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TNO report

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Intercomparison of emission estimates for the Netherlands following the EMEP/EEA Guidebook and the Dutch Emission Registry

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Summary

This study describes a comparison between an emission inventory created using the revised EMEP/EEA Guidebook and the Dutch Emission Registry. The Guidebook inventory has been compiled by combining the revised Guidebook's default methods (Tier 1 and Tier 2) with relevant activity statistics.

For most sources, the inventory created using the Guidebook leads to higher emissions, which can be explained by the relatively high level of abatement in place in the Netherlands. In the power plants and the waste incineration sector, the difference is bigger, due to the additional measures taken by the Netherlands to reduce emissions from these sectors in the past. These sectors therefore require a more detailed methodology to calculate emissions (Tier 2 or Tier 3) to better represent the situation in the Netherlands.

In general, the emissions as reported in the Dutch Emission Registry are better reproduced by the Guidebook inventory for the main pollutants (NO_x, SO_x, NMVOC) than for the less well-known pollutants (heavy metals and persistent organic pollutants). More research is necessary, especially for heavy metals and POPs, to identify all sources and develop better emission estimation methodologies. Missing sources have been identified in both inventories. The biggest eye-catchers are NMVOC emissions from manure management (not in the Dutch Emission Registry) and copper emissions from the use of fire works and from abrasion from trains (not in the Guidebook).

Contents

1 Introduction

All Parties that ratified the LRTAP Convention, are obliged to annually report their emissions to air. Most Parties – including the Netherlands – have set up their own inventory system which uses the best available information to estimate emissions from various sources.

Technical guidance on how to estimate emissions is provided by the EMEP/EEA Guidebook for Parties that did not yet set up their own inventory system. When it is combined with statistical information (activity data), the Guidebook forms a relatively simple way to estimate the countries' total annual emissions.

In order to keep the Guidebook up-to-date with changing reporting requirements and developing technologies, it has recently undergone a major revision. This revision project was carried out by TNO (lead) and AEA Technology and has resulted into a Guidebook which describes methods for present-day emission reporting requirements.

This study aims at comparing the results of the Dutch Emission Inventory system to the emissions as calculated using the revised Guidebook combined with relatively easy-to-find statistics for the year 2005, in order to find important differences and similarities between these two methods. The goal of this research is to explore the quality of the Dutch Emissions Inventory and the Guidebook by exploring the comparability of the methods. The following questions can be formulated:
- Are there any sources in the Dutch Emission Inventory or in the Guidebook that are missing in one of the two inventories?
- Can major differences between the two datasets be explained?
- Is it possible to improve the Dutch Emission Inventory work by using the Guidebook?

We expect that the emissions calculated with the Guidebook will be higher than the emissions in the Dutch Emission Inventory, due to the extended abatement in the Netherlands compared to the European average. Furthermore, we expect that some sources will be missing in the Guidebook or in the Dutch Emission Inventory, because not all sources will be important in every country. For the main air pollutants (NO_x, SO_2, NMVOC, CO and PM), we expect a greater similarity between the two emission values than for the less well-known pollutants such as heavy metals and persistent organic pollutants. We expect this difference, due to the difference in knowledge about these emissions.

This research has been conducted under the TNO knowledge programme Environmental Quality in 2008 and 2009.

The approach followed to make the comparison is described in chapter 2. Chapter 3 shows the results for a number of pollutants, while in chapter 4 the results will be discussed and some conclusions will be drawn.

2 Methodology

2.1 Dutch Emission Registry

The Dutch Emission Registry (hereafter referred to as ER) is a joint effort of PBL (Netherlands Environmental Assessment Agency), CBS (Statistics Netherlands), TNO (Netherlands Institute for Applied Scientific Research), SenterNovem, RWS-WD (Water Service, part of the Directorate-General for Public Works and Water Management) and Alterra. Every institute participates in one or more Task Forces, which calculate the emissions for different sources (industry/energy, transport, agriculture and product use). Emissions to water are calculated by a separate water Task Force. The registration of emissions in the Netherlands started in 1974 with an emission assessment of individual companies. Eventually this has lead to a yearly inventory of the emissions of almost all sources, commissioned by VROM (Dutch Ministry of Housing, Spatial Planning and the Environment).

Nowadays, many pollutants are covered and the figures derived from the ER are used to submit emissions of greenhouse gases under the Kyoto Protocol and the UNFCCC Convention (Netherlands National Inventory Report, Van der Maas et al, 2008) and to submit the emissions of air pollutants under the Convention on Long-Range Transboundary Air Pollution (Netherlands Informative Inventory Report, Jimmink et al, 2008).

This study uses the Dutch inventory for the year 2005 as it has been submitted to UNECE under the LRTAP Convention in February 2008.

2.2 Emission estimation using the Guidebook

The EMEP/EEA Emission Inventory Guidebook (TFEIP, 2008) is a tool for compiling an emission inventory for a country. The first edition of the Guidebook was completed in 1996 and since then it has been revised several times. In 2007/2008, it has been revised by TNO and AEA and has recently been accepted by the UNECE Task Force for Emission Inventories and Projections (TFEIP). In this study, we use the EMEP/EEA Emission Inventory Guidebook which has been revised in 2007/2008 by TNO and AEA Technology.

The Guidebook contains emission estimation methods for all relevant source categories for air pollutants. The Guidebook covers all pollutants that are in the protocols and required for reporting by individual Parties to the LRTAP Convention. These pollutants include:
- The 5 main air pollutants: NO_x, SO_x, NMVOC, CO and NH_3
- Particulate matter: TSP, PM_{10} and $PM_{2.5}$
- Priority heavy metals: Pb, Cd and Hg
- Other heavy metals: As, Cr, Cu, Ni, Se and Zn
- POPs Annex I: Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Hexabromo-biphenyl, Mirex and Toxaphene
- POPs Annex II: HCH, DDT and PCB
- POPs Annex III: PCDD/F, HCB, PAHs: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene individually and the sum of the 4 PAH-indicators

– Other POPs: PCP and SCCP

Greenhouse gases (CO_2, CH_4 and N_2O) are not included in the Guidebook since these pollutants are not required for reporting by individual countries to the LRTAP Convention. Methods for calculating emissions from greenhouse gases are available in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006). This study focuses on the EMEP/EEA Guidebook and will therefore not include emission calculations of greenhouse gases.

The new revised Guidebook is different from its preceding versions in the sense that emission calculations are now organised by NFR category, instead of SNAP activity. Furthermore, the Guidebook now distinguishes 3 levels of emission estimation:

– A Tier 1 method is the simplest way possible to estimate the emission of a certain pollutant in a certain NFR source category. It consists of a single emission factor which should be multiplied by a corresponding activity variable, which depends on the source category.
– A Tier 2 method contains a bit more detail about the activity. In the Tier 2 approach, one or more technologies are identified that each have their own set of emission factors (for each relevant pollutant). Additionally, Tier 2 provides abatement efficiencies for end of pipe abatement technologies where available.
– A Tier 3 method is basically anything beyond the Tier 2 method. It may consist of the use of facility level data (for instance from EPER) or emission modelling.

In this study, only Tier 1 and Tier 2 approaches will be used (relatively simple methods). Then, the emissions calculated using the Guidebook can be expressed as:

$$E_{pollutant,source} = \sum_{technologies} EF_{technology,pollutant} \times AR_{technology,source}$$

where:

$E_{pollutant,source}$	=	emission for a chosen source and pollutant
$EF_{technology,pollutant}$	=	standard emission factor for a chosen technology to perform the activity for the relevant source, and for the relevant pollutant
$AR_{technology,source}$	=	activity rate for the relevant source using the relevant technology

The above equation basically describes the Tier 2 approach, where different technologies to perform a certain activity are identified. The Tier 1 approach can be regarded as a special case of the equation above, where there is only one technology applied. In Tier 1, this technology represents the average or typical technology used to perform the activity.

To calculate emissions using the Guidebook, besides the emission factors also information on activity rates is necessary. Since in many cases it is rather difficult to collect all this information, we have chosen only to apply simple methods for emission estimation (Tier 1 or Tier 2; see Table 2-1).

The activity data have been collected from various sources, such as the IEA Energy Statistics (2007 version), various international production databases (USGS, UNstat, Eurostat PRODCOM, etc.) as well as Netherlands Statistics (CBS). Also, information from national industrial associations and from individual facilities has been used where possible.

Table 2-1 gives a complete overview of the applied Tiers and the activity data used to calculate the emissions for each pollutant, for every individual NFR source category.

Table 2-1 Overview of the Tiers applied and the source for the activity data, for the emissions calculated using the Guidebook.

NFR Code	NFR Name	Meth.	Activity data
1.A.1.a	Public electricity and heat production	Tier 1	IEA Energy Statistics, 2007
1.A.1.b	Petroleum refining	Tier 1	IEA Energy Statistics, 2007
1.A.2.a	Iron and steel	Tier 1	IEA Energy Statistics, 2007
1.A.2.b	Non-ferrous metals	Tier 1	IEA Energy Statistics, 2007
1.A.2.c	Chemicals	Tier 1	IEA Energy Statistics, 2007
1.A.2.d	Pulp, paper and print	Tier 1	IEA Energy Statistics, 2007
1.A.2.e	Food processing, beverages and tobacco	Tier 1	IEA Energy Statistics, 2007
1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other	Tier 1	IEA Energy Statistics, 2007
1.A.3.a.ii.(i)	Civil aviation (domestic, LTO)	Tier 1	IEA Energy Statistics, 2007
1.A.3.a.ii.(ii)	Civil aviation (domestic, cruise)	Tier 1	IEA Energy Statistics, 2007
1.A.3.b.i	Road transport, passenger cars	Tier 1	IEA Energy Statistics, 2007
1.A.3.b.ii	Road transport, light duty vehicles	Tier 1	IEA Energy Statistics, 2007
1.A.3.b.iii	Road transport, heavy duty vehicles	Tier 1	IEA Energy Statistics, 2007
1.A.3.b.iv	Road transport, mopeds & motorcycles	Tier 1	IEA Energy Statistics, 2007
1.A.3.b.v	Road transport, gasoline evaporation	Tier 1	IEA Energy Statistics, 2007
1.A.3.b.vi	Road transport, automobile tyre and brake wear	Tier 1	IEA Energy Statistics, 2007
1.A.3.b.vii	Road transport, automobile road abrasion	Tier 1	IEA Energy Statistics, 2007
1.A.3.c	Railways	Tier 1	IEA Energy Statistics, 2007
1.A.3.d.ii	National navigation	Tier 1	IEA Energy Statistics, 2007
1.A.4.a.i	Commercial / institutional: stationary	Tier 1	IEA Energy Statistics, 2007
1.A.4.b.i	Residential plants	Tier 1	IEA Energy Statistics, 2007
1.A.4.c.i	Stationary	Tier 1	IEA Energy Statistics, 2007
1.A.5.a	Other, stationary	Tier 1	IEA Energy Statistics, 2007
1.B.1.b	Solid fuel transformation	Tier 1	IEA Energy Statistics, 2007
1.B.2.a.i	Exploration production, transport	Tier 1	IEA Energy Statistics, 2007
1.B.2.a.iv	Refining / storage	Tier 1	IEA Energy Statistics, 2007
1.B.2.a.v	Distribution of oil products	Tier 1	IEA Energy Statistics, 2007
1.B.2.b	Natural gas	Tier 1	IEA Energy Statistics, 2007
2.A.1	Cement production	Tier 1	Estimation based on facility data
2.A.4	Soda ash production and use	Tier 1	USGS, 2007
2.A.7.d	Other mineral products	Tier 1	IIASA, 2008

NFR Code	NFR Name	Meth.	Activity data
2.B.1	Ammonia production	Tier 1	Estimation based on facility data
2.B.2	Nitric acid production	Tier 1	Estimation based on facility data
2.B.5.a	Other chemical industry	Tier 2	USGS, 2007, FAOstat, 2008 and estimations based on facility data
2.C.1	Iron and steel production	Tier 2	World Steel association, 2008
2.C.3	Aluminium production	Tier 2	USGS, 2007
2.C.5.b	Lead production	Tier 1	USGS, 2007
2.C.5.d	Zinc production	Tier 1	USGS, 2007
2.C.5.e	Other metal production	Tier 1	USGS, 2007
2.D.1	Pulp and paper	Tier 1	VNP, 2008
2.D.2	Food and drink	Tier 2	Various statistics[1]
3.A.1	Decorative coating application	Tier 2	VVVF, 2004
3.A.2	Industrial coating application	Tier 2	VVVF, 2004
3.A.3	Other coating application	Tier 1	VVVF, 2004
3.B.2	Dry cleaning	Tier 2	Expert judgement
3.D.2	Domestic solvent use including fungicides	Tier 1	Based on population, figures from CBS statline, 2008
4.B.01.a	Dairy cattle	Tier 1	CBS statline, 2008
4.B.01.b	Non-dairy cattle	Tier 1	CBS statline, 2008
4.B.03	Sheep	Tier 1	CBS statline, 2008
4.B.06	Horses	Tier 1	CBS statline, 2008
4.B.08	Swine	Tier 1	CBS statline, 2008
4.B.09.a	Laying hens	Tier 1	CBS statline, 2008
4.B.09.b	Broilers	Tier 1	CBS statline, 2008
4.B.09.c	Turkeys	Tier 1	CBS statline, 2008
4.B.09.d	Other poultry	Tier 1	CBS statline, 2008
4.B.13	Other	Tier 1	CBS statline, 2008
4.D.1	Agricultural soils	Tier 1&2 *	IFA, 2008, CBS statline, 2008, RIVM data. Average temperature from KNMI.
6.A	Solid waste disposal on land	Tier 1	Van der Maas, e.a., 2008
6.B	Waste-water handling	Tier 2	CBS Statline, 2008
6.C.a	Clinical waste incineration (d)	Tier 1	WAR, 2006
6.C.b	Industrial waste incineration (d)	Tier 2	WAR, 2006
6.C.c	Municipal waste incineration (d)	Tier 1	WAR, 2006
6.C.d	Cremation	Tier 1	LVC, 2005
6.D	Other waste	Tier 2	WAR, 2006, CBS Statline, 2008, Stivoro, 2008

* Tier 1 for NMVOC and PM, Tier 2 for NH_3.

1 For beer production data for individual breweries in the Netherlands have been collected. For wine and spirits, production data were not available for the Netherlands. Based on Belgian figures both have been assumed to be 1% of beer in production volume. For the production of bread, the UK Bakers Federation has figures for 2002 available on their website http://www.bakersfederation.org.uk/europe.aspx.

Table 2-1 also provides an overview of the NFR source categories covered by this study. Some NFR source categories are not covered, mainly because of the lack of activity data for these sources. In most cases however, these may be considered as relatively unimportant sources. An overview of the NFR source categories that have not been taken into account in the analysis is provided in Table 2-2.

Table 2-2 Overview of the source categories for which the emissions using the Guidebook have not been calculated, partly due to a lack of activity statistics and partly because several sectors do not exist in the Netherlands.

NFR Code	NFR Name	Reason for exclusion
1.A.1.c	Manufacture of solid fuels and other industries	Considered negligible
1.A.2.f.ii	Mobile combustion in manufacturing industries and construction	Considered negligible compared to stationary counterpart
1.A.3.a.i.(i)	International aviation (LTO)	Not to be included in national total emissions (memo item)
1.A.3.a.i.(ii)	International aviation (cruise)	Not to be included in national total emissions (memo item)
1.A.3.d.i.(i)	International maritime navigation	No energy consumption data in IEA energy statistics; not to be included in national total emissions (memo item)
1.A.3.d.i.(ii)	International inland waterways	No energy consumption data in IEA energy statistics; not to be included in national total emissions (memo item)
1.A.3.e	Pipeline compressors	No emission factors in Guidebook
1.A.4.a.ii	Commercial/institutional: Mobile	Considered negligible compared to stationary counterpart
1.A.4.b.ii	Residential: Household and gardening (mobile)	Considered negligible compared to stationary counterpart
1.A.4.c.ii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	Considered negligible compared to stationary counterpart
1.A.4.c.iii	Agriculture/Forestry/Fishing: National fishing	No energy consumption data in IEA energy statistics
1.A.5.b	Other, Mobile (inclusing military, land based and recreational boats)	Considered negligible compared to stationary counterpart
1.B.1.a	Fugitive emissions from solid fuels: Coal mining and handling	Does not occur in the Netherlands
1.B.1.c	Other fugitive emissions from solid fuels	No emission factors in Guidebook
1.B.2.a.vi	Geothermal energy extraction	Does not occur in the Netherlands
1.B.2.c	Venting and flaring	Insufficient activity data
2.A.2	Lime production	Does not occur in the Netherlands
2.A.3	Limestone and dolomite use	No emission factors in Guidebook

NFR Code	NFR Name	Reason for exclusion
2.A.5	Asphalt roofing	Insufficient activity data
2.A.6	Road paving with asphalt	Insufficient activity data
2.A.7.a	Quarrying and mining of minerals other than coal	Considered negligible
2.A.7.b	Construction and demolition	Insufficient activity data
2.A.7.c	Storage, handling and transport of metal products	Assumed to be taken into account in the specific sectoral chapters
2.B.3	Adipic acid production	Does not occur in the Netherlands
2.B.4	Carbide acid production	Does not occur in the Netherlands
2.B.5.b	Storage, handling and transport of mineral products	Assumed to be taken into account in the specific sectoral chapters
2.C.2	Ferroalloys production	Does not occur in the Netherlands
2.C.5.a	Copper production	Does not occur in the Netherlands
2.C.5.c	Nickel production	Does not occur in the Netherlands
2.C.5.f	Storage, handling and transport of metal products	Assumed to be taken into account in the specific sectoral chapters
2.D.3	Wood processing	Insufficient activity data
2.E	Production of POPs	No emission factors in Guidebook
2.F	Consumption of Heavy Metals and POPs	Insufficient activity data
2.G	Other industrial processes	No emission factors in Guidebook
3.B.1	Degreasing	Insufficient activity data
3.C	Chemical product use	Insufficient activity data
3.D.1	Printing	Insufficient activity data
3.D.3	Other product use	Insufficient activity data
4.B.02	Buffalo	Does not occur in the Netherlands
4.B.04	Goats	Does not occur in the Netherlands
4.B.07	Mules and asses	Does not occur in the Netherlands
4.D.2.a	Farm-level agricultural operations including storage, handling and transport of agricultural products	No emission factors in Guidebook
4.D.2.b	Off-farm storage, handling and transport of bulk agricultural products	No emission factors in Guidebook

NFR Code	NFR Name	Reason for exclusion
4.D.2.c	N-excretion on pasture range and paddock, unspecified	No emission factors in Guidebook
4.F	Field burning of agricultural wastes	Does not occur in the Netherlands
4.G	Agriculture other	Insufficient activity data
6.C.e	Small scale waste burning	Does not occur in the Netherlands
7	Other	No emission factors in Guidebook

2.3 Comparison

In order to compare the emissions calculated using the emission calculation methodologies from the revised Guidebook to the ER figures, the NFR source categories have been aggregated to a higher level. The reason for this is two-fold:

1. The source categories of the Guidebook and the ER do not always match one-to-one. In a number of cases, the ER reports emissions at the level of aggregated NFRs. In these cases, the source categories have been aggregated into source category groups, equal to these aggregated NFRs. This is a straightforward aggregation since the NFR is a hierarchical structure.

2. Since the number of resulting source category groups is rather large, the number of source categories has been reduced further by aggregating NFR source categories into a set of 11 source category groups. Table 2-3 provides an overview of the aggregation that was used.

Source categories marked by * in Table 2-3 are not considered in the inventory created using the Guidebook, but emissions are calculated in the Dutch Emission Registry. The NFR source categories 2.G and 7 are “catch-all” categories, for which the Guidebook does not contain an emission estimation method. The NFR source category 4.G does contain an emission estimation method for emissions from the use of pesticides, but these emissions have not been calculated due to lack of activity data. The emissions have been included since the Dutch Emission Registry reported some emissions in this category, which could have been reported in the other categories within NFR group 4.

Table 2-3 Overview of the aggregated NFR source categories and their relation to the original NFR source category definitions.

NFR Group	NFR Group Name	NFR Code	NFR Name
1.A.1	Energy industries	1.A.1.a	Public electricity and heat production
		1.A.1.b	Petroleum refining
1.A.2	Manufacturing industry & construction	1.A.2.a	Iron and steel
		1.A.2.b	Non-ferrous metals
		1.A.2.c	Chemicals
		1.A.2.d	Pulp, paper and print
		1.A.2.e	Food processing, beverages and tobacco
		1.A.2.f.i	Other stationary combustion in manuf. Industries
1.A.3	Transport non-road	1.A.3.a.ii.(i)	Civil aviation (domestic, LTO)
		1.A.3.a.ii.(ii)	Civil aviation (domestic, cruise)
		1.A.3.c.	Railways
		1.A.3.d.ii	National navigation
1.A.3.b	Transport road	1.A.3.b.i	Road transport, passenger cars
		1.A.3.b.ii	Road transport, light duty vehicles
		1.A.3.b.iii	Road transport, heavy duty vehicles
		1.A.3.b.iv	Road transport, mopeds & motorcycles
		1.A.3.b.v	Road transport, gasoline evaporation
		1.A.3.b.vi	Road transport, automobile tyre and brake wear
		1.A.3.b.vii	Road transport, automobile road abrasion
1.A.4	Small combustion	1.A.4.a.i	Commercial / institutional: stationary
		1.A.4.b.i	Residential: stationary plants
		1.A.4.c.i	Agriculture/Forestry/Fishing: stationary
		1.A.5.a	Other, stationary (including military)
1.B	Fugitives	1.B.1.b	Solid fuel transformation
		1.B.2.a.i	Exploration production, transport
		1.B.2.a.iv	Refining / Storage
		1.B.2.a.v	Distribution of oil products
		1.B.2.b	Natural gas
2	Industrial processes	2.A.1	Cement production
		2.A.4	Soda ash production and use
		2.A.7.d	Other mineral products
		2.B.1	Ammonia production
		2.B.2	Nitric acid production
		2.B.5.a	Other chemical industry
		2.C.1	Iron and steel production
		2.C.3	Aluminium production
		2.C.5.b	Lead production
		2.C.5.d	Zinc production
		2.C.5.e	Other metal production
		2.D.1	Pulp and paper
		2.D.2	Food and drink

NFR Group	NFR Group Name	NFR Code	NFR Name
		2.G	Other industrial processes *
3	Product use	3.A.1	Decorative coating application
		3.A.1	Industrial coating application
		3.A.1	Other coating application
		3.B.2	Dry cleaning
		3.D.2	Domestic solvent use including fungicides
4	Agriculture	4.B.01.a	Dairy cattle
		4.B.01.b	Non-dairy cattle
		4.B.03	Sheep
		4.B.06	Horses
		4.B.08	Swine
		4.B.09.a	Laying hens
		4.B.09.b	Broilers
		4.B.09.c	Turkeys
		4.B.09.d	Other poultry
		4.B.13	Other
		4.D.1	Synthetic N-fertilizers
		4.G	Agriculture other *
6	Waste	6.A	Solid waste disposal on land
		6.B	Waste water handling
		6.C.a	Clinical waste incineration
		6.C.b	Industrial waste incineration
		6.C.c	Municipal waste incineration
		6.C.d	Cremation
		6.D	Other waste
7	Other	7	Other *

* Source category not considered in the Guidebook inventory.

3 Results

This chapter first gives the general overview of all the results, and then focuses on a few interesting cases to highlight and explain the differences between the two datasets where they appear.

3.1 General overview

Table 3-1 provides the complete overview of the emissions in 2005, per pollutant and per aggregated NFR source category, as reported under the LRTAP convention by the Dutch Emission Registry (ER) and as calculated using the Guidebook (GB).

Table 3-1 Overview of emissions in Dutch Emission Registry (ER) and calculated using the Guidebook (GB), per aggregated NFR source category (columns) and pollutant (rows) for the year 2005. A reported value of 0.000 indicates that emissions are reported, but smaller than 0.0005. An empty cell indicates that emissions are not reported or calculated. The last column provides the relative difference, defined as the total ER emissions divided by the total GB emissions.

		Group												
Pollutant(Unit)	Data	1.A.1	1.A.2	1.A.3	1.A.3.b	1.A.4	1.B	2	3	4	6	7	Grand Total	Relative
NOx (Gg NO2)	ER	57.402	47.188	14.699	132.741	41.859	0.038	0.514			0.007	0.063	294.512	69%
	GB	166.125	26.934	17.043	122.212	42.389		38.837			10.641		424.181	
CO (Gg)	ER	11.037	107.811	21.044	277.452	59.374	2.734	50.017			0.010	0.319	529.798	84%
	GB	88.418	22.503	14.215	339.432	73.941		86.539			3.920		628.968	
NMVOC (Gg)	ER	1.203	4.106	3.295	38.156	11.224	18.509	30.924	58.043	0.163	0.777		166.401	43%
	GB	2.599	2.359	0.864	58.789	13.644	50.687	23.390	74.770	155.922	7.518		390.541	
SOx (Gg SO2)	ER	36.928	15.160	0.865	0.652	1.431	7.007	1.118			0.001		63.162	26%
	GB	199.920	9.991	1.976		7.963		16.966			2.464		239.279	
NH3 (Gg)	ER	0.245	0.046	0.002	2.474		0.014	2.330	1.113	121.362	0.273	5.127	132.985	51%
	GB	0.037		0.000	3.381	0.036	0.012	3.847		253.211	0.405		260.928	
TSP (Gg)	ER	2.528	2.395	0.628	8.829	3.530	0.113	12.747	1.166	9.126	0.006	1.325	42.393	63%
	GB	12.432	2.566	0.268	10.712	8.796	0.271	26.511			5.675		67.231	
PM10 (Gg)	ER	2.082	2.367	0.623	8.829	2.046	0.097	8.400	1.166	9.126	0.006	1.325	36.068	74%
	GB	8.993	2.293	0.265	8.606	8.203	0.246	6.769		12.099	1.038		48.514	
PM2.5 (Gg)	ER	1.681	1.310	0.593	6.615	1.824	0.048	3.639	0.389	1.825	0.006	1.325	19.255	62%
	GB	6.124	2.070	0.272	6.850	7.995	0.222	4.625		2.190	0.681		31.028	
As (Mg)	ER	0.152	0.001		0.218	0.018	0.766	0.381					1.536	9%
	GB	2.824	0.092	9.880	0.015	0.114	0.246	3.115			0.123		16.409	
Cd (Mg)	ER	0.075	0.000		0.043	0.062		1.504				0.000	1.684	20%
	GB	0.947	0.190	1.976	0.023	0.339	0.074	1.215			3.489		8.254	
Cr (Mg)	ER	0.346	0.007	0.001	0.276	0.044		1.589					2.263	6%
	GB	3.116	0.741	0.010	0.941	0.974		29.771			1.219		36.772	
Cu (Mg)	ER	0.251	0.098	6.026	63.377	2.846		9.432				0.000	82.030	92%
	GB	4.012	0.485	9.936	70.424	0.651		0.393			3.450		89.353	
Hg (Mg)	ER	0.338	0.003			0.024		0.355			0.093		0.813	4%
	GB	0.625	0.124	9.880		0.162	0.049	1.119			8.060		20.019	
Pb (Mg)	ER	0.174	0.004	2.281	6.363	2.529		27.218				0.084	38.653	36%
	GB	4.493	1.402	0.020	4.495	1.901	2.954	51.901			41.228		108.394	
Ni (Mg)	ER	8.277	0.121	0.004	0.342	1.064		0.938				0.007	10.753	33%
	GB	8.320	9.082	0.016	0.700	11.035	0.739	1.881			0.642		32.415	
Se (Mg)	ER	1.527	0.001		0.015	0.001	0.074	0.795					2.413	36%
	GB	5.687	0.016	0.040	0.066	0.015		0.955					6.780	
Zn (Mg)	ER	0.905	0.012	0.005	39.948	4.858		37.993	7.743			0.009	91.474	66%
	GB	30.374	6.197	0.132	26.357	10.148		39.203			25.690		138.101	
PAH (Mg)	ER	0.998	6.438	4.275	74.716	66.499	0.039	98.236	213.546			0.616	465.363	623%
	GB	0.148	2.197	0.009	0.307	8.277	7.041	56.661			0.068		74.707	
PCDD/F (g I-Teq)	ER	0.646	8.046	0.087	0.664	4.284		4.165	17.500		0.250		35.642	106%
	GB	7.130	3.756			8.870		10.938			2.937		33.631	
PCP (Mg)	ER								20.750				20.750	
	GB													

Note: It must be mentioned here that PAH emissions in the Guidebook and in the Dutch Emission Registry cannot be directly compared one-to-one. The emissions calculated using the Guidebook contain only the 4 indicator PAHs: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene, while the ER reports the sum of 10 indicator-PAHs (“The 10 of VROM”) for this pollutant and not the emissions of the individual indicators. Two of the PAHs in the sum of 10 (naphthalene and phenanthrene) add up to a large part of the total, while the “Guidebook-4” are thought to be more harmful.

Some major discrepancies can be seen in the tables which will be discussed below. Interesting observations that can be made are:

– For energy industries, the emissions calculated using the Guidebook are higher for almost all pollutants. From this observation it could be concluded that measures taken in the Netherlands to reduce emission from power plants have lead to a lower emission. But the difference could also be caused by a difference in calculation method.

– The ER reports quite a number of emissions in the source category “Other” (7). This source category is meant for emissions that cannot be allocated in another source category in the NFR structure, which are likely to be emissions specific for the situation in the Netherlands. There are more of these categories on a deeper level in the NFR structure. In the Guidebook, these so-called “catch-all categories” are mostly empty. In the Dutch Emission Registry the emissions in source Category “Other” (7) are from smoking of cigarettes and cigars, burning of candles and breathing and sweating of humans. Smoking of cigars and cigarettes are included in NFR code 6.D in the Guidebook. The other sources are not included in the Guidebook. Generally however, these emissions are rather insignificant.

– For all but 3 pollutants (PAH, PCDD/F and PCP) the total emissions of the Guidebook are higher than the total emissions in the ER. This observation shows that Dutch emissions are overestimated by the Guidebook or – equivalently – that the Netherlands performs better than average, where the Guidebook is considered to represent the “average situation”.

The following sections will highlight the differences for 5 pollutants: NO_x, CO, NMVOC, Cu and PCDD/F.

To get more feeling for the differences between the two datasets, we have taken into account the 95% confidence intervals from the Guidebook emission factors. The lower and upper limit for the emissions are calculated as being the activity data multiplied by the lower and upper limit for the emission factor, respectively.

3.2 Focus on individual pollutants

3.2.1 Emissions of NO_x

In the situation for NO_x, the estimated emissions calculated using the Guidebook are generally higher than from the ER.

The results are illustrated in figure 3-1. The figure shows that for all sources, except Industrial processes and Waste, the emission estimate from the ER is within the 95% confidence interval of the Guidebook emission. However, it is also shown that this 95% confidence interval is very large, since in most cases a Tier 1 method is applied.

In the Industrial Processes sector, emissions are only calculated for the Guidebook. The ER does not report any NO_x emissions from Industrial Processes separately. Since companies are not obliged to report process- and combustion emissions of NO_x separately, all the industrial NO_x emissions in the Emission Registry are reported in the relevant combustion sector (Manufacturing Industries). This explains the zero emission of NO_x in Industrial Processes and also why the ER value is higher than the GB value for the Manufacturing Industries sector.

When using the Guidebook, the highest emission is estimated for the energy industries, while according to the Dutch emission registry, the highest emission is reported in road transport. Emissions from both road and non-road transport are quite similar for both estimation methods. Emissions in the energy industries however differ largely. The emission estimate from the Dutch Emission Registry is still within the 95% confidence interval of the Guidebook estimate, but the Guidebook's default method estimate is roughly a factor 3 higher than the ER value. This indicates that for the energy industries, a Tier 2 method is needed.

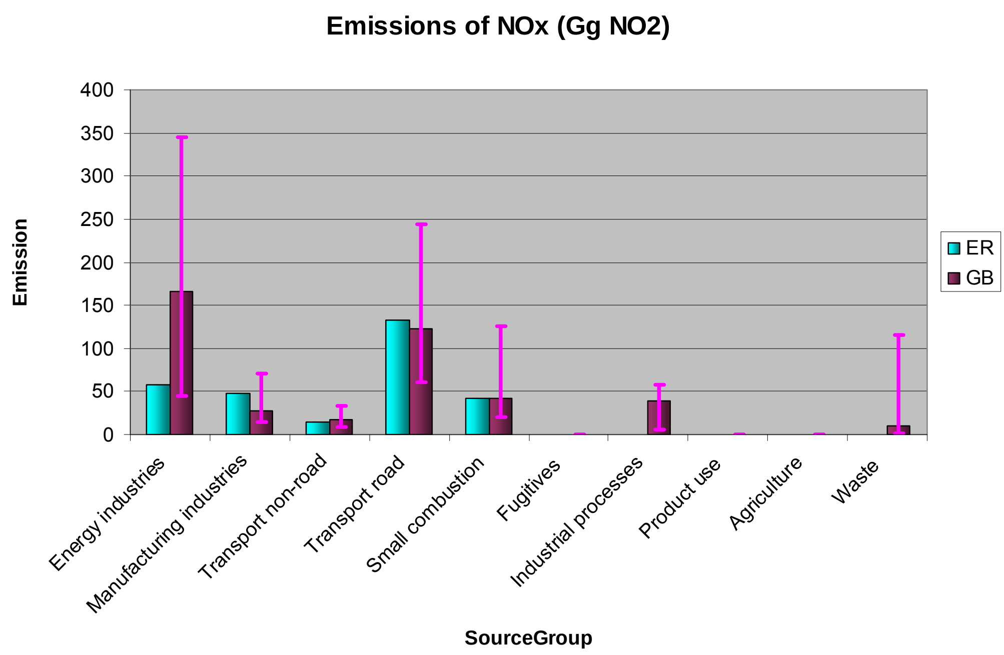

Figure 3-1 Comparison between Dutch Emission Registry (ER) and emissions calculated using the revised EMEP/EEA Guidebook (GB) for emissions of NOx. The magenta bar indicates the 95% confidence interval for the emissions calculated using the Guidebook.

3.2.2 *Emissions of SO_x*

The comparison of SO_x emissions in the Emission Registry and in the Guidebook is displayed in a graph in Figure 3-2. There is a big difference in the Energy industries sector, where the Guidebook emissions exceed the ER by more than a factor 5.

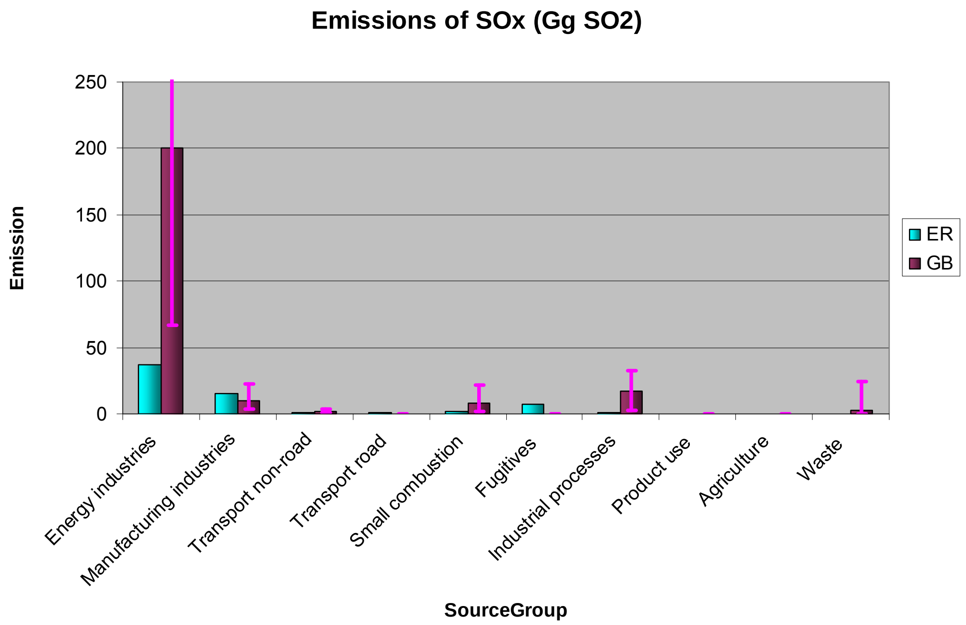

Figure 3-2 Comparison between Dutch Emission Registry (ER) and emissions calculated using the revised EMEP/EEA Guidebook (GB) for emissions of SO_x. The magenta bar indicates the 95% confidence interval for the emissions calculated using the Guidebook.

To look at the Energy industries in more detail, a comparison for each of the NFR source categories individually is displayed in Figure 3-3. This figure clearly shows that the difference in 1.A.1 originates from the difference in source category 1.A.1.a: public electricity and heat production.

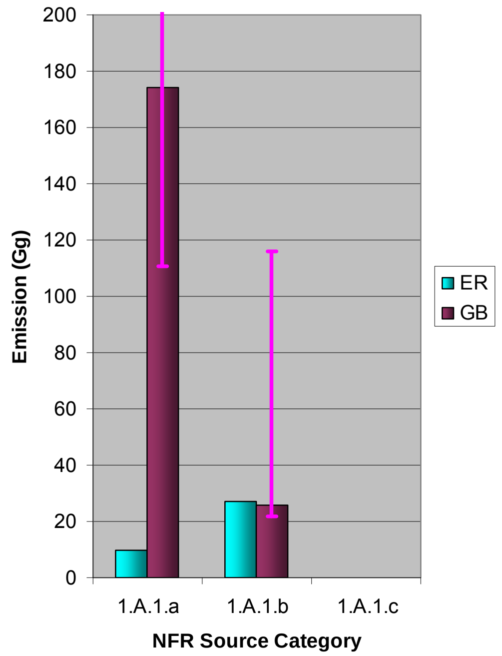

Figure 3-3 SO_x emissions from Energy industries (1.A.1) in the Dutch Emission Registry (ER) and calculated using the revised Guidebook (GB).

The figure shows that the emission calculated using the Guidebook is ~ 20 times as high as the emission reported in the ER. To find the reason for this difference, the actual emissions for several fuels according to both the Guidebook and the ER have been compared. The result is displayed in Table 3-2.

Table 3-2 Underlying data for SO_x emissions from power plants in the Netherlands in 2005.

	Guidebook			***Dutch Emission Registry***
Fuel	**Energy use (TJ)**	**EF (kg/TJ)**	**Emission (kg)**	**EF (kg/TJ)** [1)]
Coal	207 293	820	169 980 193	41.0
Natural gas	483 178	0.28	135 290	0.55
Waste	56 722	10.8	612 598	3.3
Biogas	2 422	10.8	26 158	0.9
Solid biomass	20 238	10.8	218 570	29.0
Gas/Diesel oil	737	460	338 867	42.3
Blast Furnace Gas	22 539	0.28	6 311	16.3
Other liquid fuels	5 145	460	2 366 580	20.0
Total	798 273		173 684 567	

1) Due to confidentiality, no data on the energy use and the separate emissions per fuel type will be published here.

The table shows a difference in emission factor, mainly for coal (factor of 20 difference) and for gas/diesel oil (factor of 10 difference) and other liquid fuels (factor of 20 difference).

Since SO_x emissions from coal burning form the vast majority of the SO_x emissions from power plants, the factor of 20 difference is also reflected in the final emission estimate for SO_x from power plants.

Assuming that the emissions in the ER are correct, the simple approach (Tier 1) for power plants using the Guidebook apparently overestimates emissions for coal fired power plants by roughly a factor of 20. This indicates that the technology as used in the Netherlands is much more advanced and cleaner than the average technology that has been assumed in the Guidebook. The difference in emission factor can also partly be explained by the sulphur content in the fuel. The Guidebook assumes 1% mass sulphur content, while coal used in the Netherlands often has a lower sulphur content.

The Tier 2 emission factors for some of the cleaner technologies in the Guidebook are much closer to the Emission Registry factors. For example the emission factor for SO_x in fluid bed boilers (using hard coal) is reported in the Guidebook to be 43 kg/TJ, which is near the emission factor in the Dutch Emission Registry. This shows that the simple (Tier 1) method in the Guidebook is not suitable for estimating emissions from the energy generation sector in the Netherlands and leads to a large overestimation in emissions.

In figure 3-4, emissions of SO_x from other sources than Energy Industries are shown. These emissions are much lower than the emissions from Energy Industries. Emissions from Manufacturing Industries and from Industrial Processes are showing an allocation problem. If we add up these emissions, it will show a greater similarity between the Guidebook and the Dutch Emission Inventory. Using the Guidebook, no emissions have been calculated for road transport and fugitives. This is caused by the simple (Tier 1) method used, and the lack of SO_x emission factors in the Guidebook for the Tier 1 method.

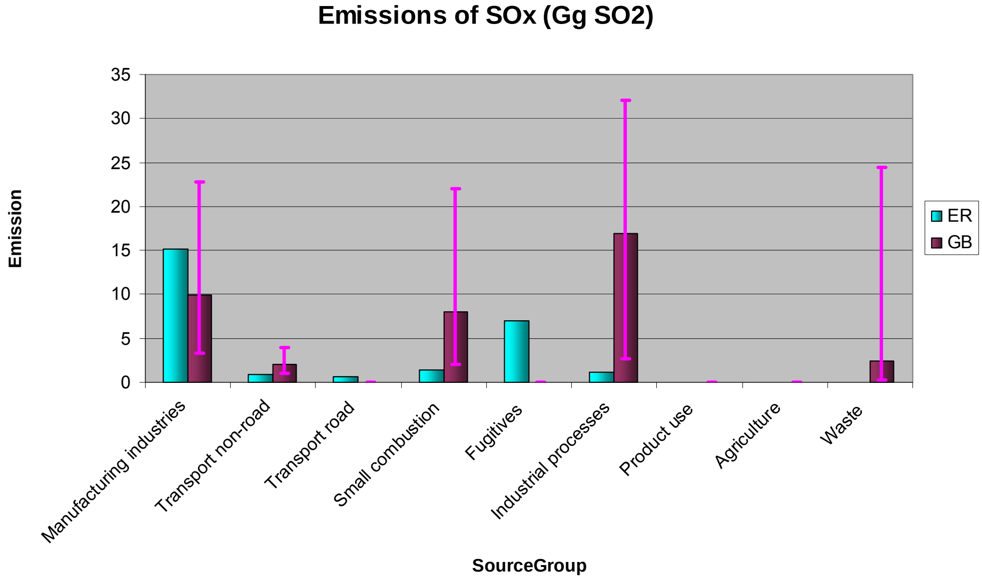

Figure 3-4 Comparison between Dutch Emission Registry (ER) and emissions calculated using the revised EMEP/EEA Guidebook (GB) for emissions of SO_x, without the emissions for Energy Industries. The magenta bar indicates the 95% confidence interval for the emissions calculated using the Guidebook.

3.2.3 *Emissions of NMVOC*

For NMVOC the comparison is displayed in Figure 3-5. The figure shows a good resemblance between the GB emissions and the ER emissions for most sectors. However, there is one major difference which can be seen from the figure: the NMVOC emissions from agriculture.

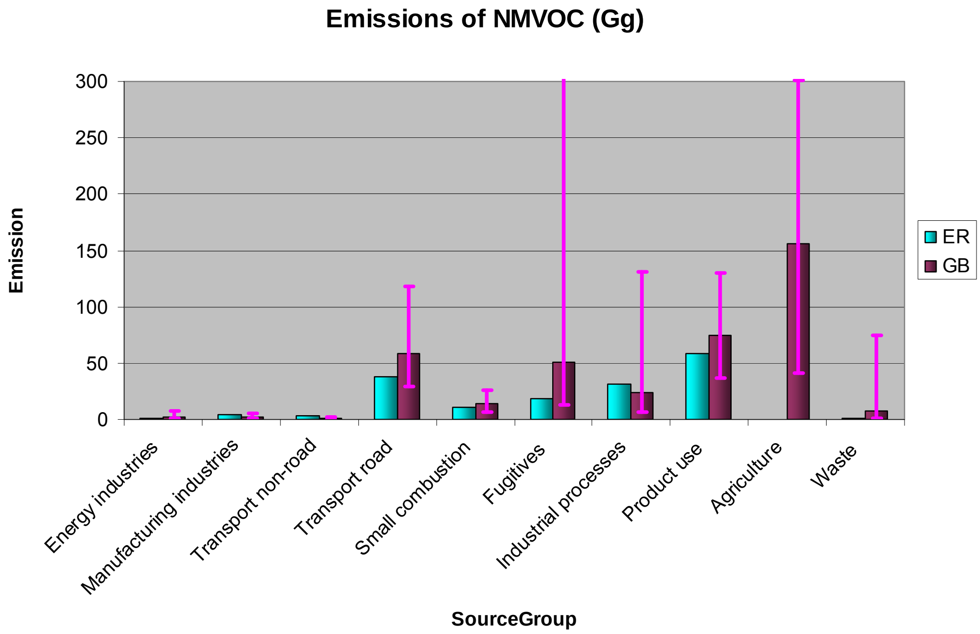

Figure 3-5 Comparison between Dutch Emission Registry (ER) and emissions calculated using the revised EMEP/EEA Guidebook (GB) for emissions of NMVOC. The magenta bar indicates the 95% confidence interval for the emissions calculated using the Guidebook.

Using the simple method from the Guidebook to estimate NMVOC emissions from agriculture, agriculture turns out to be responsible for ~ 40% of all NMVOC emissions. This is very much in contrast with the ER, which does not report any NMVOC emissions from agriculture, except for a very small amount in the category 4.G "Other agriculture", where NMVOC emissions from agricultural crops are reported. The resulting emissions table is displayed with the most available detail in Table 3-3. The table shows a large difference in NMVOC emissions reported by the Dutch Emission Registry and the NMVOC emissions calculated with the Guidebook. The Dutch Emission Registry does not report NMVOC emissions from animals at all, while using the Guidebook approach this sector is responsible for more than 99 % of the NMVOC emissions from agriculture.

Table 3-3 Detailed NMVOC emission data from the Dutch Emission Registry [ER] and calculated using the Guidebook [GB].

NFR	NFR Name	Emission[GB]	Emission[ER]
4.B.01.a	Dairy cattle	19 492 ton	
4.B.01.b	Non-dairy cattle	17 505 ton	
4.B.03	Sheep and goats	331 ton	
4.B.08	Swine	98 480 ton	
4.B.09.a	Laying hens	12 789 ton	
4.B.09.b	Broilers	5 028 ton	
4.B.09.c	Turkeys	1 121 ton	
4.B.09.d	Other poultry	1 175 ton	
4.D	Agricultural soils	0,15 ton	
4.G	Agriculture other		163 ton

Table 3-4 displays the activity statistics and the corresponding emission factors that have been used in the emission calculation procedure. The emission factors are based on a peer-reviewed article about NMVOC emissions from manure management.

Table 3-4 Calculation of NMVOC emissions from manure management using the Guidebook.

NFR	NFR Name	Number of animals	EF [kg/animal/year] for NMVOC	Emission [ton] of NMVOC
4.B.01.a	Dairy cattle	1 433 202	13.6	19 492
4.B.01.b	Non-dairy cattle	2 365 602	7.4	17 505
4.B.03	Sheep and goats	1 654 755	0.2	331
4.B.06	Horses, mules and asses	133 321	-[2]	0
4.B.08	Fattening pigs	5 528 016	3.9	21 559
	Sows	5 783 542	13.3	76 921
4.B.09.a	Laying hens	42 629 710	0.3	12 789
4.B.09.b	Broilers	50 284 466	0.1	5 028
4.B.09.c	Turkeys	1 245 420	0.9	1 121
4.B.09.d	Other poultry	1 305 487	0.9	1 175
Sum				155 922

Table 3-4 shows that all manure management categories contribute to the total NMVOC emissions, where the largest contributions originate from pigs and sows. The explanation of this major discrepancy is not straightforward. The Guidebook emission factors are based on a study by Hobbs et al. (2004) for NMVOC emissions factors from manure management.

[2] No NMVOC emission factor is available in the Guidebook for this sector.

3.2.4 *Emissions of Cu*

Figure 3-6 displays the comparison between the copper emissions from the Dutch Emission Inventory and those calculated using the revised Guidebook.

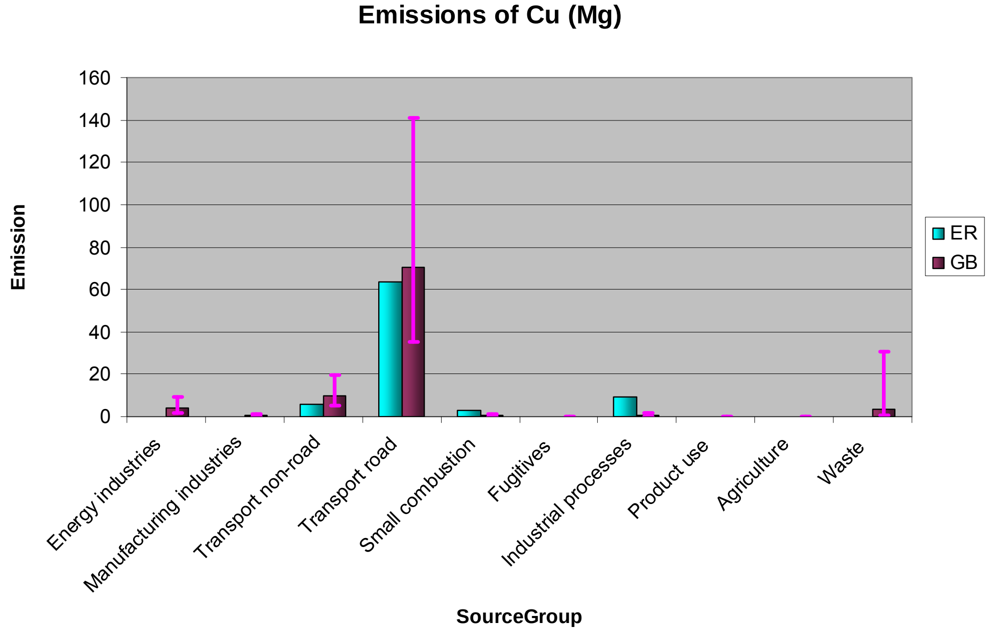

Figure 3-6 Comparison between Dutch Emission Registry (ER) and emissions calculated using the revised EMEP/EEA Guidebook (GB) for copper emissions. The magenta bar indicates the 95% confidence interval for the emissions calculated using the Guidebook.

The figure shows good agreement between the two datasets for the major sources. By far the largest contributor to Cu emissions in the Netherlands is road transport (in particular brake and tyre wear), in both the Dutch emission inventory and the emissions calculated using the Guidebook.

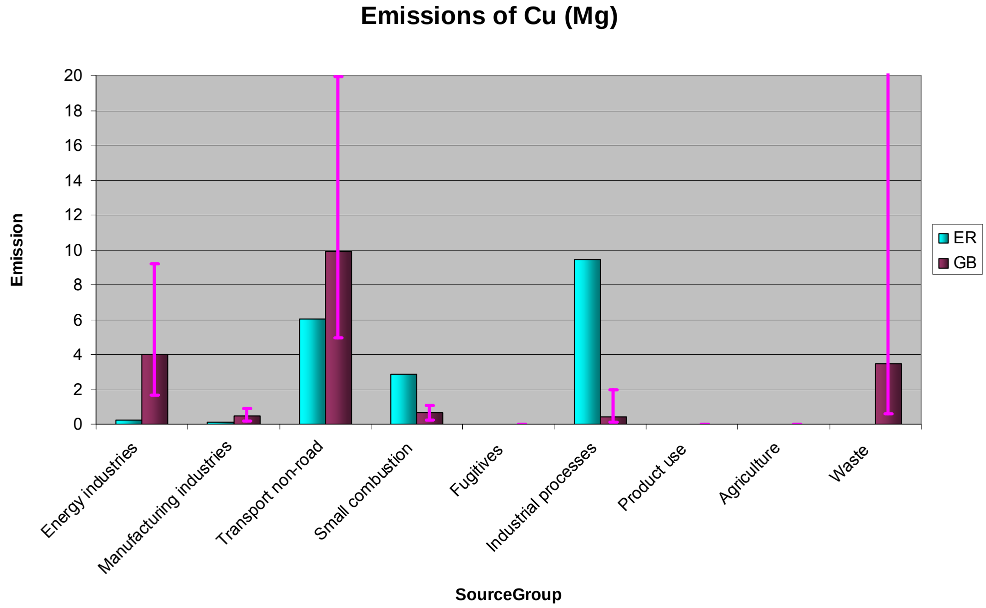

Figure 3-7 Comparison between Dutch Emission Registry (ER) and emissions calculated using the revised EMEP/EEA Guidebook (GB) for copper emissions, without the emissions for Transport Road. The magenta bar indicates the 95% confidence interval for the emissions calculated using the Guidebook.

Figure 3-7 shows the emissions from all sources, excluding road transport. Cu emissions from Energy industries and Waste are higher in the Guidebook inventory, which is likely to be caused by the strict measures taken in the Netherlands (compared to the European average) to reduce hazardous emissions from power plants and waste incineration plants. These additional measures (on top of the average European measures to reduce these emissions) are not accounted for in the Guidebook.

The category “Industrial processes” is also represented in the ER, however the Guidebook emissions are negligible. The sources represented here in the ER is fire works, which is currently not identified as a source of emissions in the Guidebook. Additionally, it seems to be odd that this source is covered by “Industrial processes” while it seems to suit better in the category “Product use”.

For non-road transport, the sources of emissions in the Guidebook and the ER are different. The ER emissions are mainly due to the abrasion of contact wires and pantographs on trains, while Cu emissions in the Guidebook inventory mainly originate from fuel combustion in the marine sector.

The two previously mentioned sources (fire works and the abrasion of contact wires and pantographs on trains) are not covered by the Guidebook, but according to the ER they represent the second and third most important contributors to copper emissions in the Netherlands in 2005. This is not only a problem in the copper inventory, but also for other metals and particulate matter the Guidebook is missing two relevant important sources.

Emissions from small combustion are higher according to the Dutch Emission Registry. This is caused by differences in activity data. According to the Dutch Emission Registry, waste is used in residential burning, which causes the largest copper emissions in this sector. This is not included in the IEA Energy Statistics.

3.2.5 *Emissions of PCDD/F*

The comparison for dioxins and furans (PCDD/F) is displayed in Figure 3-8.

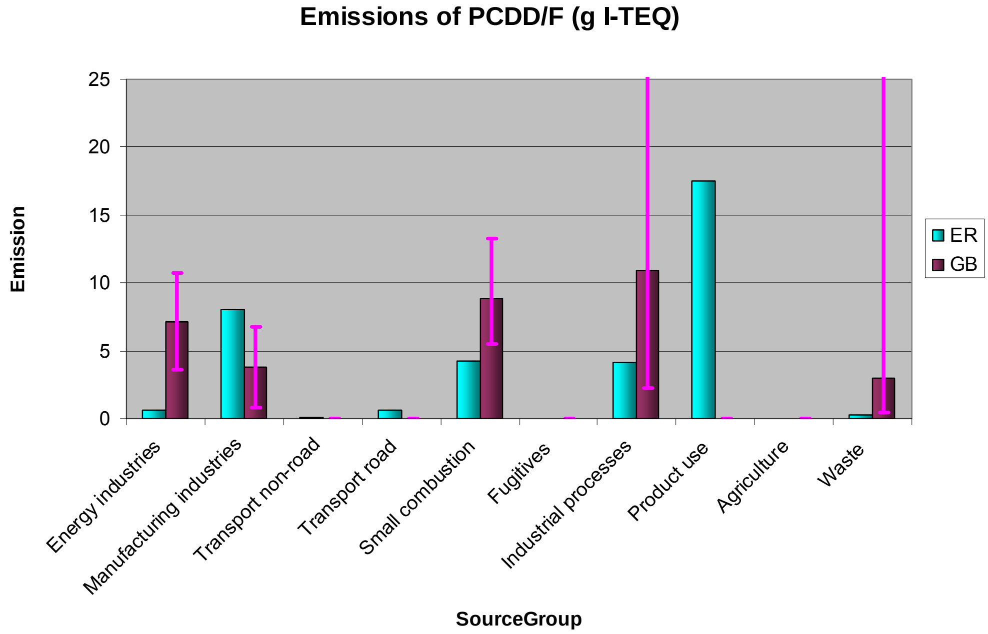

Figure 3-8 Comparison between Dutch Emission Registry (ER) and emissions calculated using the revised EMEP/EEA Guidebook (GB) for PCDD/F emissions. The magenta bar indicates the 95% confidence interval for the emissions calculated using the Guidebook.

The figure displayed here includes the best available reduction measures to reduce PCDD/F emission from waste incineration, as available from the Guidebook. The original calculation, not taking into account any specific reduction measures, resulted in a total emission from waste in the Guidebook of over 36 kg I-TEQ. The additional add-on measures have reduced these by more than a factor 10 000.

The best available abatement measures are thought to represent the situation in the Netherlands well, since the country has put a lot of effort in reducing PCDD/F emissions in the past decade.

The general eye-catchers, as explained in Section 3.1, are also seen in this figure:

– For energy industries, the emission calculated using the Guidebook is much higher than the emission reported in the ER, even when emission factors with maximum abatement are used to estimate the emissions with the Guidebook.

– In Manufacturing Industries, the emission from the ER is higher. However, as for other pollutants this may be explained as being an allocation problem because in the Industrial Processes the Guidebook emissions are higher.

This figure also shows a few interesting specific issues:

- The largest source of emissions in the ER is product use. The emissions from this source are from category 3.D (Other use of solvents) and are related to PCP pressure treated wood, applied in private households. This source is not included in the Guidebook, while in the Netherlands it is considered to be the largest source of dioxin emissions. If this is indeed the case, this source should also be included as a source of emissions in the Guidebook.

- Despite the fact that the best available abatement measures have been applied in the waste sector, emissions calculated using the Guidebook are still well above the reported emissions in the ER. This implicates that the Guidebook reduction efficiencies are not high enough for the situation in the Netherlands, assuming that the ER emissions are correct.

4 Discussion and Conclusions

4.1 Conclusion

This report presents a relatively simple and straightforward way to compare the complex national inventory system of a country – in this case The Netherlands – to the emission estimation methods as they are available in the “international standard” concerning emission estimation methods, the EMEP/EEA Emission Inventory Guidebook.

As explained in the Introduction, this comparison is not primarily meant to identify whether one of the two is right or wrong. It’s main purpose is check whether it is possible to perform this relatively simple comparison and see if the observed differences between the two datasets can be explained, for instance because the simple (averaged) emission estimation method does not always reflect the situation in the Netherlands.

The main conclusions from the comparison are:

- Generally, the emissions calculated using the Guidebook are higher than the emissions from the ER. This is mainly valid for the main pollutants (NO_x, SO_x, NMVOC, NH_3, CO, PM) for which the main sources are relatively well known in both the Guidebook and the Emission Registry in the Netherlands. This difference can be explained by the difference in applied abatement technologies in the Netherlands, compared to the European average. For the less well-known pollutants (such as Heavy Metals and POPs) it is observed that large differences do exist. For instance, the largest source for PCDD/F in the ER is product use, while this source is not present in the Guidebook. Especially for these pollutants, the uncertainties in both the Dutch Emission Registry and the inventory created using the Guidebook are high, which warrants further research. Some caution in using the conclusions from this comparison should therefore be in place.

- The emissions from the industry, represented by sector 1.A.2 Manufacturing Industries (emissions originating from combustion) and 2 Industrial Processes (other emissions), are apparently not divided over these two sectors in the same way. For most pollutants, the emissions from the ER are higher than the Guidebook emissions for the Manufacturing Industry, while for the Industrial Processes it is the other way around. Different monitoring systems use (slightly) different definitions for emission sources and emission categories. This makes it sometimes impossible to compare calculated emissions for a certain sector. This is also the case with emissions in sector 1.A.2 Manufacturing Industries and sector 2 Industrial Processes.

- For almost all pollutants, the Energy Industries sector contains higher emissions when calculated using the Guidebook than reported in the ER. The ratio of the two emissions depends on the pollutant and is between a factor 2 and 8 for the major pollutants, with a factor 33 as peak ratio for Zn. The difference is thought to be related to specific measures taken in the Netherlands to reduce emissions from power plants, while the simple method from the Guidebook assumes an “average” situation.

As described above, a number of ‘new’ sources have been identified: these are sources that contribute largely to total emissions of a specific pollutant in one emission dataset, while they do not or only to a limited extent contribute to total emissions in the other dataset. These ‘new’ sources include:

- NMVOC emissions from manure management in agriculture are currently not reported in the Dutch Emission Registry. The Guidebook emission factors are based on a study by Hobbs et al. (2004) for NMVOC emission factors, leading to a large contribution of this sector to the total NMVOC emissions. In fact, agriculture becomes the most important source for NMVOC emissions, contributing to 40% of the total NMVOC emissions in the Netherlands in 2005 (when calculating using the simple methods from the Guidebook in this study).

- Cu emissions from non-road transport are currently not described in the Guidebook. These are presented in the ER and mainly originate from abrasion of contact wires and pantographs on trains.

- Cu emissions from industrial processes in the ER are mainly related to the use of fire works. Emissions from this source should be allocated to sector 3 Product Use, but in the Dutch Emission Registry, these emissions are allocated to 2 Industrial Processes. In the ER this is a significant source of Cu emissions, while it is not covered at all by the Guidebook (neither in sector 2 Industrial Processes, nor in sector 3 Product Use).

4.2 Discussion

This relatively simple comparison has identified differences between the emission inventory as it currently is reported and how it could be calculated using the Guidebook. This comparison is therefore a useful tool to improve emission inventories and identify areas where improvements and further research are necessary. Also, it provides a sense of uncertainties and indicates for which sectors and pollutants the uncertainties in the inventory are high and it helps to identify missing sources. To make cost-effective reductions of pollutants, all major sources should be known with a relatively low degree of uncertainty.

However, the simple method used in this study to make an emission inventory is not suitable for emission reporting, since it is shown in this study that generic emission factors (often Tier 1) lead in many cases to overestimation of emissions as reported by the Dutch Emission Registry. These simple methods, using average emission factors to estimate emissions, are often less accurate than specific methods used in the countries themselves. However, if the Guidebook methodology would be strictly followed and the methods would have been chosen based on the key category analysis, more Tier 2 or Tier 3 methods would have been used and the actual emissions in the Netherlands would have been better reproduced than using mostly Tier 1 methods, as in this study.

Recommendations from this study:

- Add emissions from contact wires and pantographs on trains and fireworks to the Guidebook.

- Perform a Tier 2 emission inventory for the Energy sector, to verify whether the emissions from the Dutch Emission Registry are similar to the emissions calculated with the Guidebook with the correct technology.

- More research on NMVOC emissions from agriculture, and if this source is really important for the Netherlands, it could be added to the Dutch Emission Registry.

- More research on heavy metals and POPs. The emissions of these pollutants show large differences between the ER emissions and the GB emissions, and it is important to discover why and to investigate whether the Dutch Emission Registry may need improvement for (some of) these pollutants.

5 Glossary

As	Arsenic
CBS	Netherlands Statistics
Cd	Cadmium
CO	Carbon Monoxide
Cr	Chromium
Cu	Copper
DDT	DichloorDifenylTrichloorethaan
EEA	European Environment Agency
EMEP	European Monitoring and Evaluation Program
EPER	European Pollutant Emission Register
ER	Emission Registry (in the Netherlands)
GAINS	Greenhouse gas and Air pollution Interactions and Synergies
GB	Guidebook
HCB	HexaChloroBenzene
HCH	Hexachlorocyclohexane
Hg	Mercury
LRTAP	Long Range Transboundary Air Pollution
LVC	Dutch Organisation for crematoria
NFR	Nomenclature For Reporting
NH3	Ammonia
Ni	Nickel
NIR	National Inventory Report
NMVOC	Non Methane Volatile Organic Compounds
NOx	Nitrogen Oxides
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PCB	PentaChloroBenzene
PCDD/F	PolyChlorinated DibenzoDioxins and –Furans, referred to as dioxins and furans
PCP	PentaChloroPhenol
PM	Particulate Matter
PM_{10}	Particulate Matter with a diameter smaller than 10 µm

$PM_{2.5}$	Particulate Matter with a diameter smaller than 2.5 µm
POP	Persistent Organic Pollutant
PRODCOM	“PRODuction COMmunautaire” (Community Production)
SCCP	Short Chained Chlorinated Paraffin
Se	Selenium
SOx	Sulphur Oxides
TFEIP	Task Force on Emission Inventories and Projections
TSP	Total Suspended Particle
UNECE	United Nations Economic Committee for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UNstat	United Nations Statistics Division
USGS	United States Geological Survey
VROM	Dutch Ministry for Housing, Spatial Planning and Environment
Zn	Zinc

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