be included in the bridging items rows.

Table 11: Differences in the coverage of air emissions between the IPCC guidelines and Air Emissions Accounts

	Air Emissions Accounts	IPCC	Comment	Implication for bridging item section
Land transport (all emission types)				
- resident units on the territory	yes	yes		Not relevant for bridging items
- non-resident units on the territory	no	yes	IPCC: no reference is made to international transport (lorries) and tourists (private cars) on the territory. All emissions stemming from road transport on the national territory are therefore included, whoever are the cars and lorries' owners.	Row 3.1 - include land transport emissions due to non-residents travelling on the territory (both economic activities and households – tourism)
- resident units abroad	yes	no		Row 2.2 – include NAMEA land transport emissions due to residents travelling abroad (both economic activities – international land transport and households – tourism)
Water transport (all emission types)				
- resident units on the	yes	(yes) partial	Only 'national' journeys (from one national harbour to another national harbour) of resident ship operators. This	Not relevant for bridging items

	Air Emissions Accounts	IPCC	Comment	Implication for bridging item section
territory			may include journeys of considerable length - e.g. between main territory and far overseas territory.	
- non-resident units on the territory	no	(yes) partial	Only 'national' journeys (from one national harbour to another national harbour) of foreign ship operators. This may include journeys of considerable length - e.g. between main territory and far overseas territory.	Row 3.2 – include national sea traffic emissions from shipping vessels operated by non-resident units
- resident units abroad	yes	No	IPCC: vessels engaged in international transport should as far as possible be excluded from national total (but are to be reported separately for information in Memo items), except emissions related to fishing that are to be reported in the category Other sectors (1A4iii).	Row 2.3 - include NAMEA international sea traffic emissions from shipping vessels operated by resident units
Air transport (all emission types)				
- resident units on the territory	yes	(yes) partial	IPCC: national companies' emissions related to national flights only; emissions from fuel used for international flights by resident companies are not included, since emissions related to all international flights are excluded from national total (reported separately).	Not relevant for bridging items
- non-resident units on the territory	no	(yes) partial	IPCC: foreign companies' emissions related to national flights only; emissions from fuel used for international flights by foreign companies are not included, since emissions related to all international flights are excluded from national total (reported separately).	Row 3.3 – include national air traffic emissions from aircrafts operated by non-resident units
- resident units abroad	yes	No	IPCC: emissions stemming from international civil aviation should as far as possible be excluded from national total, but they are to be reported separately for information (Memo Items).	Row 2.4 - include NAMEA international air traffic emissions from aircrafts operated by resident units

Emissions caused by non-economic agents, i.e. nature, are not covered by bridging items since they are excluded both from Air Emissions Accounts' totals and from national totals for the UNFCC/CLRTAP.

Annex 1: Correspondence between SNAP97, CRF/NFR and NACE

Source: EMEP/CORINAIR Emission Inventory Guidebook 2007 (EEA website)

http://reports.eea.europa.eu/EMEPCORINAIR5/en/page002.html

The correspondence table on the following pages presents the allocation of SNAP-based EMEP/CORINAIR emission data to NACE Rev.1.1 divisions and NACE 2.0. (2-digits) for Eurostat's Environmental Accounts.

Legend:

level of complexity:		Flaggs
easy		# one single SNAP process needs to be distributed over several NACE divisions
medium		(#) distribution is eventually required
very complex		

Code	Label	code	label	NACE Rev.1.1 codes	flag	notes	Nace Rev 2.0
1	**COMBUSTION IN ENERGY AND TRANSFORMATION INDUSTRIES**						
01 01	Public Power	1.A.1.a	Public electricity and heat production				
01 01 01	*Combustion plants >= 300 MW (boilers)*	*1.A.1.a*	Public electricity and heat production	40			35
01 01 02	*Combustion plants >= 50 and < 300 MW (boilers)*	*1.A.1.a*	Public electricity and heat production	40			35
01 01 03	*Combustion plants < 50 MW (boilers)*	*1.A.1.a*	Public electricity and heat production	40			35
01 01 04	*Gas turbines*	*1.A.1.a*	Public electricity and heat production	40			35
01 01 05	*Stationary engines*	*1.A.1.a*	Public electricity and heat production	40			35
01 02	District heating plants	1.A.1.a	Public electricity and heat production				
01 02 01	*Combustion plants >= 300 MW (boilers)*	*1.A.1.a*	Public electricity and heat production	40			35
01 02 02	*Combustion plants >= 50 and < 300 MW (boilers)*	*1.A.1.a*	Public electricity and heat production	40			35
01 02 03	*Combustion plants < 50 MW (boilers)*	*1.A.1.a*	Public electricity and heat production	40			35
01 02 04	*Gas turbines*	*1.A.1.a*	Public electricity and heat production	40			35
01 02 05	*Stationary engines*	*1.A.1.a*	Public electricity and heat production	40			35
01 03	Petroleum refining plants	1.A.1.b	Petroleum refining				
01 03 01	*Combustion plants >= 300 MW (boilers)*	*1.A.1.b*	Petroleum refining	23 and/or 40	(#)	Power plants operated by refinery industry (NACE Rev.1.1 code 23) generating electricity may be identified as a secondary activity and hence re-grouped to the industry column with NACE Rev.1.1 code 40 in your ESA supply table. In other words, power plants operated by refinery industry may become independent power plants over time (NACE Rev.1.1 code 40) while the emissions are still recorded under this SNAP category; check with your emissions expert if this is the case and NA experts (alternatively Supply table) where they record electricity produced in refinery industry. Emissions from combustion plants for heating purposes (particularly space and water heating) should be recorded under NACE Rev.1.1 code 23 (ancillary activity).	19 and/or 35
01 03 02	*Combustion plants >= 50 and < 300 MW (boilers)*	*1.A.1.b*	Petroleum refining	23 and/or 40	(#)		19 and/or 35

01 03 03	*Combustion plants < 50 MW (boilers)*	*1.A.1.b*	Petroleum refining	23 and/or 40	(#)		19 and/or 35
01 03 04	*Gas turbines*	*1.A.1.b*	Petroleum refining	23 and/or 40	(#)		19 and/or 35
01 03 05	*Stationary engines*	*1.A.1.b*	Petroleum refining	23 and/or 40	(#)		19 and/or 35
01 03 06	*Process furnaces*	*1.A.1.b*	Petroleum refining	23 and/or 40	(#)		19 and/or 35
01 04	Solid fuel transformation plants	1.A.1.c	Manufacture of solid fuels and other energy industries				
01 04 01	*Combustion plants >= 300 MW (boilers)*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	23 and/or 40	(#)		19 and/or 35
01 04 02	*Combustion plants >= 50 and < 300 MW (boilers)*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	23 and/or 40	(#)		19 and/or 35
01 04 03	*Combustion plants < 50 MW (boilers)*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	23 and/or 40	(#)		19 and/or 35
01 04 04	*Gas turbines*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	23 and/or 40	(#)		19 and/or 35
01 04 05	*Stationary engines*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	23 and/or 40	(#)		19 and/or 35
01 04 06	*Coke oven furnaces*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	27 or 23	(#)	Coke oven furnaces for NACE Rev.1.1 codes are mainly operated by steel industry (NACE Rev.1.1 code 27) but this activity could be outsourced to NACE Rev.1.1 code 23 (check with your National Accounts experts where they record the coke production in steel industry)	24;19
01 04 07	*Other (coal gasification, liquefaction, ...)*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	23 and/or 40	(#)	see above cells 01 03 01 ff.	19 and/or 35
01 05	Coal mining, oil/gas extraction, pipeline compressor						
01 05 01	*Combustion plants >= 300 MW (boilers)*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	10 - 11 and/or 40	(#)	Power plants operated by coal mining and oil extraction industries (NACE Rev.1.1 code 10 and 11) generating electricity may be identified as secondary activity and hence re-grouped to the industry column with NACE Rev.1.1 code 40 in your ESA supply table. In other words, they may become independent power plants over time (NACE Rev.1.1 code 40) while the emissions are still recorded under this SNAP category; check with your emissions expert if this is the case and NA experts (alternatively Supply table) where they record electricity produced in mining industry. Combustion plants for heating purposes (particularly buildings) should be recorded under NACE Rev.1.1 code 10 and 11 according to where they actually take place.	05-06, 08.9 & /or 35
01 05 02	*Combustion plants >= 50 and < 300 MW (boilers)*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	10 - 11 and/or 40	(#)		05-06, 8 & /or 35
01 05 03	*Combustion plants < 50 MW (boilers)*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	10 - 11 and/or 40	(#)		05-06, 8 &

SNAP	Description	NFR	Description	NACE	#	Notes	NACE2
							/or 35
01 05 04	*Gas turbines*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	10 - 11 and/or 40	(#)		05-06, 8 & /or 35
01 05 05	*Stationary engines*	*1.A.1.c*	Manufacture of solid fuels and other energy industries	10 - 11 and/or 40	(#)		05-06, 8 & /or 35
01 05 06	*Pipeline compressors*	*1.A.3.e.i*	Pipeline compressors	60			49
2	**NON-INDUSTRIAL COMBUSTION PLANTS**						
02 01	Commercial and institutional plants	1.A.4.a.i ; 1.A.5.a	Commercial / institutional: stationary				
02 01 01	*Combustion plants >= 300 MW (boilers)*	1.A.4.a.i ; 1.A.5.a	Commercial / institutional: stationary	(10) 50 - 99 and/or 40	#	Check with your emissions expert, what kind of combustions plants are actually recorded under this SNAP codes (e.g. electricity and heat; or only heat) and where (in all industries or only the service industries as suggested by the name of the SNAP code?) Power plants operated by service industries (NACE Rev.1.1 divisions 50 to 99) generating electricity may be identified as secondary activity and hence re-grouped to the industry column with NACE code 40 in your ESA supply table. In other words, they may become independent power plants over time (NACE Rev.1.1 code 40) while the emissions are still recorded under this SNAP category; check with your emissions expert if this is the case and NA experts (alternatively Supply table) where they record electricity produced in service industry. Emissions from combustion plants for heating purposes (particularly space and water heating) are associated with ancillary activities and should be recorded under NACE Rev.1.1 divisions 50 to 99 according to where they a	45-99 and/or 35
02 01 02	*Combustion plants >= 50 and < 300 MW (boilers)*	1.A.4.a.i ; 1.A.5.a	Commercial / institutional: stationary	(10) 50 - 99 and/or 40	#		45-99 and/or 35
02 01 03	*Combustion plants < 50 MW (boilers)*	1.A.4.a.i ; 1.A.5.a	Commercial / institutional: stationary	(10) 50 - 99 and/or 40	#		45-99 and/or 35
02 01 04	*Stationary gas turbines*	1.A.4.a.i ; 1.A.5.a	Commercial / institutional: stationary	(10) 50 - 99 and/or 40	#		45-99 and/or 35
02 01 05	*Stationary engines*	1.A.4.a.i ; 1.A.5.a	Commercial / institutional: stationary	(10) 50 - 99 and/or 40	#		45-99 and/or 35

Code	Description	NFR	Name	Col5	Col6	Notes	Last
02 01 06	*Other stationary equipments (n)*	1.A.4.a.i ; 1.A.5.a	Commercial / institutional: stationary	(10) 50 - 99 and/or 40	#		45-99 and/or 35
02 02	Residential plants	1.A.4.b.i	Residential plants				
02 02 01	*Combustion plants >= 50 MW (boilers)*	*1.A.4.b.i*	Residential plants	H. heating			H.heating
02 02 02	*Combustion plants < 50 MW (boilers)*	*1.A.4.b.i*	Residential plants	H. heating			H.heating
02 02 03	*Gas turbines*	*1.A.4.b.i*	Residential plants	H. heating			H.heating
02 02 04	*Stationary engines*	*1.A.4.b.i*	Residential plants	H. heating			H.heating
02 02 05	*Other equipments (stoves, fireplaces, cooking,...)*	*1.A.4.b.i*	Residential plants	H. others			H.heating
02 03	Plants in agriculture, forestry and aquaculture	1.A.4.c.i	Agriculture / Forestry / Fishing - Stationary				
02 03 01	*Combustion plants >= 50 MW (boilers)*	*1.A.4.c.i*	Agriculture / Forestry / Fishing - Stationary	01 - 05	(#)	Power plants operated by agriculture, forestry, fisheries (NACE Rev.1.1 codes 01, 02, and 05) generating electricity may be identified as secondary activity and hence re-grouped to the industry column with NACE Rev.1.1 code 40 in your ESA supply table. In other words, they may become independent power plants over time (NACE Rev.1.1 division 40) while the emissions are still recorded under this SNAP category; check with your emissions expert if this is the case and NA experts (alternatively Supply table) where they record electricity produced in agriculture, forestry, fisheries. Emissions from combustion plants for heating purposes (particularly space and water heating) are associated with ancillary activities and should be recorded under NACE Rev.1.1 divisions 01, 02 and 03 according to where they actually take place.	01-03
02 03 02	*Combustion plants < 50 MW (boilers)*	*1.A.4.c.i*	Agriculture / Forestry / Fishing - Stationary	01 - 05	(#)		01-03
02 03 03	*Stationary gas turbines*	*1.A.4.c.i*	Agriculture / Forestry / Fishing - Stationary	01 - 05	(#)		01-03
02 03 04	*Stationary engines*	*1.A.4.c.i*	Agriculture / Forestry / Fishing - Stationary	01 - 05	(#)		01-03
02 03 05	*Other stationary equipments (n)*	*1.A.4.c.i*	Agriculture / Forestry / Fishing - Stationary	01 - 05	(#)		01-03
3	**COMBUSTION IN MANUFACTURING INDUSTRY**						
03 01	Comb. in boilers, gas turbines and stationary engines	1.A.2.a - 1.A.2.f					

03 01 01	Combustion plants >= 300 MW (boilers)	1.A.2.a - 1.A.2.f		15 - 22; 24 - 37; 45	#	Power plants generating electricity operated by these industries (NACE Rev.1.1 divisions 15-22; 24-37; 45) may be identified as secondary activities and hence re-grouped to the industry column with NACE Rev.1.1 code 40 in your ESA supply table. In other words, they may become independent power plants over time (NACE Rev.1.1 code 40) while the emissions are still recorded under this SNAP category; check with your emissions expert if this is the case and NA experts (alternatively Supply table) where they record electricity produced in these industries. Emissions from combustion plants for heating purposes (particularly space and water heating) are associated with ancillary activities and should be recorded under these industries (NACE Rev.1.1 divisions 15-22; 24-37; 45) according to where they actually take place. If 4-digit NFR/CRF code is available, this gives some indication on how to distribute: 1.A.2.a = iron & steel (NACE Rev.1.1 codes 27-28) 1.A.2.b = non-ferrous metals (NACE Rev.1.1 codes 27-28) 1.	10-11 12-18, 20-32, 38, 41-43, 58
03 01 02	Combustion plants >= 50 and < 300 MW (boilers)	1.A.2.a - 1.A.2.f		15 - 22; 24 - 37; 45	#		10,-18,, 20-33, 38, 41-43, 58
03 01 03	Combustion plants < 50 MW (boilers)	1.A.2.a - 1.A.2.f		15 - 22; 24 - 37; 45	#		10-18, 20-33, 38, 41-43, 58
03 01 04	Gas turbines	1.A.2.a - 1.A.2.f		15 - 22; 24 - 37; 45	#		10,-18, 20-33, 38, 41-43, 58
03 01 05	Stationary engines	1.A.2.a - 1.A.2.f		15 - 22; 24 - 37; 45	#		10,-18, 20--33, 38, 41-43, 58
03 01 06	Other stationary equipments (n)	1.A.2.a - 1.A.2.f		15 - 22; 24 - 37; 45	#		10,-18, 20,-33, 38, 41-43, 58
03 02	Process furnaces without contact (a)						
03 02 03	Blast furnace cowpers	1.A.2.a	Iron and steel	27			24
03 02 04	Plaster furnaces	1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 02 05	Other furnaces	1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other (Please	26 - 27	#		23;24

					specify in your IIR)			
03 03		Processes with contact						
03 03 01		Sinter and pelletising plants	1.A.2.a	Iron and steel	27			24
03 03 02		Reheating furnaces steel and iron	1.A.2.a	Iron and steel	27			24
03 03 03		Gray iron foundries	1.A.2.a	Iron and steel	27			24
03 03 04		Primary lead production	1.A.2.b	Non-ferrous metals	27			24
03 03 05		Primary zinc production	1.A.2.b	Non-ferrous metals	27			24
03 03 06		Primary copper production	1.A.2.b	Non-ferrous metals	27			24
03 03 07		Secondary lead production	1.A.2.b	Non-ferrous metals	27			24
03 03 08		Secondary zinc production	1.A.2.b	Non-ferrous metals	27			24
03 03 09		Secondary copper production	1.A.2.b	Non-ferrous metals	27			24
03 03 10		Secondary aluminium production	1.A.2.b	Non-ferrous metals	27			24
03 03 11		Cement (f)	1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03 12		Lime (includ. iron and steel and paper pulp industry)(f)	1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	15; 26; 27	#	Note: lime might also be produced in food and steel industry	10-11;23;24
03 03 13		Asphalt concrete plants	1.A.2.f.i - 1.A.2.f.ii	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	23; 45	#		19:41-43
03 03 14		Flat glass (f)	1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03 15		Container glass (f)	1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03 16		Glass wool (except binding) (f)	1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03		Other glass (f)	1.A.2.f.i	Stationary combustion in	26			23

17			manufacturing industries and construction: Other (Please specify in your IIR)				
03 03 18	*Mineral wool (except binding)*	*1.A.2.f.i*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03 19	*Bricks and tiles*	*1.A.2.f.i*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03 20	*Fine ceramic materials*	*1.A.2.f.i*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03 21	*Paper-mill industry (drying processes)*	*1.A.2.f.i*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	21			17
03 03 22	*Alumina production*	*1.A.2.f.i*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	27			24
03 03 23	*Magnesium production (dolomite treatment)*	*1.A.2.f.i*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	27			24
03 03 24	*Nickel production (thermal process)*	*1.A.2.f.i*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	27			24
03 03 25	*Enamel production*	*1.A.2.f.i - 1.A.2.f.ii*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	26			23
03 03 26	*Other*	*1.A.2.f.i - 1.A.2.f.ii*	Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	15 - 22; 24 - 37; 45	#	Note: NACE Rev.1.1 division 23 is already covered in SNAP 0103 and 0104; mining is covered in SNAP 0105 If emission data are available for this SNAP code; then, the national emission experts should know where it comes from?	10, -18, 20, -33, 38, 41-43, 58
4	**PRODUCTION PROCESSES**						
04 01	Processes in petroleum industries	1.B.2.a.iv	Refining / storage				
04 01 01	*Petroleum products processing*	*1.B.2.a.iv*	Refining / storage	23			19
04 01 02	*Fluid catalytic cracking - CO boiler*	*1.B.2.a.iv*	Refining / storage	23			19
04 01 03	*Sulphur recovery plants*	*1.B.2.a.iv*	Refining / storage	23			19

04 01 04	Storage and handling of petroleum produc. in refinery	1.B.2.a.iv	Refining / storage	23			19
04 01 05	Other	1.B.2.a.iv	Refining / storage	23			19
04 02	Processes in iron and steel industries and coaleries						
04 02 01	Coke oven (door leakage and extinction)	1.B.1.b	Solid fuel transformation	23; 27	#	see comment related to SNAP 01 04 06 'coke oven furnaces'	19;24
04 02 02	Blast furnace charging	2.C.1	Iron and steel production	27			24
04 02 03	Pig iron tapping	2.C.1	Iron and steel production	27			24
04 02 04	Solid smokeless fuel	1.B.1.b	Solid fuel transformation	27			24
04 02 05	Open hearth furnace steel plant	2.C.1	Iron and steel production	27			24
04 02 06	Basic oxygen furnace steel plant	2.C.1	Iron and steel production	27			24
04 02 07	Electric furnace steel plant	2.C.1	Iron and steel production	27			24
04 02 08	Rolling mills	2.C.1	Iron and steel production	27			24
04 02 09	Sinter and pelletising plant (except comb. 03.03.01)	2.C.1	Iron and steel production	27			24
04 02 10	Other	2.C.1	Iron and steel production	27			24
04 03	Processes in non-ferrous metal industries						
04 03 01	Aluminium production (electrolysis)	2.C.3	Aluminium production	27			24
04 03 02	Ferro alloys	2.C.2	Ferroalloys production	27			24
04 03 03	Silicium production	2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)	27			24
04 03 04	Magnesium production (except 03.03.23)	2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)	27			24
04 03 05	Nickel production (except 03.03.24)	2.C.5.c	Nickel production	27			24
04 03 06	Allied metal manufacturing	2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)	27			24
04 03 07	Galvanising	2.C.5.e	Other metal production (Please specify the sources	27			24

			included/excluded in the notes column to the right)			
04 03 08	Electroplating	2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)	27		24
04 03 09	Other	2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)	27		24
04 04	Processes in inorganic chemical industries					
04 04 01	Sulphuric acid	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20
04 04 02	Nitric acid	2.B.2	Nitric acid production	24		20
04 04 03	Ammonia	2.B.1	Ammonia production	24		20
04 04 04	Ammonium sulphate	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20
04 04 05	Ammonium nitrate	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20
04 04 06	Ammonium phosphate	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20
04 04 07	NPK fertilisers	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20
04 04 08	Urea	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20
04 04 09	Carbon black	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20
04 04 10	Titanium dioxide	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24		20

04 04 11	Graphite	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 04 12	Calcium carbide production	2.B.4	Carbide production	24			20
04 04 13	Chlorine production	2.B.5	Carbide production	24			20
04 04 14	Phosphate fertilisers	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 04 15	Storage and handling of inorganic chemical prod. (o)	2.B.5.b	Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)	24			20
04 04 16	Other	2.B.5.a-b	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 05	Processes in organic chemical industries (bulk production)						
04 05 01	Ethylene	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 05 02	Propylene	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 05 03	1,2 dichloroethane (except 04.05.05)	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 05 04	Vinylchloride (except 04.05.05)	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 05 05	1,2 dichloroethane + vinylchloride (balanced process)	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20
04 05 06	Polyethylene Low Density	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24			20

04 05 07	Polyethylene High Density	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 08	Polyvinylchloride	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 09	Polypropylene	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 10	Styrene	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 11	Polystyrene	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 12	Styrene butadiene	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 13	Styrene-butadiene latex	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 14	Styrene-butadiene rubber (SBR)	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 15	Acrylonitrile Butadiene Styrene (ABS) resins	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 16	Ethylene oxide	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 17	Formaldehyde	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 18	Ethylbenzene	2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20

04 05 19	*Phtalic anhydride*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 20	*Acrylonitrile*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 21	*Adipic acid*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 22	*Storage and handling of organic chemical products (o)*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 23	*Glyoxylic acid*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 25	*Pesticide production*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 26	*Production of persistent organic compounds*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 05 27	*Other (phytosanitary,...)*	*2.B.5.a*	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	24	20
04 06	Processes in wood, paper pulp, food, drink and other industries				
04 06 01	*Chipboard*	*2.D.1*	Pulp and paper	20	16
04 06 02	*Paper pulp (kraft process)*	*2.D.1*	Pulp and paper	21	17
04 06 03	*Paper pulp (acid sulfite process)*	*2.D.1*	Pulp and paper	21	17
04 06 04	*Paper pulp (Neutral Sulphite Semi-Chemical process)*	*2.D.1*	Pulp and paper	21	17
04 06 05	*Bread*	*2.D.2*	Food and drink	15	10
04 06 06	*Wine*	*2.D.2*	Food and drink	15	111

04 06 07	*Beer*	*2.D.2*	Food and drink	15			11
04 06 08	*Spirits*	*2.D.2*	Food and drink	15			11
04 06 10	*Roof covering with asphalt materials*	*2.A.5*	Asphalt roofing	45		Allocation to NACE Rev.1.1 division 45 is based on the following sentence from the Inventory Guidebook: "The asphalt roofing industry manufactures saturated felt, roofing and siding shingles, and roll…Our interpretation is that these products are produced by the industry that uses them (asphalt roofing industry = NACE Rev.1.1 code 45) rather than by a separate producer.	42
04 06 11	*Road paving with asphalt*	*2.A.6*	Road paving with asphalt	45			43
04 06 12	*Cement (decarbonising)*	*2.A.1*	Cement production	26			23
04 06 13	*Glass (decarbonising)*	*2.A.7.d*	Other mineral products (Please specify the sources included/excluded in the notes column to the right)	26			23
04 06 14	*Lime (decarbonising)*	*2.A.2*	Lime production	15; 26; 27	#	Note: lime might also be produced in food and steel industry; not an elephant, if you have data ok; otherwise only NACE Rev.1.1 division 26	10-11;23-24
04 06 15	*Batteries manufacturing*	*2.A.7.d*	Other mineral products (Please specify the sources included/excluded in the notes column to the right)	31			27
04 06 16	*Extraction of mineral ores*	*2.A.7.a*	Quarrying and mining of minerals other than coal	13 - 14	#		07-08
04 06 17	*Other (including asbestos products manufacturing)*	*2.A.7.d*	Other mineral products (Please specify the sources included/excluded in the notes column to the right)	15 - 45	#	Note: only what is not include elsewhere	10-43
04 06 18	*Limestone and dolomite use*	*2.A.3*	Limestone and dolomite use	26			23
04 06 19	*Soda ash production and use*	*2.A.4*	Soda ash production and use	24		Na$_2$CO$_3$ is produced in NACE Rev.1.1 division 24; main use in: glass industry, chemical industry, steel industry, paper/pulp industry (but also textile, food, water supply, flue gas desulphurisation) Actually, emissions occur during production, i.e. in NACE Rev.1.1 division 24.	20
04 08	Production of halocarbons and sulphur hexafluoride						
04 08 01	*Halogenated hydrocarbons production - By-products*	*n.a.*		24			20
04 08 02	*Halogenated hydrocarbons production - Fugitive*	*n.a.*		24			20
04 08 03	*Halogenated hydrocarbons production - Other*	*n.a.*		24			20
04 08 04	*Sulphur hexafluoride production - By-products*	*n.a.*		24			20

04 08 05	*Sulphur hexafluoride production - Fugitive*	*n.a.*		24			20
04 08 06	*Sulphur hexafluoride production - Other*	*n.a.*		24			20
5	**EXTRACTION AND DISTRIBUTION OF FOSSIL FUELS AND GEOTHERMAL ENERGY**						
05 01	Extraction and first treatment of solid fossil fuels	1.B.1.a	Coal mining and handling				
05 01 01	*Open cast mining*	*1.B.1.a*	Coal mining and handling	10			05 8.92 peat extraction is missing
05 01 02	*Underground mining*	*1.B.1.a*	Coal mining and handling	10			05 8.92 peat extraction is missing
05 01 03	*Storage of solid fuel*	*1.B.1.a*	Coal mining and handling	23-24; 26; 27; 40	#	Plausible assumption: those industries using coal will have to store coal, i.e. will maintain majority of storage facilities. Most likely, coal power plant have by far the biggest storage. Italy splits the emissions among the relevant NACE Rev.1.1 divisions on the basis of their relative use of coal, lignite and peat. Over the period 1990 - 2005 NACE Rev.1.1 division 40 accounts for more than 50% of the uses while NACE Rev.1.1 division 23 is second (around 20%) up to 2003 and is replaced by NACE Ref.1.1 division 27 in the last two years.	19-20, 23-24, 35
05 02	Extraction, first treatment and loading of liquid	1.B.2.a	Other (please specify)				
05 02 01	*Land-based activities*	*1.B.2.a.i*	Exploration production, transport	11			06
05 02 02	*Off-shore activities*	*1.B.2.a.i*	Exploration production, transport	11			06
05 03	Extraction, first treatment and loading of gaseous fossil fuels	1.B.2.b	Natural gas				
05 03 01	*Land-based desulfuration*	*1.B.2.b*	Natural gas	11			06
05 03 02	*Land-based activities (other than desulfuration)*	*1.B.2.b*	Natural gas	11			06
05 03 03	*Off-shore activities*	*1.B.2.b*	Natural gas	11			06
05 04	Liquid fuel distribution (except gasoline distribution)	1.B.2.a.v	Distribution of oil products				
05 04 01	*Marine terminals (tankers, handling and storage)*	*1.B.2.a.iv*	Refining / storage	23			19
05 04 02	*Other handling and storage (including pipeline) (q)*	*1.B.2.a.iv*	Refining / storage	23; 60; 63	#		19;49;52
05 05	Gasoline distribution	1.B.2.a.v	Distribution of oil products				

05 05 01	*Refinery dispatch station*	*1.B.2.a.v*	Distribution of oil products	23		It seems likely that the dispatch activity that gives rise to the emissions is not a separate transport activity but rather an ancillary activity of the refinery company.	19
05 05 02	*Transport and depots (except 05.05.03)*	*1.B.2.a.v*	Distribution of oil products	23		It seems likely that the storage activity that gives rise to the emissions is not a secondary activity but rather an ancillary activity of the refinery company. ITALY: As concerns transport, it could be a separate activity but our data do not allow us to split the emissions, so we introduced a simplifying assumption	19
05 05 03	*Service stations (including refuelling of cars)*	*1.B.2.a.v*	Distribution of oil products	50			47
05 06	Gas distribution network	1.B.2.b	Natural gas				
05 06 01	*Pipelines (q)*	*1.B.2.b*	Natural gas	40			35
05 06 03	*Distribution networks*	*1.B.2.b*	Natural gas	40			35
05 07	Geothermal energy extraction	1.B.2.a.vi	Geothermal energy extraction	40		ITALY: If there were emissions accounted for in the emission inventory, they would be placed under Nace 40. However, our Inventory does not include any emissions under this item as nature and not the process of geothermal energy extraction per se is considered to be the cause of emissions. I do not understand how households' activities can have a role in this process?	35
6	**SOLVENT AND OTHER PRODUCT USE**						
06 01	Paint application						
06 01 01	*Paint application : manufacture of automobiles*	*3.A.2*	Industrial coating application	34			29
06 01 02	*Paint application : car repairing*	*3.A.2*	Industrial coating application	50			45
06 01 03	*Paint application : construction and buildings **(except item 06.01.07)***	*3.A.1*	Decorative coating application	45			41-43
06 01 04	*Paint application : domestic use (except 06.01.07)*	*3.A.1*	Decorative coating application	H. other			H.other
06 01 05	*Paint application : coil coating*	*3.A.2*	Industrial coating application	28			25
06 01 06	*Paint application : boat building*	*3.A.2*	Industrial coating application	35			30
06 01 07	*Paint application : wood*	*3.A.2*	Industrial coating application	20 ; 36	#	NACE Rev.1.1 division 20 is included here as painting is part of the manufacture of wood products as well.	16;31
06 01 08	*Other industrial paint application*	*3.A.2*	Industrial coating application	21-22; 24-27; 29-35	#	This is one example of country-specific links: in principle all industrial sectors not mentioned before could be included but in practice in the Italian case the emissions arise from a limited number of sectors only.	17-18, 20, 22-24, 26-

06 01 09	*Other non-industrial paint application*	*3.A.3*	Other coating application (Please specify the sources included/excluded in the notes column to the right)	--			
06 02	Degreasing, dry cleaning and electronics						
06 02 01	*Metal degreasing*	*3.B.1*	Degreasing	27, 28	#		25
06 02 02	*Dry cleaning*	*3.B.2*	Dry cleaning	93			96
06 02 03	*Electronic components manufacturing*	*3.B.1*	Degreasing	32			26
06 02 04	*Other industrial cleaning*	*3.B.1*	Degreasing	--			
06 03	Chemical products manufacturing or processing	3.C	Chemical products, manufacture and processing				
06 03 01	*Polyester processing*	*3.C*	Chemical products, manufacture and processing	25			22
06 03 02	*Polyvinylchloride processing*	*3.C*	Chemical products, manufacture and processing	25			22
06 03 03	*Polyurethane processing*	*3.C*	Chemical products, manufacture and processing	25			22
06 03 04	*Polystyrene foam processing (c)*	*3.C*	Chemical products, manufacture and processing	25			22
06 03 05	*Rubber processing*	*3.C*	Chemical products, manufacture and processing	25			22
06 03 06	*Pharmaceutical products manufacturing*	*3.C*	Chemical products, manufacture and processing	24			21
06 03 07	*Paints manufacturing*	*3.C*	Chemical products, manufacture and processing	24			20
06 03 08	*Inks manufacturing*	*3.C*	Chemical products, manufacture and processing	24			20
06 03 09	*Glues manufacturing*	*3.C*	Chemical products, manufacture and processing	24			20
06 03 10	*Asphalt blowing*	*3.C*	Chemical products, manufacture and processing	45		for the same reason applying to SNAP process 040610: asphalt production seems to be undertaken by construction industries and we found no evidence in economic data that is recorded under a different nace	42
06 03 11	*Adhesive, magnetic tapes, films and photographs*	*3.C*	Chemical products, manufacture and processing	24			20
06 03 12	*Textile finishing*	*3.C*	Chemical products, manufacture and processing	17			13
06 03 13	*Leather tanning*	*3.C*	Chemical products, manufacture and processing	19			15
06 03	*Other*	*3.C*	Chemical products, manufacture	--			

Code		Activity	IPCC	IPCC description	NACE	#	Comment	NACE2
	14	and processing						
06 04		Other use of solvent and related activities						
06 04 01		*Glass wool induction*	*3.D.3*	Other product use	26			23
06 04 02		*Mineral wool induction*	*3.D.3*	Other product use	26			23
06 04 03		*Printing industry*	*3.D.1*	Printing	22			18,
06 04 04		*Fat, edible and non-edible oil extraction*	*3.D.3*	Other product use	15			10
06 04 05		*Application of glues and adhesives*	*3.D.3*	Other product use	? --		This is a case in which it is advisable to know in detail how the emissions are estimated; hence contact emission experts	
06 04 06		*Preservation of wood*	*3.D.3*	Other product use	20 + 36	#	Similar to SNAP 06 01 07	16;31
06 04 07		*Underseal treatment and conservation of vehicles*	*3.D.3*	Other product use	34; 35 + 50	#	Most likely NACE Rev.1.1 divisions 34 and 35 (both in production) and 50 (repairing)	29;30;45
06 04 08		*Domestic solvent use (other than paint application)(k)*	*3.D.2*	Domestic solvent use including fungicides	H. other			H.other
06 04 09		*Vehicles dewaxing*	*3.D.3*	Other product use	50		case dewaxing is done by NACE Rev.1.1 code 50.2 - maintenance and repair	45
06 04 10		*Pharmaceutical product manufacturing (SNAP 94)*	*3.D.3*	Other product use			not included in SNAP97	
06 04 11		*Domestic use of pharmaceutical products (k)*	*3.D.2*	Domestic solvent use including fungicides	H. other			H.other
06 04 12		*Other (preservation of seeds,...)*	*3.D.3*	Other product use	? --		depends on the actual data source for this process in a specific country	
06 05		Use of HFC, N_2O, NH_3, PFC and SF_6						
06 05 01		*Anaesthesia*	*3.D.3*	Other product use	85			86-87
06 05 02		*Refrigeration and air conditioning equipments using halocarbons (e)*	*2.G*	Other (please specify in a covering note)	? --		potentially all NACE Rev.1.1 divisions, depends on the actual data source for this process in a specific country	
06 05 03		*Refrigeration and air conditioning equipments using other products than halocarbons (e)*	*2.G*	Other (please specify in a covering note)	? --		potentially all NACE Rev.1.1 divisions, depends on the actual data source for this process in a specific country	
06 05 04		*Foam blowing (except 06 03 04)*	*2.F.2*	Consumption of POPs and HMs	? --		potentially all NACE Rev.1.1 divisions, depends on the actual data source for this process in a specific country	
06 05 05		*Fire extinguishers*	*2.F.2*	Consumption of POPs and HMs	? --		potentially all NACE Rev.1.1 divisions, depends on the actual data source for this process in a specific country	

Code	Description	NFR	Road transport	H. transp	#	Notes	H:transp
06 05 06	*Aerosol cans*	*2.G*	Other (please specify in a covering note)	? --		ITALY: in our case it is aerosol use in food products only	
06 05 07	*Electrical equipments (except 060203)*	*2.F.6*	Consumption of POPs and HMs	? --			
06 05 08	*Other*	*2.F.6*	Consumption of POPs and HMs	? --			
7	**ROAD TRANSPORT**						
07 01	Passenger cars (r)	1.A.3.b.i	Road transport, passenger cars	H. transp + 01-99	#		H:transp+01-99
07 01 01	*Motorway driving*	*1.A.3.b.i*	Road transport, passenger cars				
07 01 02	*Rural driving*	*1.A.3.b.i*	Road transport, passenger cars				
07 01 03	*Urban driving*	*1.A.3.b.i*	Road transport, passenger cars				
07 02	Light duty vehicles < 3.5 t (r)	1.A.3.b.ii	Road transport, light duty vehicles	H. transp + 01-99	#		H:transp+01-99
07 02 01	*Motorway driving*	*1.A.3.b.ii*	Road transport, light duty vehicles				
07 02 02	*Rural driving*	*1.A.3.b.ii*	Road transport, light duty vehicles				
07 02 03	*Urban driving*	*1.A.3.b.ii*	Road transport, light duty vehicles				
07 03	Heavy duty vehicles > 3.5 t and buses (r)	1.A.3.b.iii	Road transport, heavy duty vehicles	H. transp + 01-99	#		H:transp+01-99
07 03 01	*Motorway driving*	*1.A.3.b.iii*	Road transport, heavy duty vehicles				
07 03 02	*Rural driving*	*1.A.3.b.iii*	Road transport, heavy duty vehicles				
07 03 03	*Urban driving*	*1.A.3.b.iii*	Road transport, heavy duty vehicles				
07 04	Mopeds and Motorcycles < 50 cm3	1.A.3.b.iv	Road transport, mopeds & motorcycles	H. transp + 01-99	#		H:transp+01-99
07 05	Motorcycles > 50 cm3	1.A.3.b.iv	Road transport, mopeds & motorcycles	H. transp + 01-99	#		H:transp+01-99
07 05 01	*Motorway driving*	*1.A.3.b.iv*	Road transport, mopeds & motorcycles				
07 05 02	*Rural driving*	*1.A.3.b.iv*	Road transport, mopeds & motorcycles				
07 05 03	*Urban driving*	*1.A.3.b.iv*	Road transport, mopeds & motorcycles				
07 06	Gasoline evaporation from vehicles	1.A.3.b.v	Road transport, gasoline evaporation	H. transp + 01-99	#		H:transp+01-99
07 07	Automobile tyre and brake	1.A.3.b.vi	Road transport, automobile tyre	H. transp +	#		H:transp+01-

	wear		and brake wear	01-99			99
07 08	Automobile road abrasion	1.A.3.b.vii	Road transport, automobile road abrasion	H. transp + 01-99	#		H:transp+01-99
8	**OTHER MOBILE SOURCES AND MACHINERY**						
08 01	Military	1.A.5.b	Other, mobile (including military, land based and recreational boats)	75			84
08 02	Railways	1.A.3.c	Railways				
08 02 01	*Shunting locs*	*1.A.3.c*	Railways	60		It may happen, that railway vehicles are operated by other (manufacturing) industries	49
08 02 02	*Rail-cars*	*1.A.3.c*	Railways	60			49
08 02 03	*Locomotives*	*1.A.3.c*	Railways	60			49
08 03	Inland waterways	1.A.3.d.ii	National navigation				
08 03 01	*Sailing boats with auxiliary engines*	*1.A.3.d.ii*	National navigation	61			50
08 03 02	*Motorboats / workboats*	*1.A.3.d.ii*	National navigation	61			50
08 03 03	*Personal watercraft*	*1.A.3.d.ii*	National navigation				
08 03 04	*Inland goods carrying vessels*	*1.A.3.d.ii*	National navigation				
08 04	Maritime activities						
08 04 02	*National sea traffic within EMEP area*	*1.A.3.d.ii*	National navigation	61			50
08 04 03	*National fishing*	*1.A.3.d.ii*	National navigation	05			03
08 04 04	*International sea traffic (international bunkers)(h)*	*1.A.3.d.ii*	National navigation	61			50
08 05	Air traffic						
08 05 01	*Domestic airport traffic (LTO cycles - <1000 m)*	*1.A.3.a.ii.(i) - (ii)*	Civil aviation (domestic, LTO)	62			51
08 05 02	*International airport traffic (LTO cycles - <1000 m)*	*1.A.3.a.i.(i) - (ii)*	International aviation (LTO)	62			51
08 05 03	*Domestic cruise traffic (>1000 m)*	*1.A.3.a.ii.(i) - (ii)*	Civil aviation (domestic, LTO)	62			51
08 05 04	*International cruise traffic (>1000 m)(i)*	*1.A.3.a.i.(i) - (ii)*	International aviation (LTO)	62			51
08 06	Agriculture	1.A.4.c.ii	Agriculture / Forestry / Fishing - Off-road vehicles and other	01			01

				machinery				
08 07	Forestry	1.A.4.c.ii	Agriculture / Forestry / Fishing - Off-road vehicles and other machinery	02				02
08 08	Industry	*1.A.2.a - 1.A.2.f*		10-37 + 45	#	many construction related sources		05-33, 38, 41-43
08 09	Household and gardening	1.A.4.b.ii	Household and gardening (mobile)	H.transport		H. transport. The rationale for putting gardening under households' transport emissions the consistency with economic data - see 'old' compilation guide: "In table 2a, expenditure data should be consistent with the emission data (tables 2b). The definition of transport fuels (item 07.2.2-Fuels and lubricants for personal transport equipment) also includes the fuels used for boats, leisure aircraft, camper vans, lawn mowers and other major tools such as chainsaws, pumps or cutters. Therefore, the category transport (emissions) in table 2b should include all emissions from transport fuels. This introduces a (usually relatively small) inconsistency with the table on transport emissions where only emissions related to transport are to be recorded.		H.transport
08 10	Other off-road	1.A.4.c.ii	Agriculture / Forestry / Fishing - Off-road vehicles and other machinery	? --				
9	**WASTE TREATMENT AND DISPOSAL**							
09 02	Waste incineration							
09 02 01	*Incineration of domestic or municipal wastes*	*6.C.c*	Municipal waste incineration (d)	90, 75	#	mainly NACE Rev.1.1 division 90! It might be that waste treatment activities are operated by municipalities (recorded under NACE Rev.1.1 division 75)		84;38
09 02 02	*Incineration of industrial wastes (except flaring)*	*6.C.b*	Industrial waste incineration (d)	90; 10 - 37	#	The number of large merchant incinerators of hazardous waste, operated by waste disposal contractors (NACE Rev.1.1 code 90) to receive a wide variety of wastes from different sources, is relatively small. Many industries (NACE Rev.1.1 divisions 10 to 37) have smaller hazardous/chemical waste incinerators constructed within their own site and intended for their use only. A large proportion of these handle only single streams of waste. There is little information on emissions from these smaller plants.		05-33;38
09 02 03	*Flaring in oil refinery*	*1.B.2.c*	Venting and flaring	23				19
09 02 04	*Flaring in chemical industries*	*6.C.b*	Industrial waste incineration (d)	24				20
09 02 05	*Incineration of sludge from waste water treatment*	*6.C*		90; 24	#	mainly NACE Rev.1.1 division 90! Maybe, chemical industry (NACE Rev.1.1 code 24 operates its own incineration plants for combusting their own waste water sludge. ITALY: possibly others (in our case data for NACE Rev.1.1 division 62 are limited to a few years only)		38;20
09 02 06	*Flaring in gas and oil extraction*	*1.B.2.c*		11				06
09 02 07	*Incineration of hospital wastes*	*6.C.a*	Clinical waste incineration (d)	90; 85	#	It might be, that hospitals (NACE Rev.1.1 division 85) operate their own incineration plants		38;86-87

09 02 08	*Incineration of waste oil*	*6.C.b*	Industrial waste incineration (d)	90; 26	#	mainly NACE Rev.1.1 division 90! possibly others, e.g. cement industry	38;23
09 04	Solid Waste Disposal on Land						
09 04 01	*Managed Waste Disposal on Land*	*6.A.1*	Solid waste disposal on land	90, 75	#	mainly NACE Rev.1.1 division 90! It might be that waste treatment activities are operated by municipalities (recorded under NACE Rev.1.1 division 75)	38;84
09 04 02	*Unmanaged Waste Disposal Sites*	*6.A.2*	Solid waste disposal on land	90			38
09 04 03	*Other*	*6.A.3*	Solid waste disposal on land	90, 75	#	mainly NACE Rev.1.1 division 90! It might be that waste treatment activities are operated by municipalities (recorded under NACE Rev.1.1 division 75)	38,84
09 07	Open burning of agricultural wastes (except 10.03)	*6.C.b*	Industrial waste incineration (d)	01			01
09 09	Cremation	6.C.d	Cremation				
09 09 01	*Incineration of corpses*	6.C.d	Cremation	93			96
09 09 02	*Incineration of carcasses*	6.C.d	Cremation	93			96
09 10	Other waste treatment						
09 10 01	*Waste water treatment in industry*	*6.B.1*	Waste-water handling	10-45; 90	#	In principle all industrial activities; ITALY: in our case a limited number of them as we know where the data come from	05-43, 38
09 10 02	*Waste water treatment in residential/commercial sect.*	*6.B.2*	Waste-water handling	90			38
09 10 03	*Sludge spreading*	*6.D*	Other waste	90 ; 01	#	ITALY: We also wondered whether Agriculture could be involved but concluded on the basis of information from some enterprises that sludge spreading is likely to be undertaken by the industry generating sludge, i.e. NACE Rev.1.1 division 90	38;01
09 10 05	*Compost production*	*6.D*	Other waste	90 ; 01	#		38, 01
09 10 06	*Biogas production*	*6.D*	Other waste	90 ; 01	#	mainly NACE Rev.1.1 division 90	38, 01
09 10 07	*Latrines*	*6.B.2*	Waste-water handling	90			38
09 10 08	*Other production of fuel (refuse derived fuel,...)*	*6.D*	Other waste	90			38
10	**AGRICULTURE**						
10 01	Cultures with fertilisers						
10 01 01	*Permanent crops*	*4.D.1*	Agriculture Soils - Synthetic N-fertilisers	01			01
10 01 02	*Arable land crops*	*4.D.1*	Agriculture Soils - Synthetic N-fertilisers	01			01

10 01 03	Rice field	4.C	Rice Cultivation -	01		01
10 01 04	Market gardening	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 01 05	Grassland	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 01 06	Fallows	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 02	Cultures without fertilisers					
10 02 01	Permanent crops	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 02 02	Arable land crops	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 02 03	Rice field	4.C	Rice Cultivation -	01		01
10 02 04	Market gardening	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 02 05	Grassland	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 02 06	Fallows	4.D.1	Agriculture Soils - Synthetic N-fertilisers	01		01
10 03	On-field burning of stubble, straw,...					
10 03 01	Cereals	4.F.1	Field burning of agricultural wastes	01		01
10 03 02	Pulse	4.F.2	Field burning of agricultural wastes	01		01
10 03 03	Tuber and Root	4.F.3	Field burning of agricultural wastes	01		01
10 03 04	Sugar Cane	4.F.4	Field burning of agricultural wastes	01		01
10 03 05	Other	4.F.5	Field burning of agricultural wastes	01		01
10 04	Enteric fermentation					
10 04 01	Dairy cows	4.A.1.a	Enteric fermentation - Cattle - Dairy	01		01

10 04 02	Other cattle	4.A.1.b	Enteric fermentation - Cattle - Non-Dairy	01	01
10 04 03	Ovines	4.A.3	Enteric fermentation - Sheep	01	01
10 04 04	Fattening pigs	4.A.8	Enteric fermentation - Swine	01	01
10 04 05	Horses	4.A.6	Enteric fermentation - Horses	01	01
10 04 06	Mules and asses	4.A.7	Enteric fermentation - Mules and Asses	01	01
10 04 07	Goats	4.A.4	Enteric fermentation - Goats	01	01
10 04 08	Laying hens	4.A.9	Enteric fermentation - Poultry	01	01
10 04 09	Broilers	4.A.9	Enteric fermentation - Poultry	01	01
10 04 10	Other poultry (ducks,geese,etc.)	4.A.9	Enteric fermentation - Poultry	01	01
10 04 11	Fur animals	4.A.10	Enteric fermentation - Cattle - Non-Dairy	01	01
10 04 12	Sows	4.A.8	Enteric fermentation - Swine	01	01
10 04 13	Camels	4.A.5	Enteric fermentation - Camels and Llamas	01	01
10 04 14	Buffalo	4.A.2	Enteric fermentation - Buffalo	01	01
10 04 15	Other	4.A.10	Enteric fermentation - Cattle - Non-Dairy	01	01
10 05	Manure management regarding organic compounds				
10 05 01	Dairy cows	4.B.1.a	Manure Management - Dairy cattle	01	01
10 05 02	Other cattle	4.B.1.b	Manure Management - Non-dairy cattle	01	01
10 05 03	Fattening pigs	4.B.8	Manure Management - Swine	01	01
10 05 04	Sows	4.B.8	Manure Management - Swine	01	01
10 05 05	Ovines	4.B.3	Manure Management - Sheep	01	01
10 05 06	Horses	4.B.6	Manure Management - Horses	01	01
10 05 07	Laying hens	4.B.9.a	Manure Management - Laying hens	01	01
10 05 08	Broilers	4.B.9.b	Manure Management - Broilers	01	01
10 05 09	Other poultry (ducks,geese,etc.)	4.B.9.d	Manure Management - Other poultry	01	01

10 05 10	*Fur animals*	*4.B.13*	Manure Management - Other	01		01
10 05 11	*Goats*	*4.B.4*	Manure Management - Goats	01		01
10 05 12	*Mules and asses*	*4.B.7*	Manure Management - Mules and asses	01		01
10 05 13	*Camels*	*4.B.5*	Manure Management -	01		01
10 05 14	*Buffalo*	*4.B.2*	Manure Management - Buffalo	01		01
10 05 15	*Other*	*4.B.13*	Manure Management - Other	01		01
10 06	Use of pesticides and limestone					
10 06 01	*Agriculture*	*4.G*	Agriculture - Other	01		01
10 06 02	*Forestry*	*4.G*	Agriculture - Other	05		02
10 06 03	*Market gardening*	*4.G*	Agriculture - Other	01		01
10 06 04	*Lakes*	*4.G*	Agriculture - Other	01		01
10 09	Manure management regarding nitrogen compounds					
10 09 01	*Dairy cows*	*4.B.1.a*	Manure Management - Dairy cattle	01		01
10 09 02	*Other cattle*	*4.B.1.b*	Manure Management - Non-dairy cattle	01		01
10 09 03	*Fattening pigs*	*4.B.8*	Manure Management - Swine	01		01
10 09 04	*Sows*	*4.B.8*	Manure Management - Swine	01		01
10 09 05	*Sheep*	*4.B.3*	Manure Management - Sheep	01		01
10 09 06	*Horses*	*4.B.6*	Manure Management - Horses	01		01
10 09 07	*Laying hens*	*4.B.9*	Manure Management - Swine	01		01
10 09 08	*Broilers*	*4.B.9*	Manure Management - Swine	01		01
10 09 09	*Other poultry (ducks,geese,etc.)*	*4.B.10*	Manure Management - xxx	01		01
10 09 10	*Fur animals*	*4.B.13*	Manure Management - Other	01		01
10 09 11	*Goats*	*4.B.4*	Manure Management - Goats	01		01
10 09 12	*Mules and asses*	*4.B.7*	Manure Management - Mules and asses	01		01

10 09 13	*Camels*	*4.B.5*	Manure Management -	01		01
10 09 14	*Buffalo*	*4.B.2*	Manure Management - Buffalo	01		01
10 09 15	*Other*	*4.B.13*	Manure Management - Other	01		01
10 10	Fugitive PM sources					
10 10 01	*Particle emissions from animal husbandry*	*n.a.*		01		01

Annex 2: Production activities by industries

Eurostat's Air Emissions Accounts record air emissions generated as unwanted output of the production processes by production activities[53], i.e. by sub-entities of the economic system that are engaged in producing goods and services.

Eurostat's Air Emissions Accounts are linked to ESA Supply Tables which the European Statistical System report annually to Eurostat. In ESA Supply Tables, *industry* is the unit employed to denote and delineate production activities. This unit is also to be applied in Eurostat's Air Emissions Accounts.

For compilers of Air Emissions Accounts it is important to understand how industries are defined and delineated in their national ESA Supply Tables reported to Eurostat.

The ESA Supply Table is a product by industry table with products in the row and industries in the columns. It shows the supply of goods and services by product and type of supplier. Products are classified according to the CPA classification and industries are classified according to the NACE classification. On the 2-digit level CPA and NACE are identical (i.e. distinguishing 60 products and industries respectively). The supply of goods and services recorded in ESA Supply Tables comprises market output, output produced for own use, and other non-market output (SUIOT Manual, p. 72, p. 90, ESA95 paragraphs 3.16ff.).

The columns of the Supply Table present the production programme for each industry.

A producing unit (industry or local KAU; see below) may produce several products. The ESA95 distinguishes three main types of activities (see ESA95, paragraphs 3.10 ff.):

> 1) *principal activities*: the principal activity of a producing unit is the activity whose value added exceeds that of any other activity carried out within the same unit (ESA95 paragraph 3.10).
>
> 2) *secondary activities*: a secondary activity is an activity carried out within a producing unit in addition to the principal activity. The output of the secondary activity is a secondary product (ESA95 paragraph 3.11).
>
> 3) *ancillary activities*: an ancillary activity is not undertaken for its own sake but purely in order to provide supporting services for principal or secondary activities. The output of an ancillary activity is not intended for use outside the enterprise. Typical ancillary activities

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[53] Emissions directly caused by private households' activities are not dealt with in this but in the following section.

that may be carried out are transporting, storing, marketing, various kinds of financial and business services, computing, communications, training, security, maintenance, etc. Ancillary activities are not isolated to form distinct recording entities, i.e. they are recorded together with the associated principal and/or secondary activity (ESA95 paragraphs 3.12 – 3.13).

It follows that outputs produced by principal and secondary activities are recorded. Particular cases included are: (a) the goods and services which one local KAU (see below) provides to a different local KAU belonging to the same institutional unit; (b) the goods which are produced by a local KAU and remain in inventories at the end of the period in which they are produced, whatever their subsequent use. However, goods or services produced and consumed within the same accounting period and within the same local KAU are not separately identified. They are therefore not recorded as part of the output or intermediate consumption of that local KAU. When an institutional unit contains more than one local KAU, the output of the institutional unit is the sum of the outputs of its component local KAUs, including outputs delivered between the component local KAUs (ESA95 paragraphs 3.14 – 3.15).

The supply of primary products deriving from principal activities (including ancillary activities) is recorded on the main diagonal of the ESA95 Supply Table. That is, each industry produces its typical product. Actually, the output of the main product is characterising the industry. The output of secondary products is recorded off the main diagonal.

For example, butter is a primary product of the dairy industry, as well as cream, yoghurt, cheese, and other dairy products. Production of those dairy products constitutes the principal activity in the dairy industry and would be the primary output. The production of non-dairy products (such as e.g. electricity and heat, or restaurant services) would be the secondary output of the dairy industry. Similarly, the production of dairy products in other industries would be their secondary output.

The columns of the Supply Table present the supply of goods and services produced by the respective industry. An industry's column includes the output of primary products and may also include the output of secondary products. For each industry Air Emissions Accounts add the generation of air emissions related to the production programme of that industry as it is recorded in the Supply Table.

For example, assume that the waste management industry[54] – as a secondary activity – produces electricity and heat (e.g. from waste incinerators) and this secondary output is recorded in the waste management industry's column in the Supply Table. Then, the air emissions associated with the secondary activity, i.e. electricity and heat production, also have to be recorded under the waste management industry in the Air Emissions Accounts. Compilers of Air Emissions Accounts should be aware of this.

The share of secondary outputs varies from industry to industry. Some industries may only have primary outputs, while others will have a considerable amount of secondary outputs. Secondary outputs are usually smaller than primary outputs.

The size of secondary output also depends on the way how Supply Tables are compiled at your national statistical institute. The ESA95 and the SUIOT Manual recommend applying the so-called *local KAU* approach leading to rather homogenous industry units producing almost only their primary products (see e.g. SUIOT Manual, p. 19, p. 307; see also following Box).

Box 1:   Use of local kind-of-activity units in ESA Supply Tables

The supply and use tables are based on the use of the local kind-of-activity units (local KAU) as unit of observation. The local KAU is designed to partition institutional units into smaller and more homogeneous units with regard to the kind of production.

In order to analyse flows occurring in the process of production and in the use of goods and services, it is necessary to choose units which emphasise relationships of a technical-economic kind. This requirement means that as a rule institutional units must be partitioned into smaller more homogeneous units with regard to the kind of production. Local kind-of-activity units are intended to meet this requirement as a first but practice-oriented operational approach. (ESA 1995, p. 2.105)

If an institutional unit consists of a principal activity and also one or several secondary activities, it should be subdivided into the same number of KAUs, and secondary activities should be re-classified under different headings from the principal activity. However, "KAUs falling within a particular heading of the classification system can produce products outside the homogeneous group on account of secondary activities connected with them which cannot be separately identified from available accounting documents. Thus a KAU may carry out one or more secondary activities." (ESA 1995, p. 2.107)

These quotations from the ESA make clear that even if local KAUs are designed to describe production processes as homogeneously as possible; in practice it is impossible to observe the data necessary to describe

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[54] Which is part of NACE Rev.2 division 38 " Sewage and refuse disposal, sanitation and similar activities"

each process separately. If observation were perfect, the local KAU would be a perfectly homogeneous unit without secondary production, apart from possible by- and joint products (see below for definitions).

Source: SUIOT manual page 307, section 11.2.3 "Statistical units underlying symmetric input-output tables and supply and use tables"

Local KAUs should be identified on the class level (4-digits) of the NACE Rev.2. That is, institutional units should be partitioned into smaller and homogenous units on a 4-digit level.

In ESA Supply Tables *local KAUs* are regrouped to *industries* at the NACE Rev.2. 2-digit level. That is, all local KAUs engaged in the same, or similar, kind-of-activity are regrouped to the respective industry column in the Supply Table. In the ideal case, local KAUs are partitioned in an almost "pure" way, i.e. all secondary activities are separated and reclassified to the corresponding industry column. Then, also the industries, i.e. groupings of local KAUs, should be rather homogenous. In this ideal case, the monetary Supply Table would almost have no values off the main diagonal.

For compilers of Air Emissions Accounts, it is important to know how "pure", i.e. homogenous, industries have been grouped in their national Supply Tables in order to make the correct assignment of air emissions to industries. A means to do so is having a thorough look at the monetary Supply Table and to contact compilers of supply and use tables in your national statistical institution.

Annex 3: Classification list of economic activities as included in Eurostat's 2012-questionnaire for Air Emissions Accounts

The classification of production activities is based on NACE rev. 2.0.. The latter employs the following aggregation levels and terminologies:

level	terminology	coding
Level 1	21 sections	identified by alphabetical letters A to U
Level 2	88 divisions	identified by two-digit numerical codes (01 to 99)
Level 3	272 groups	identified by three-digit numerical codes (01.1 to 99.0)
Level 4	615 classes	identified by four-digit numerical codes (01.11 to 99.00)

The NACE A*64 breakdown employed in our AEA questionnaire is a slightly reduced A*88 (pure 2-digit breakdown). We have chosen A*64 (instead of A*88) because the ESA Supply and Use Tables have chosen this special breakdown and our goal is to be in line with the ESA Tables.

Activities of private households are classified into three sub-items:
- Transport;
- Heating;
- Others

The following hierarchical classification list of economic activities as employed for Eurostat's Air Emissions Accounts comprises production activities and private household's activities. Based on NACE rev.2.:

Code	Label
A_U 01-99	**Total industries**
A	**Agriculture, forestry and fishing**
A01	Crop and animal production, hunting and related service activities
A02	Forestry and logging
A03	Fishing and aquaculture

Code	Label
B	**Mining and quarrying**
C	**Manufacturing**
C10-C12	*Manufacture of food products, beverages and tobacco products*
C13-C15	*Manufacture of textiles, wearing apparel and leather products*
C16-C18	*Manufacture of wood, paper, printing and reproduction*
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	Manufacture of paper and paper products
C18	Printing and reproduction of recorded media
C19	*Manufacture of coke and refined petroleum products*
C20	*Manufacture of chemicals and chemical products*
C21	*Manufacture of basic pharmaceutical products and pharmaceutical preparations*
C22_C23	*Manufacture of rubber and plastic products and other non-metallic mineral products*
C22	Manufacture of rubber and plastic products
C23	Manufacture of other non-metallic mineral products
C24_C25	*Manufacture of basic metals and fabricated metal products, except machinery and equipment*
C24	Manufacture of basic metals
C25	Manufacture of fabricated metal products, except machinery and equipment
C26	*Manufacture of computer, electronic and optical products*
C27	*Manufacture of electrical equipment*
C28	*Manufacture of machinery and equipment n.e.c.*
C29_C30	*Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment*
C29	Manufacture of motor vehicles, trailers and semi-trailers
C30	Manufacture of other transport equipment
C31-C33	*Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment*

Code	Label
C31_C32	Manufacture of furniture; other manufacturing
C33	Repair and installation of machinery and equipment
D	**Electricity, gas, steam and air conditioning supply**
E	**Water supply; sewerage, waste management and remediation activities**
E36	Water collection, treatment and supply
E37-E39	Sewerage, waste management, remediation activities
F	**Construction**
G	**Wholesale and retail trade; repair of motor vehicles and motorcycles**
G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
G46	Wholesale trade, except of motor vehicles and motorcycles
G47	Retail trade, except of motor vehicles and motorcycles
H	**Transportation and storage**
H49	Land transport and transport via pipelines
H50	Water transport
H51	Air transport
H52	Warehousing and support activities for transportation
H53	Postal and courier activities
I	**Accommodation and food service activities**
J	**Information and communication**
J58-J60	*Publishing, motion picture, video, television programme production; sound recording, programming and broadcasting activities*
J58	Publishing activities
J59_J60	Motion picture, video, television programme production; programming and broadcasting activities
J61	*Telecommunications*
J62_J63	*Computer programming, consultancy, and information service activities*
K	**Financial and insurance activities**
K64	Financial service activities, except insurance and pension funding

Code	Label
K65	Insurance, reinsurance and pension funding, except compulsory social security
K66	Activities auxiliary to financial services and insurance activities
L	**Real estate activities**
L68A	Imputed rents of owner-occupied dwellings
M	**Professional, scientific and technical activities**
M69-M71	***Legal and accounting activities; activities of head offices; management consultancy activities; architectural and engineering activities; technical testing and analysis***
M69_M70	Legal and accounting activities; activities of head offices; management consultancy activities
M71	Architectural and engineering activities; technical testing and analysis
M72	***Scientific research and development***
M73-M75	***Advertising and market research; other professional, scientific and technical activities; veterinary activities***
M73	Advertising and market research
M74_M75	Other professional, scientific and technical activities; veterinary activities
N	**Administrative and support service activities**
N77	Rental and leasing activities
N78	Employment activities
N79	Travel agency, tour operator reservation service and related activities
N80-N82	Security and investigation, service and landscape, office administrative and support activities
O	**Public administration and defence; compulsory social security**
P	**Education**
Q	**Human health and social work activities**
Q86	Human health activities
Q87_Q88	Residential care activities and social work activities without accommodation
R	**Arts, entertainment and recreation**
R90-R92	Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities

Code	Label
R93	Sports activities and amusement and recreation activities
S	**Other service activities**
S94	Activities of membership organisations
S95	Repair of computers and personal and household goods
S96	Other personal service activities
T	**Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use**
U	**Activities of extraterritorial organisations and bodies**

- Transport
- Heating
- Other

Annex 4: Inventory-first: Allocation of transport emissions

For transport and international fishing activities, in order to derive residents' emissions from territory-related emission statistics it is necessary:

- to add residents' emissions abroad, and
- to subtract non-residents' air emissions on the national territory

I

n symbols, for a given country c, the territory-related emission inventory data include the following components:

$$EMI^R(d) + EMI^{NR}(d) + EMI^R(I) + EMI^{NR}(I) \tag{1}$$

where,

EMI:	emissions
R:	resident units;
NR:	non-resident units
d:	domestic journeys;
I:	international journeys leaving from country 'c' (outbound);

By contrast, Air Emissions Accounts will need to record the following transport emissions:

$$EMI^R(d) + EMI^R(I) + EMI^R(A) \tag{2}$$

where,

A: international journeys leaving from abroad (international journeys leaving from abroad with destination country 'c' and international journeys entirely abroad);

In order to derive (2) from (1), $EMI^{NR}(d) + EMI^{NR}(I)$ need to be subtracted and the component $EMI^R(A)$ should be added.

The following section deals with the implications of this general principle for the actual calculation of transport emissions in the context of Air Emissions Accounts.

Calculating transport emissions for resident units from air emission inventories[55]

As highlighted in previous section **Error! Reference source not found.**, in order to ensure consistency with the National Accounts' resident principle, Air Emissions Accounts data should include the emissions of resident units operating abroad for transport activities (driving, shipping or

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[55] This section is also relevant for countries in which the UNFCCC/CLRTAP reporting is the only available data source

flying) and should exclude the emissions of non-resident units operating in the country for the same transport activities.

This same principle also applies to fishing vessels that purchase fuel (bunkering) in countries where they are not resident. The fuel purchases by the non-resident fishing vessels need to be corrected for in the same ways as non-resident ships, aircraft and vehicles.

Within the 'inventory first' approach, transport related emissions from the national emission inventory (classified by SNAP processes or CRF/NFR subcategories) are typically taken as a given and are the starting point for deriving a total consistent with the resident principle (as well as for the assignment to NACE industry codes). A general feature of this approach is that the calculation of resident units' transport-related emissions is likely to occur by estimating a proportion W^R of total air emission statistics for transport processes, EMI, i.e.:

$$\mathrm{EMI}^R\,(\mathrm{d}) + \mathrm{EMI}^R\,(\mathrm{I}) + \mathrm{EMI}^R\,(\mathrm{A}) = W^R * EMI \tag{3}$$

For the calculation of W^R suitable auxiliary data – mainly energy and transport statistics – are used. By contrast, as outlined in chapter 0, in the case of the 'energy use first' approach the adjustment needed in order to be consistent with National Accounts principles is more likely to be implemented at the stage of energy use data in order to directly estimate the emission components to be subtracted/added. In the inventory first approach the option of directly estimating the emissions components to be added or subtracted from the basic data by complementing the original activity data with proper energy use/transport statistics, is an option, particularly for the transport modes in which the emission estimates are obtained by multiplying activity data by emission factors. However for transport modes for which a complex model is required for the emission estimates this direct estimation method is not appropriate (as in the case of road transport emissions).

All examples in this section relate to estimating residents' emissions as a proportion of inventory emissions as in equation (3). When applying this general principle to the actual calculation of Air Emissions Accounts on the basis of emission inventories, the actual adjustment to be made varies depending on the transport mode.

Road transport

This paragraph describes how the emissions of resident units due to road transport activities can be calculated for the purposes of Air Emissions Accounts on the basis of road transport emissions recorded in the air emissions inventories. In the EMEP/EEAEMEP/EEA inventory the emissions due to road transport are included under SNAP category 07 *'Road Transport'*, specifically:

0701 - Passenger cars

0702 - Light duty vehicles <3.5t

0703 - Heavy duty vehicles >3.5t

0704 - Mopeds and motorcycles <50cm^3

0705 - Mopeds and motorcycles >50cm^3

Corresponding CRF/NFR codes are: 1 A 3 b

Road transport emissions relate to the combustion of propellant fuel purchased by users of road transport equipment (lorries, coaches, cars and motorcycles) on the national territory, regardless of the nationality of the user.

Hence, in principle, the EMEP/EEA road transport emissions of a hypothetical country 'c' include emissions of residents as well as non-resident units due to domestic journeys and to international journeys leaving from country 'c' as in equation (1) above:

$$EMI^R(d) + EMI^{NR}(d) + EMI^R(I) + EMI^{NR}(I)$$

For the Air Emissions Accounts purposes, and particularly in order to be consistent with the National Accounts resident principle, the emissions of resident units only, for domestic as well as international journeys regardless of the origin of the trip are needed, i.e.
$EMI^R(d) + EMI^R(I) + EMI^R(A)$ (see equation 2 above).

In order to derive resident road transport emissions from emission inventory data the following steps are needed:

a) the emissions of foreign units driving on the national territory need to be excluded:

$-[\ EMI^{NR}(d)\ +\ EMI^{NR}(I)]$,

b) the emissions caused by national residents operating transport services abroad (mostly lorries and coaches registered) and national residents driving their cars abroad e.g. for tourism, need to be added:[56]

$+\ EMI^R(A)$

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[56] Compilers should also investigate if significant price differences exist/used to exist between their neighbouring countries, as this is likely to result in unbalanced emissions between residents and non-residents driving across the border. If the prices of fuel in foreign neighbouring countries were significantly lower than country 'c', the emissions of resident units on the territory could be related to fuel purchased abroad, when they fill in their tanks abroad just before re-entering in their home country; this component should be added to the inventory estimates when calculating Air Emissions Accounts. By contrast, if the prices of fuel in foreign neighbouring countries are significantly higher than country 'c', non-residents would fill in their tanks in country 'c' just before leaving; this component should be subtracted when calculating Air Emissions Accounts.

Two methodological examples of estimating a) and b) based on auxiliary data, namely energy use and transport statistics, are given below. In general, it is recommended to contact the national emission experts in order to learn which variables are included in the emission estimates and whether they can be used to estimate residents' road transport emissions.[57]

Methodology A. Using energy-use as auxiliary data

If data on the total use of fuel j[58] for road transport on the national territory can be broken down by residents and non-residents, the share of emissions due to non-resident units driving in country 'c' (to be subtracted – see a. above), can be assumed to be equal to the share of non-residents' consumption of energy product j on the national territory for passenger road transport (use_j^{NR}) out of total passenger consumption for the same energy product:

$$EMI_j^{NR}(d) + EMI_j^{NR}(I) = \frac{use_j^{NR}(d) + use_j^{NR}(I)}{\sum_i use_j^i}[EMI_j^R(d) + EMI_j^{NR}(d) + EMI_j^R(I) + EMI_j^{NR}(I)] \tag{4}$$

If fuel purchases for transport purposes abroad of residents of country 'c' are known the corresponding emissions could be estimated by a similar equation.

Methodology B. Using transport statistics as auxiliary data

Transport statistics could be used as well to estimate the components to be added/ subtracted as a proportion of the inventories' emissions. This approach is shown below with the example of statistics on transport of goods.

In order for this method to be applied to road transport emissions, the first step would be to split inventory data on road transport emissions into passenger transport and goods/freight transport. Goods/freight transport emissions can be derived directly from the EMEP/EEA inventory as follows:

- SNAP 97 process 070200 "light duty vehicles < 3.5 t",
- SNAP 97 process 070300 "heavy duty vehicles > 3.5t and buses" only for the part "heavy duty vehicles"[59].

Eurostat statistics on goods/freight transport by road allow to calculate the following equation:

$$TG = G^R(d) + G^{NR}(d) + G^R(I) + G^{NR}(I) \tag{5}$$

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[57] In addition to the amount of fuel use, the actual emissions depend on a number of variables such as the type of vehicle, speed, driving mode (Motorway, rural, urban), all of which are taken into account in the data system and models set up by national air emission experts. Further details on the breakdown of SNAP processes within this category as well as on the methodology for emission estimates are given in subsection 0).

[58] It is likely that the most relevant energy product for the calculation will be gasoline and diesel (j = gasoline and diesel)

[59] The remaining part would be passenger-related transport statistics: SNAP 97 processes 070100 "passenger cars", 070300 "heavy duty vehicles > 3.5t and buses" only for the part "buses", 070400 "mopeds and motorcycles < 50 cm³", 070500 "motorcycles > 50 cm³".

where total goods/freight transport (*TG*) in country 'c' is given by the sum of transport of goods by resident as well as non-resident units due to domestic journeys and to international journeys leaving from country 'c'; the components into which total goods transport is split are the same component that make up the road transport emissions of country 'c' [see equation (1)].

Each component of the emissions can be assumed to be proportional to the corresponding Tkm (tonne kilometres) of goods/freight transport, namely:

$$EMI^R(d) : EMI = G^R(d) : TG \qquad (6)$$

$$EMI^{NR}(d) : EMI = G^{NR}(d) : TG$$

$$EMI^R(I) : EMI = G^R(I) : TG$$

$$EMI^{NR}(I) : EMI = G^{NR}(I) : TG$$

Eurostat statistics on road transport in Tkm also allow to calculate the transport of goods by resident companies outside the country 'c', $G^R(A)$. Hence, the emissions of resident companies for transport of goods outside the territory, $EMI^R(A)$ (to be added to inventory data), are calculated by assuming that they can be related to goods transport by resident companies abroad, $G^R(A)$:

$$EMI^R(A) : EMI = G^R(A) : TG \qquad (7)$$

Table 12**Error! Reference source not found.** shows the list of Eurostat statistics on road transport in Tkm that can be used for equations (5) to (7). The first column lists the individual components of goods transport that appear in equations (5) to (7) and column 2 provides for each component, the name of the corresponding Table of the Eurostat online database that allows each component of column 1 to be quantified; all Tables are available in the Section Transport – Road transport – road freight transport measurement. Column 3 provides a numerical example for Italy.

Table 12: Eurostat statistics on goods/freight transport suitable as auxiliary data for Air Emissions Accounts

Transport statistic	Eurostat database Table	Example: Italy - 2005 Variables selection	Mio Tkm
$G^R(d)$: transport of goods by residents within national territory	National annual road transport by group of goods and type of transport	Reporting country: Italy Group of goods: total Type of transport: total	171 568
$G^{NR}(d)$: transport of goods by non-residents within national territory	Road cabotage transport by country in which cabotage takes place	Partner: Italy	1 098
$G^R(I)$: transport of goods by residents for international journeys leaving from country 'c'	International annual road freight transport – goods loaded in reporting country by type of transport	Reporting country: Italy Type of transport: total Unload: all countries of the world	20 108
$G^{NR}(I)$): transport of goods by non-residents for international journeys leaving from country 'c'	International annual road freight transport by country of loading and unloading and by reporting country	Load: Italy Unload: all countries of the world Reporting country: all excluding Italy	32 792
$G^R(A)$: transport of goods by residents for international journeys leaving from a foreign country and bound to country 'c' (1) or operating entirely abroad (2) and (3)	1. International annual road freight transport – goods unloaded in reporting country by type of transport	Reporting country: Italy Type of transport: total Load: all countries of the world	17 763
	2. Road cabotage by hauliers from each reporting country	Reporting country: Italy	1 098
	3. Quarterly cross-trade road freight transport by type of transport	Reporting country: Italy Type of transport: total Load: all countries of the world Unload: all countries of the world	1 247

Water transport

This section describes how the emissions of resident units due to water transport activities can be calculated for the purposes of Air Emissions Accounts on the basis of water transport emissions recorded in emissions inventories. No reference is made to the extent to which the international component of water transport emissions is reported in the emission inventories, an issue that is dealt with in chapter 0 (Bridging items table).

In the EMEP/EEA inventory the emissions due to water transport are included under SNAP category 08 '*Other mobile sources and machinery*', specifically:

    080402 - National sea traffic
    080403 - National fishing
    080404 - International sea traffic (international bunkers)

Corresponding CRF/NFR codes are: 1.A.3.d.i, 1.A.3.d.ii, 1.A.4.c.iii

As specified in the EMEP/EEA guidelines, data include all shipping activities – at sea, in port or on inland waterways – and they are recorded regardless of the nationality or flag of the carrier.

National Sea Traffic

In national emission inventories national sea traffic emissions for country 'c' refer to the emissions from shipping vessels between ports in the same country, irrespective of flag or nationality. Also included are 'segments' of international journeys, in the following cases:

- shipping vessels that depart from one port in country 'c', stop in another port in the same country and drop and pick up passengers or freight, then depart and leave the national territory, finally arriving in another country;
- shipping vessels that depart from one country other than 'c', stop in one port in country 'c' and drop and/or pick up more passengers or freight, then depart from the national port, finally arriving in a second port in the same country.

Compilers of Air Emissions Accounts should learn from the emission experts regarding the detailed methodology applied to estimate national sea traffic emissions consistently with the EMEP/EEA guidelines. In principle, the EMEP/EEA definition of national sea traffic emissions would include the emissions of resident as well as non-resident shipping vessels for domestic sea traffic, i.e. $EMI^R(d) + EMI^{NR}(d)$. In order to be consistent with the National Accounts' resident principle, only $EMI^R(d)$ should be included. In other words, only emissions from those shipping vessels operated by resident units should be considered

Statistics to look for in order to derive resident emissions are:

a) Fuel use statistics; if data on the total use of fuel j for national sea navigation can be broken down by residents and non-residents, the emissions related to national sea navigation due to resident units can be calculated as a share of total national sea traffic emissions equal to the share of fuel j used by residents out of total fuel used for national sea traffic:

$$EMI_j^R(d) = \frac{use_j^R(d)}{use_j^R(d) + use_j^{NR}(d)}[EMI_j^R(d) + EMI_j^{NR}(d)] \tag{8}$$

In some countries there are differentiated tax rates on maritime fuels so the tax revenues and tax rates can be used to distinguish the resident/non-resident fuel purchases.

b) Transport statistics; if statistics on national water transport include a break down by nationality of the operator, the emissions related to national sea navigation operated by

resident units can be calculated as a share of total national sea traffic emissions equal to (for example) the share of total goods (in tonnes or Tkm) moved by national sea transport:

$$EMI^R(d): [EMI^R(d) + EMI^{NR}(d)] = G_S^R(d) : [G_S^{NR}(d) + G_S^R(d)] \qquad (9)$$

where $G_S^{NR}(d)$ and $G_S^R(d)$ are the weight of goods moved in national sea transport operated by resident units and non-resident units. In order for this method to be applied the consistency between the definition of resident units in the available (fuel or transport) statistics and the National Accounts definition should be checked.

National fishing

In emission inventories national fishing includes the emissions from all fuel supplied to commercial fishing activities in the reporting country. By contrast, for the Air Emissions Accounts purposes, emissions stemming from foreign fishing vessels, which purchase their fuel on national territory, should be excluded and the emissions of national fishing vessels purchasing fuel abroad need to be included. For countries in which international fishing is a significant activity of the resident fleet (Spain, Ireland, UK, Denmark, Norway, Russia, Iceland), it is likely that national fishing emissions need to be complemented by the estimated emissions related to overseas activities of resident units operating fishing vessels abroad. One possible source of auxiliary information to adjust these figures would be the proportion of total catches landed by non-resident/foreign fishing vessels (to be subtracted); a similar ratio could be used to estimate the emissions upwards for resident units operating abroad (to be added).

International navigation

In emission inventories, international navigation emissions cover the emissions caused by the combustion of fuel sold for international sea traffic purposes in the reporting country (so called bunkering); the following cases are included:
- shipping vessels that depart from one country and arrive in another,
- shipping vessels that depart from one country, make a 'technical' stop in the same country without dropping or picking up any passengers or freight, then depart again to arrive in another country;
- shipping vessels that depart from one country, stop in the same country and only pick up more passengers or freight and then finally depart from the national territory arriving in another country;
- shipping vessels that depart from one country with a destination in another country, and make an intermediate stop in the destination country where no passengers or cargo are loaded.

Compilers should learn from their national emission experts, the detailed methodology applied to estimate international sea traffic emissions. In principle, according to EMEP/EEA guidelines, international sea traffic emissions would include the emissions of shipping vessels for international maritime journeys operated by resident units as well as by non-resident units (i.e. all shipping vessels bunkering fuel on the territory for international journeys), i.e. $EMI^R(I) + EMI^{NR}(I)$. In order to be consistent with the National Accounts' resident principle, residents' emissions $EMI^R(I)$ should be singled out

On the other hand, $EMI^R(A)$, i.e. the emissions caused by shipping vessels operated by resident units and bunkering fuel abroad for international journeys, should be added.

Statistics to look for in order to derive non-residents' emissions are:

a) Fuel use statistics: if data on the total use of bunker fuel j for international sea navigation can be broken down by residents and non-residents, the emissions related to international sea navigation operated by resident units (departing from country 'c') can be calculated as a share of total international sea traffic emissions equal to the share of bunker fuel j used by residents out of total bunker fuel used for international sea traffic:

$$EMI_j^R(I) = \frac{use_j^R(I)}{use_j^R(I) + use_j^{NR}(I)} [EMI_j^R(I) + EMI_j^{NR}(I)] \qquad (10)$$

In addition the emissions $EMI^R(A)$, i.e. emissions from shipping vessels operated by resident units bunkering fuel abroad for international sea traffic, could also be calculated on the basis of resident units' fuel bunkering abroad, if available.

b) Transport statistics: if statistics on international water transport include a break down by nationality of the operators, the emissions related to international sea navigation operated by resident units can be calculated as a share of total international sea traffic emissions equal to (for example) the share of goods (in tonnes or Tkm) moved by sea by resident shipping vessels (for outgoing international traffic) out of total goods moved by sea (outgoing international traffic):

$$EMI^R(I): [EMI^R(I) + EMI^{NR}(I)] = G_S^R(I): [G_S^{NR}(I) + G_S^R(I)] \qquad (11)$$

where $G_S^{NR}(I)$ and $G_S^R(I)$ are the weights of goods moved by sea (for international outgoing traffic) by resident operators as well as non-resident operators.

c) Detailed Balance of Payments (BoP) statistics: A third methodology for identifying resident units' activities outside the national territory is based on detailed balance of payments statistics where the bunkering by resident units operating vessels engaged in ocean transport activities should be separately identified as imported intermediate goods. This monetary data

is then used together with estimates of average fuel prices to estimate energy use. Emissions factors are then applied to the fuel use data to obtain emissions estimates.

In order for any of these methods to be applied, the consistency between the definition of resident units in the available (fuel or transport) statistics and the National Accounts definition should be checked.

Air transport

This paragraph describes how the emissions related to resident units' air transport activities can be calculated for the purposes of Air Emissions Accounts on the basis of air transport emissions as recorded in emissions inventories. No reference is made to the extent to which the international component of air transport emissions is reported to the UNFCCC /CLRTAP conventions, an issue that is dealt with in chapter 0 (Bridging items table).

In the EMEP/EEA inventory the emissions due to air transport are included under SNAP category 08 '*Other mobile sources and machinery*', specifically:

- 080501 - Domestic airport traffic (LTO cycles - <1000 m), where LTO is an abbreviation for the landing and take-off stage of the flight, which includes all activities near the airport that take place below the altitude of 1000 m (3000 feet).
- 080502 - International airport traffic (LTO cycles - <1000 m), where cruise is defined as all activities that take place at altitudes above 1000 m (3000 feet), including climb from the end of climb-out in the LTO cycle to cruise altitude, cruise, and descent from cruise altitudes to the start of LTO operations of landing.
- 080503 - Domestic cruise traffic (>1000 m)
- 080504 - International cruise traffic (>1000 m)

As specified in the EMEP/EEA guidebook, data include all use of aeroplanes consisting of scheduled and charter traffic of passengers and freight. This also includes taxiing, helicopter traffic and private aviation. Military aviation is included if it is possible to estimate. Emissions come from use of kerosene and aviation gasoline as fuel for the aircraft. Gasoline is used in small (piston engine) aircraft only.[60]

Domestic Air Traffic

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[60] The EMEP/EEA guidebook also provides examples of aircraft-related emissions which are included under SNAP codes other than 0805: fuelling and fuel handling (SNAP 050402) in general; maintenance of aircraft engines (SNAP 060204); painting of aircraft (SNAP 060108); service vehicles for catering and other services (SNAP 0808); anti-icing and de-icing of aircraft (SNAP 060412).

(SNAP processes 080501 and 080503)

Under the EMEP/EEA guidebook definition all traffic between two airports in one country is considered domestic no matter the nationality of the carrier. In addition, if an aircraft goes from one airport in one country to another in the same country and then leaves to a third airport in another country, the first part of the trip is considered a domestic trip.

In principle the EMEP/EEA definition would cover the emissions from aircrafts operated by resident units as well as by non-resident units for national air traffic, i.e. the following two components: $EMI^R(d) + EMI^{NR}(d)$.

Compilers should check if in fact (particularly for the first years of the emissions time series) domestic flights are run by resident companies only.

If EMEP/EEA domestic air transport emissions can be regarded as being only due to aircrafts operated by resident units they match the component $EMI^R(d)$, and can be included as such in the Air Emissions Accounts; by contrast, if domestic flights can be operated both by resident as well as by non-resident companies, the emissions due to domestic flights operated by resident units only need to be singled out.

Once again, it would be best to bring national territory-oriented emission inventory data to National Accounts residence basis using energy-based estimates. Alternatively, if transport statistics allow a distinction between flights operated by resident enterprises and flights operated by foreign/non-resident enterprises, the share of emissions due to resident units out of total domestic air traffic emissions can be assumed to be equal to the share of domestic flights run by resident companies out of total flights:

$$EMI^R(d): [EMI^R(d) + EMI^{NR}(d)] = F^R(d) : [F^{NR}(d) + F^R(d)] \qquad (12)$$

where $F^R(d)$ and $F^{NR}(d)$ are, respectively, the number of domestic flights run by resident enterprises of country 'c' and non-resident enterprises. In order to be consistent with the National Accounts resident principle it is also relevant to check with National Accounts whether or not foreign enterprises performing domestic flights are regarded as resident units.

International Air Traffic

(SNAP processes 080502 and 080504)

In emission inventories (according to the EMEP/EEA guidebook) air traffic is considered international if it takes place between airports in two different countries. In addition if an aircraft goes from one airport in one country to another in the same country and then leaves to a third airport in another country, the second part of the trip is considered an international trip. Also included are

technical refuelling stops, or domestic trips that only allow passenger or freight to board for an international trip or leave the aircraft after an international trip. EMEP/EEA estimates are based on incoming international flights, regardless the nationality of the airlines. In principle, international air traffic emissions would include the emissions from international flights operated by resident as well as non-resident companies arriving to country 'c', i.e. $EMI^R(A) + EMI^{NR}(A)$.

Similarly to the case of domestic air transport, the share of emissions due to resident enterprises out of total international air traffic emissions can be assumed to be equal to the share of international flights run by resident companies out of total flights:

$$EMI^R(A): [EMI^R(A) + EMI^{NR}(A)] = F^R(A) : [F^{NR}(A) + F^R(A)] \qquad (13)$$

Since the number of outgoing flights equals the number of incoming flights, $EMI^R(I)$, i.e. the amount of emissions due to departing flights run by resident companies (to be added to the emission inventory data), equals $EMI^R(A)$.