



Ricardo
Energy & Environment

Industrial emissions policy country profile – The Netherlands

Report for European Commission
070201/2016/741491/SFRA/ENV.C.4



Part of Ramboll Environ

ED 62698 | Issue Number 2 | Date 09/02/2018

Customer:**European Commission – DG Environment****Customer reference:**

070201/2016/741491/SFRA/ENV.C.4

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09 February 2018

Ricardo Energy & Environment reference:

Ref: ED62698- Issue Number 2

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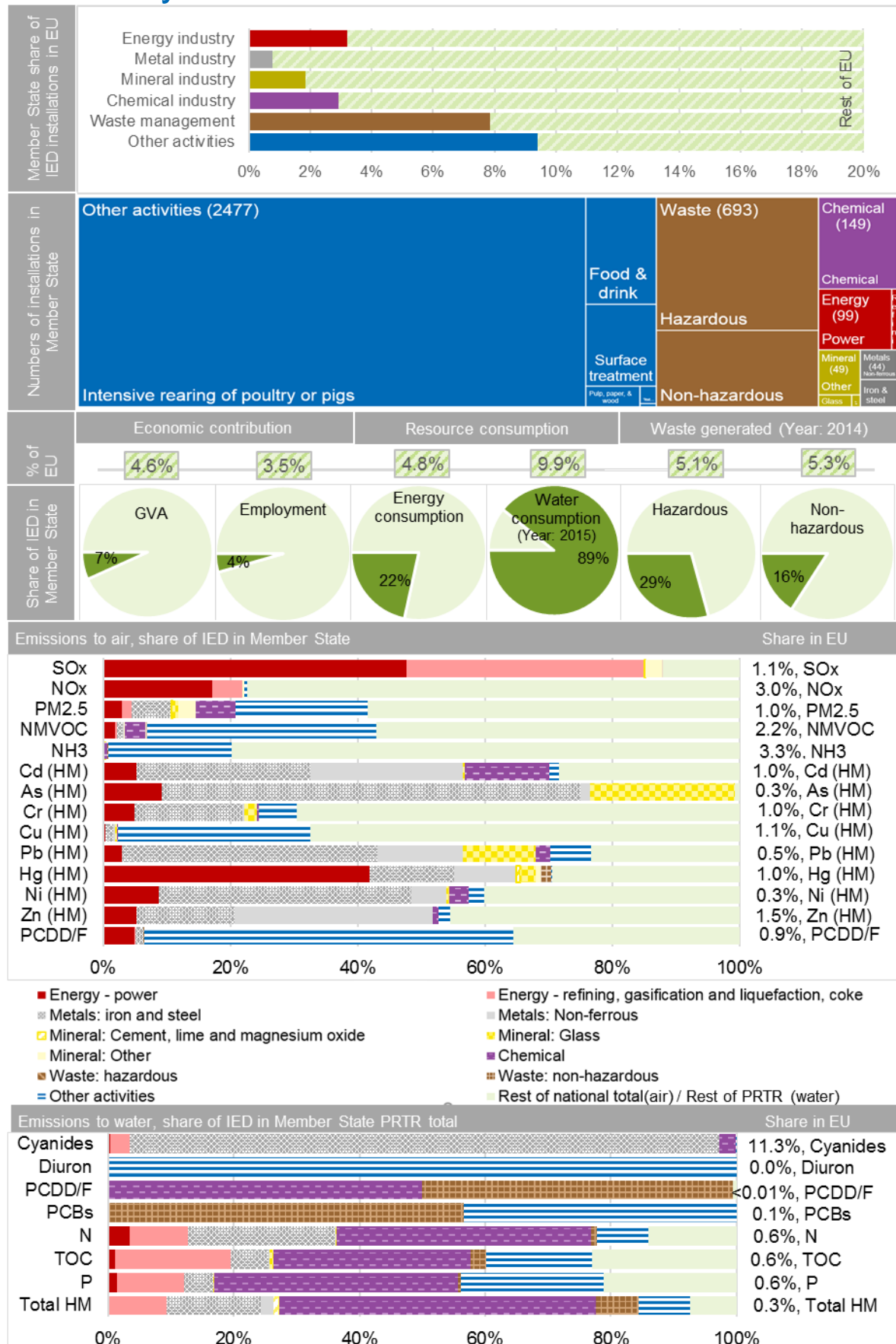
Appendix 1 Mapping industrial sectors across data sources for the Netherlands.

Appendix 2 Emissions to air by pollutant and industrial sector (detail)

Abbreviations and units

AOX	Adsorbable Organic Halides
As	Arsenic
Cd	Cadmium
CLRTAP	Convention on Long-range Transboundary Air Pollution
CO ₂	Carbon Dioxide
Cr	Chromium
Cu	Copper
DG	Directorate-General
EEA	European Environment Agency
E-PRTR	European Pollutant Release and Transfer Register
EU	European Union
EUR	Euros
GVA	Gross Value Added
HCBs	Hexachlorobenzenes
Hg	Mercury
HM	Heavy Metals
IED	Industrial Emissions Directive
IPPCD	Integrated Pollution Prevention and Control Directive
kg	Kilogram
ktoe	Kilotonne of oil equivalent
MW	Megawatts
N	Nitrogen
NACE	General Classification of Economic Activities within the European Communities
NH ₃	Ammonia
Ni	Nickel
NL	Netherlands
NMVO	Non-Methane Volatile Organic Compound
NO _x	Oxides of Nitrogen
P	Phosphorus
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PCBs	Polychlorinated Biphenyls
PCDD	Polychlorinated Dibenzodioxins
PCDF	Polychlorinated Dibenzofurans
PJ	Petajoules
PM	Particulate Matter
SO _x	Oxides of Sulphur
TOC	Total Organic Carbon
Zn	Zinc

Summary of industrial statistics for the Netherlands



1 Introduction and summary of methodology

1.1 The industrial emissions policy country profiles

Industrial activities play an important role in the economic welfare and development of countries contributing to their economic growth. They can also have a significant impact on their environment. Directive 2010/75/EC on Industrial Emissions (IED) aims to prevent and reduce harmful industrial emissions across the EU while promoting the use of techniques that reduce pollutant emissions and that are energy and resource efficient.

This document is part of a series of industrial emissions policy profiles that provide an overview of industrial activities regulated by the IED for each Member State. This profile covers the Netherlands.

The profiles show the economic significance of activities regulated by the IED in terms of the number of IED installations, their economic contribution (measured by gross value added and employment), and resources consumed (measured by energy and water consumed) – sections 2 and 3 respectively. The profiles also show the environmental impacts in terms of emissions to air and water (section 4) and waste generated (section 5).

The significance is shown both for the latest year of available data (typically 2015), as well as assessing the trends over time of key metrics. The data shown in the profiles is accompanied by descriptive analysis to bring together the various assessments made and draw out the salient messages. EU data sources used for each metric are described in a separate methodology paper together with their data limitations. The specific data sources used in this profile are summarised in Appendix 1. Each of the sections 2, 3, 4 and 5 consider the gaps in these data sources specific for the Netherlands and how they have been addressed.

The profile also identifies the impact of industrial sectors or activities in the Netherlands, within the scope of the IED policy, and the importance and political attention paid to this (section 6).

1.2 Definition of industrial sectors

The approach taken in the country profiles identifies data and trends wherever possible for a set of industrial sectors. However, in the data sources used to develop the profiles, there are several different approaches to sectoral classification. Since the definition of an ‘industrial sector’ differs across data sources, an approach has been taken to try to consistently report ‘sectors’ as much as possible. This has been aligned with the grouping of activities in Annex I of the IED where possible, but in practice the available datasets limit this.

The sectors defined in these profiles are referred to as ‘industrial sectors’. Together these industrial sectors represent activity regulated by the IED, albeit subject to certain limitations as described here. The grouping for the industrial sectors has been chosen to reflect the level of granularity most commonly reported from EU data sources across the different metrics assessed while trying not to lose detail where it is available. The industrial sectors used in the profiles are shown in Table 1. A consistent colour scheme – also illustrated in Table 1 – is used throughout the profile.

Where available, the industrial sectors split out the energy, metal, mineral and waste management sectors into subsectors. Where this split is not possible, we refer to the respective IED sector group, e.g. metal in the case of the IED activities iron and steel and non-ferrous metals. Due to the large number and wide variety of activity within the IED sector ‘other activities’, these have also been grouped as ‘other activities’ in this profile, but split out into constituent industries when they are important sectors in the Member State in their own right, and where data are available.

Table 1: Industrial sectors used in the profiles with their corresponding IED Annex I activities

Industrial sectors used in the profiles	Corresponding IED Annex I activities	
Energy industries , split where possible into:	Energy: power	Combustion of fuels (activity 1.1)
	Energy: refining, gasification and liquefaction, coke ovens	Refining, gasification and liquefaction, coke ovens (activities 1.2, 1.3, 1.4)
Production and processing of metals , split where possible into:	Metals: iron and steel	Iron and steel manufacturing (activities 2.1, 2.2, 2.3, 2.4)
	Metals: non-ferrous	Non-ferrous metal production (activity 2.5)
Mineral industry , split where possible into:	Mineral: Cement, lime and magnesium oxide	Production of cement, lime and magnesium oxide (activity 3.1)
	Mineral: Glass	Manufacture of glass (activity 3.3)
	Mineral: Other	Other mineral industries (activities 3.2, 3.4, 3.5)
Chemical industry	Chemical	Chemical industry (activities 4.1, 4.2, 4.3, 4.4, 4.5, 4.6)
Waste management , split where possible into:	Waste: hazardous	Hazardous waste (activities 5.1, 5.2(b), 5.5, 5.6)
	Waste: non-hazardous	Non-hazardous waste (activities 5.2(a), 5.3, 5.4, 6.5, 6.11)
Other activities , split when constituent activities are important:	Other activities	Pulp, paper and wood production (activity 6.1) Pre-treatment or dyeing of textile fibres or textiles (activity 6.2) Tanning of hides and skins (activity 6.3) Food and drink (activity 6.4) Intensive rearing of poultry and pigs (activity 6.6) Surface treatment (activities 2.6, 6.7) Production of carbon (activity 6.8)

Note: No installations operated with IED activity 6.9 in 2015 or before. The limited data available for activity 6.10 means it is excluded from the analysis.

2 Economic significance of industrial sectors

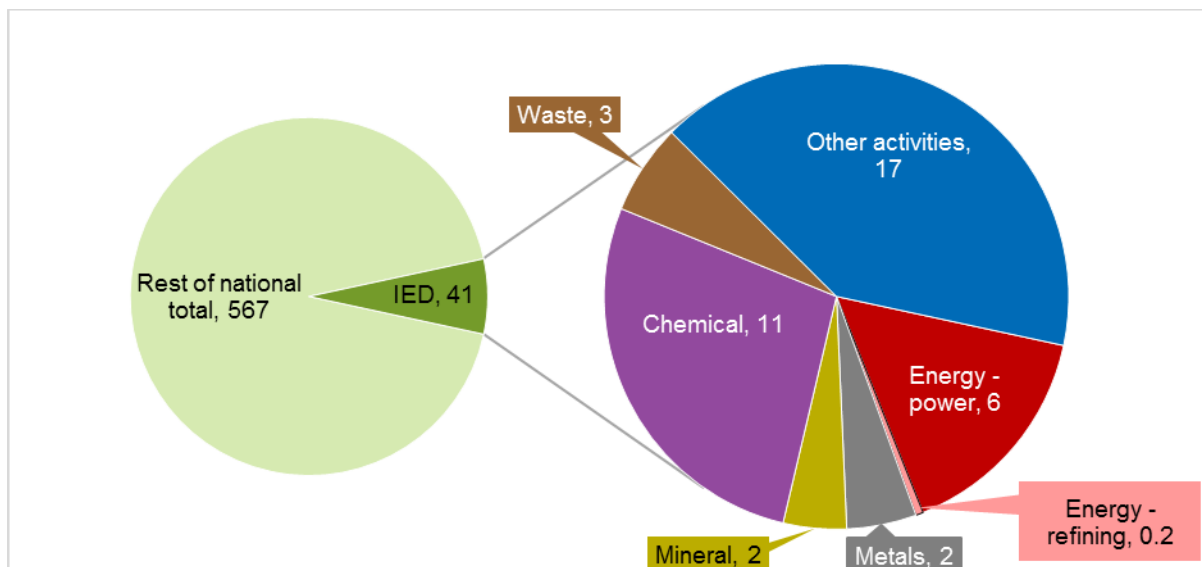
2.1 Economic contribution

The contribution of industrial sectors to the Netherlands' economy is assessed using the gross value added (GVA) and employment indicators.

Industrial sectors contribute a relatively small share of the total national GVA in the Netherlands (41 billion EUR, 7% of total GVA) (illustrated in Figure 1)¹. Of this share, 'other activities' accounts for the largest contribution. In 2015, the GVA of all activities within 'other activities' amounts to 17 billion EUR representing 41% of all industrial activities. Almost 80% of the GVA in 'other activities' relates to food and drink production (32% of all industrial activities). The chemical sector is the second largest and energy – power the third largest industrial sector, accounting for 27% and 15%, respectively, of total industrial sector GVA.

In 2015, the relative share of GVA by industrial sector shows a similar snapshot for employment (Figure 2), although the share of employment in the chemical sector is less significant than the equivalent share of GVA. Taken together, the GVA and employment statistics indicate that food and drink production, the chemicals industry and the energy – power sector contribute the most to the Dutch economy of the industrial sectors.

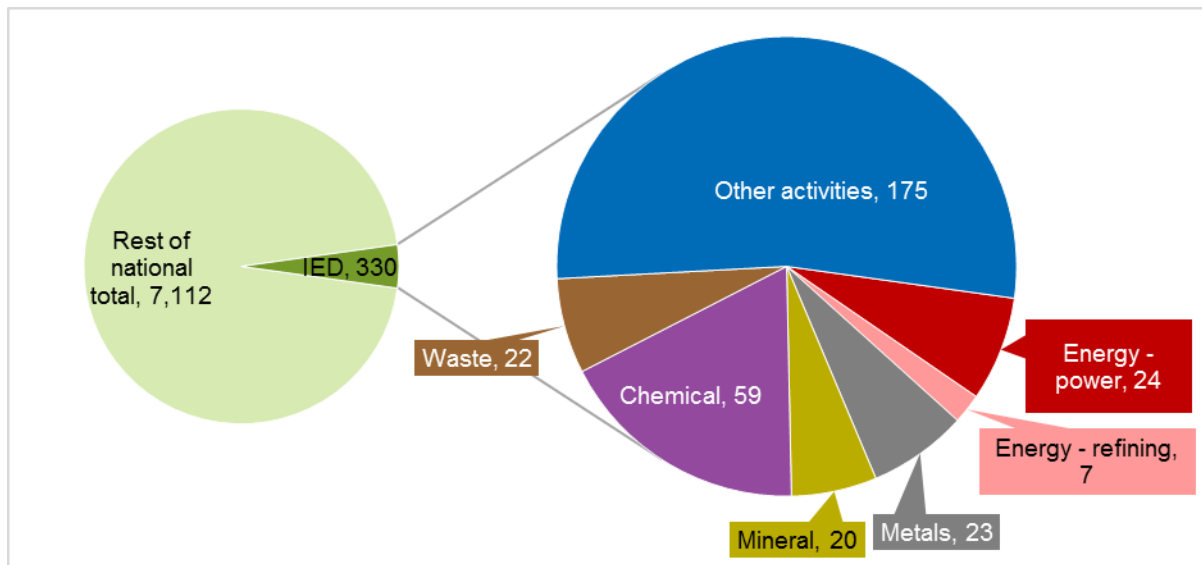
Figure 1: Gross value added of industrial sectors in 2015 (Current prices, billion EUR)



Note: Rest of national total means all NACE activities minus the industrial sectors shown here.

Source: Eurostat (2017a)

¹ Energy – refining is grouped in these profiles with gasification and liquefaction and coke ovens; however, as no permitted installations were reported for these IED activities, the sector is referred to as energy - refining in the Dutch profile.

Figure 2: Employment within industrial sectors in 2015 (thousands, aged 15 to 64 years)

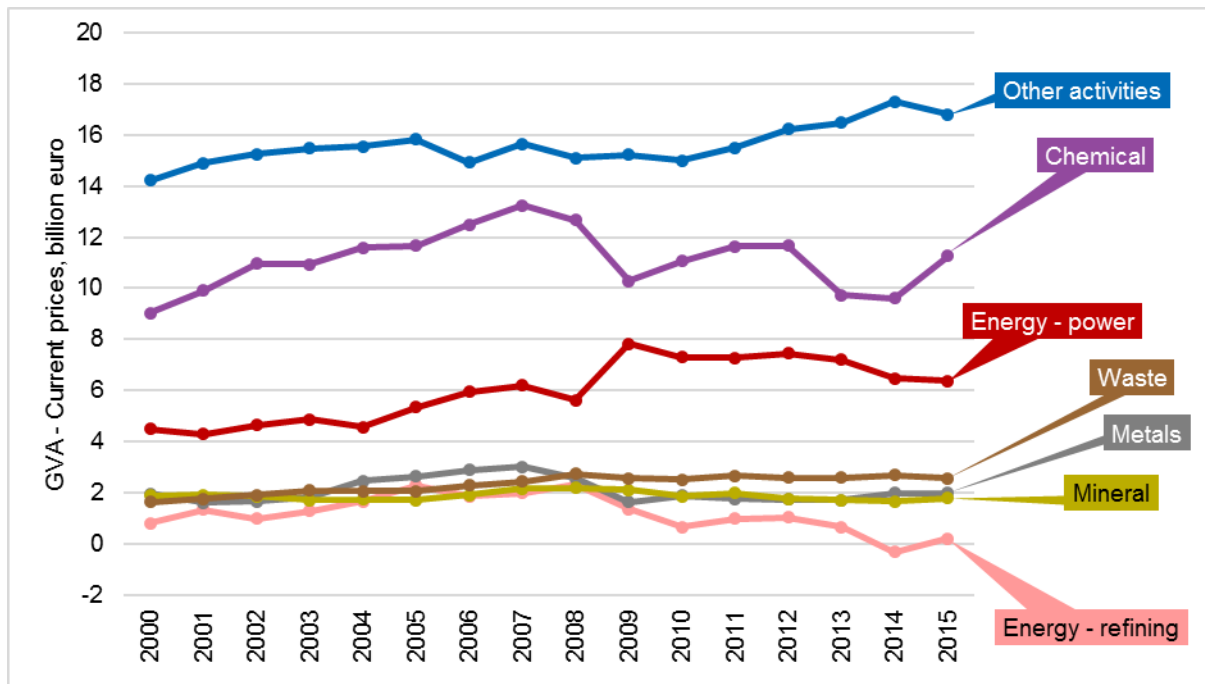
Note: Rest of national relates to all NACE activities minus the industrial sectors in the chart.

Source: Eurostat (2017b)

Under 'other activities', food and drink production is the main contributor to the economy in 2015. It is a key economic activity and area of economic growth in the Netherlands. In this sector, the GVA increased by around 25% in the time period 2000 to 2015 (textiles and tanning within 'other activities' decreased while other industries within 'other activities' show no change). Most other sectors have shown some economic growth in the Netherlands, as measured by growth in GVA, in the period 2000 to 2007, 2008 or 2009 (variable between sectors). Since 2009 however, GVA has decreased or remained fairly stable. The second largest industrial sector contributing to GVA, the chemical sector, has significantly increased until 2007, but then shown various fluctuations afterwards until 2015. A downward trend can be seen in the energy – refining sector, where the GVA in 2015 is close to being four times smaller than in 2000. Changes across the other industrial sectors in the Netherlands are relatively limited.

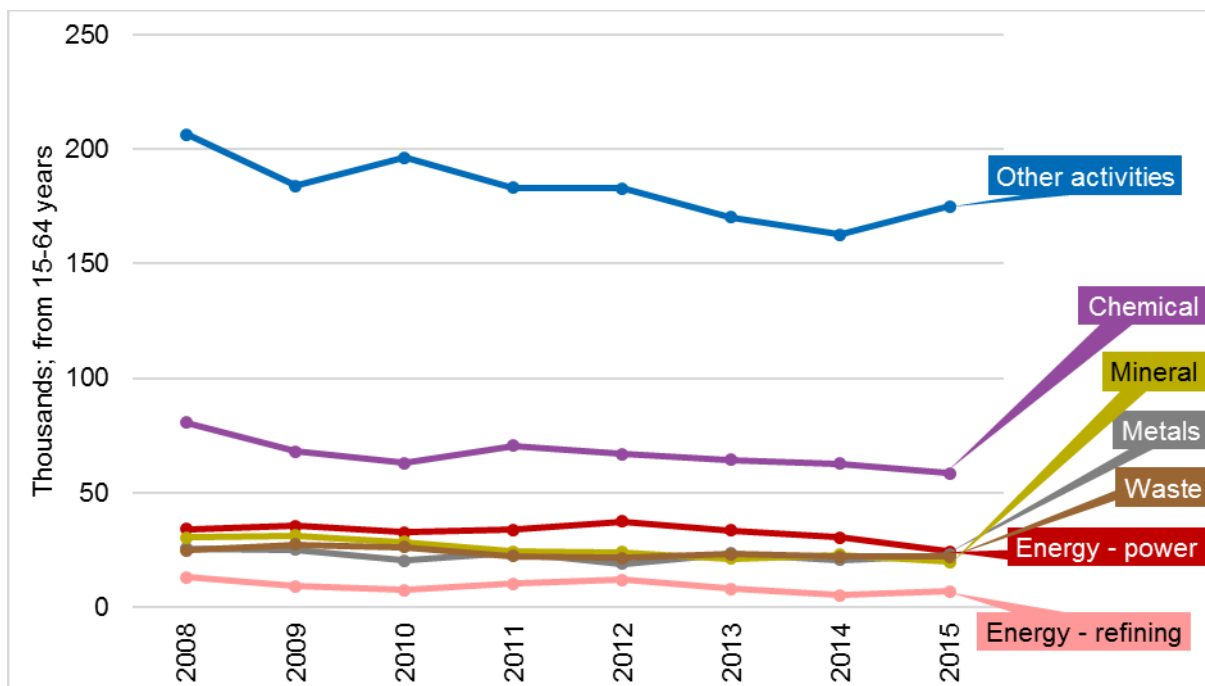
Taken together with the employment data (Figure 4), it can be observed that despite growth in the GVA in some sectors, employment has decreased in all sectors. The fluctuations in GVA for the chemical sector affected employment relatively significantly, decreasing from 81 thousand in 2008 to 59 thousand in 2015. Employment in the waste management sector decreases slightly, while in 'other activities' the number in employment has fallen by 15%, with significant decreases in the pulp, paper and wood production and the food and drink production sectors, despite increasing GVA.

Figure 3: Gross value added of industrial sectors (2000-2015)



Source: Eurostat (2017a)

Figure 4: Employment in industrial sectors (2008-2015)



Note: The employment data for 'other activities' for the year 2013 was interpolated.

Source: Eurostat (2017b)

Limitations

The use of NACE classifications for reporting has generally led to overreporting for both GVA and employment data against each industrial sector compared to a scope strictly limited to the IED. Overreporting is expected to be greatest for the waste management GVA data because it not only includes waste management, but also water supply, sewerage and waste remediation. No data could be included within 'other activities' to reflect the IED activity intensive rearing of poultry or pigs as reporting was not at the appropriate level of NACE classification.

Table 2: Gaps in employment data for the Netherlands

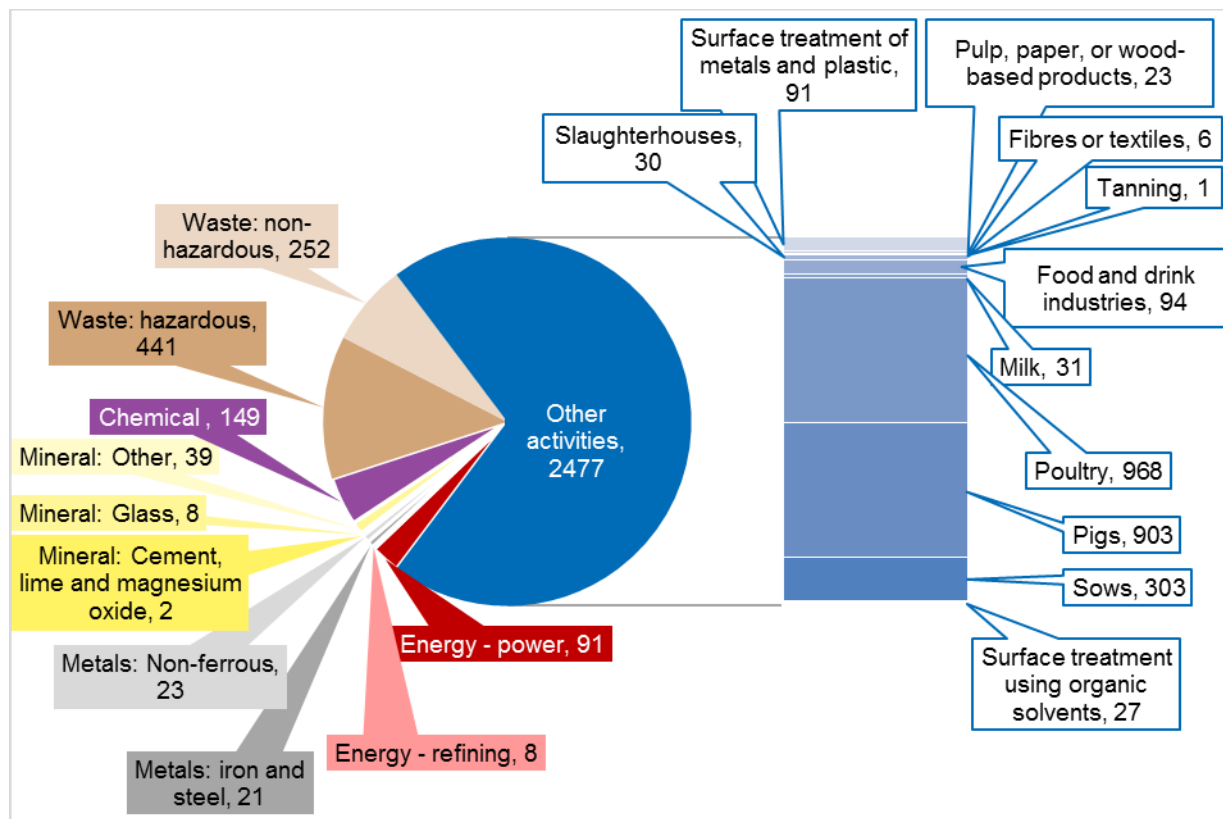
Missing data	Description	Conclusion and actions taken
Data gaps	Missing data for 'other activities' for the year 2013	Extrapolation undertaken

2.2 Number of IED installations

In 2015, the Netherlands had a reported total of 3,511 IED installations. The main industrial sector, according to the number of IED installations, is intensive rearing of poultry or pigs (IED activity 6.6), comprising 62% of total IED installations in 2015 (Figure 5, Table 3). This is followed by the hazardous waste management sector and the non-hazardous waste management sector.

According to this same dataset, most IED activities are carried out in the Netherlands, except for the production of coke (IED activity 1.3), gasification or liquefaction (IED activity 1.4), the production of explosives (IED activity 4.6) and carbon or electrographite (IED activity 6.8).

Figure 5: Number of installations by industrial sector in 2015, with ‘other activities’ split by IED activity



Source: IPPCD and IED reporting / DG Environment, Personal Communication

Table 3: Number of installations in 2015 by industrial sector, with IED activity detail

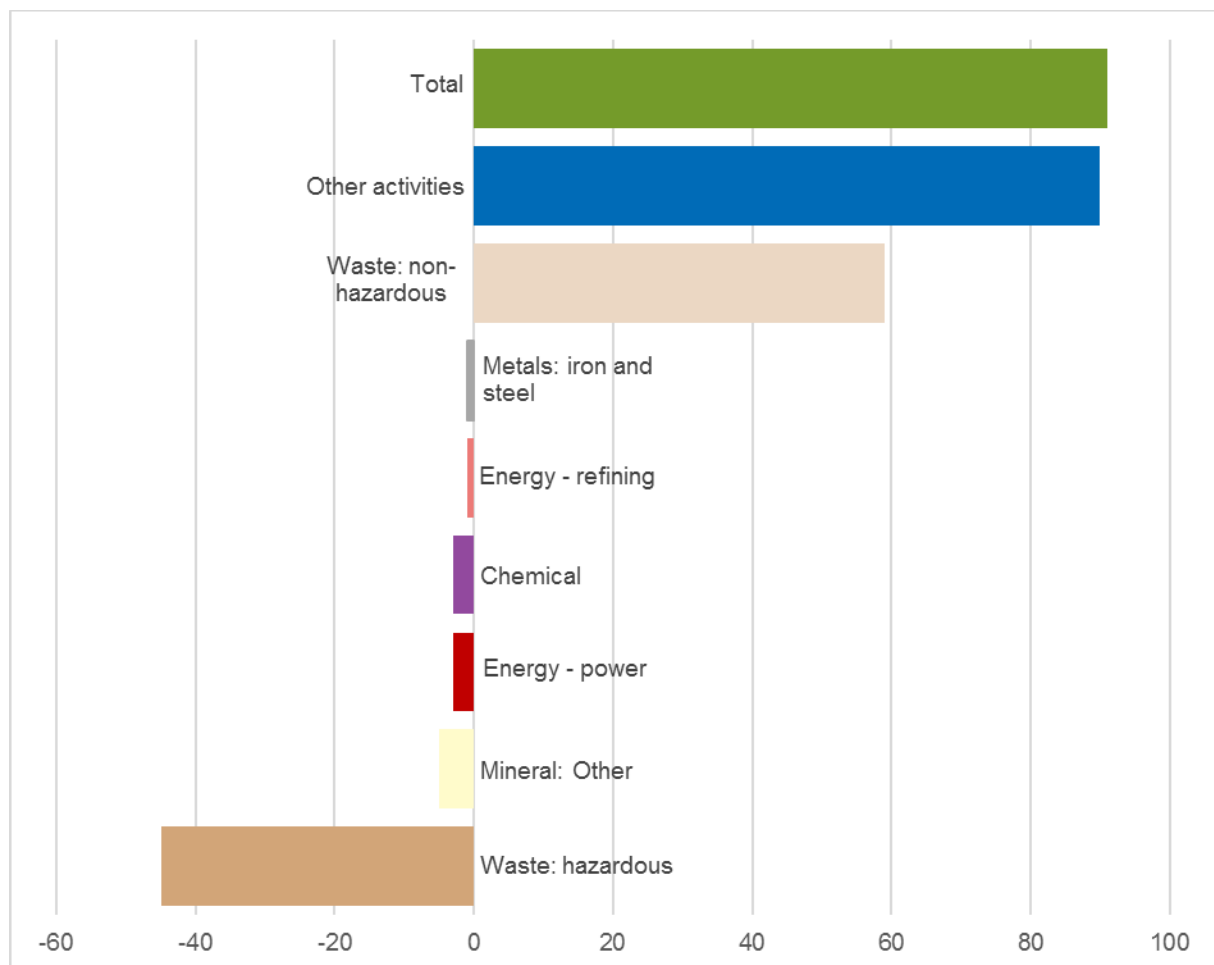
Industrial sector, with IED activity detail	2011	2015	Change in number of IED installations 2011 to 2015
Energy: power (1.1 Combustion of fuels)	94	91	-3
Energy: refining (1.2 Refining)	9	8	-1
Metals: iron and steel	22	21	-1
2.1 Metal ore	3	3	0
2.2 Pig iron or steel	2	2	0
2.3 Processing of ferrous metals	7	6	-1
2.4 Ferrous metals foundries	10	10	0
Metal: non-ferrous (2.5 Processing of non-ferrous metals)	23	23	0
Mineral: Cement, lime and magnesium oxide (3.1 Cement, lime and magnesium oxide)	2	2	0
Mineral: glass (3.3 Glass)	8	8	0
Mineral: Other	44	39	-5
3.4 Mineral fibres	2	2	0
3.5 Ceramic	42	37	-5
Chemical	152	149	-3
4.1 Organic chemicals	102	100	-2
4.2 Inorganic chemicals	30	29	-1
4.3 Phosphorus-, nitrogen- or potassium-based fertilisers	5	5	0
4.4 Plant protection products	6	6	0
4.5 Pharmaceutical products	9	9	0
Waste: hazardous (5.1 Disposal / recovery)	486	441	-45
Waste: non-hazardous	192	252	60
5.2 co-/incineration of hazardous and non-hazardous waste	14	13	-1
5.3 Disposal of non-hazardous	108	167	59
5.4 Landfills	57	58	1
6.5 Disposal of animal carcasses	13	14	1
Other activities	2,387	2,477	90
6.1 Pulp, paper, or wood-based products	24	23	-1
6.2 Textiles	8	6	-2
6.3 Tanning	1	1	0
6.7 Surface treatment using organic solvents	27	27	0
2.6 Surface treatment of metals and plastic	98	91	-7
6.4 (a) Slaughterhouses	31	30	-1
6.4 (b) Food and drink	83	94	11
6.4 (c) Milk	34	31	-3
6.6 (a) Poultry	969	968	-1
6.6 (b) Pigs	0	903	903
6.6 (c) Sows	1,112	303	-809
Total	3,419	3,511	92

Note: IED activities are in italics. The IED activity 5.2 (Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants) relates to non-hazardous waste (5.2(a)) and hazardous waste (5.2(b)). Owing to the generally small number of installations reported within this category across the EU, these installations have been categorised as non-hazardous waste management. Data for permitted installations carrying out IED activity 6.11 is not included in the reported data and therefore not included in this table.

Source: IPPCD and IED reporting / DG Environment, Personal Communication

Between 2011 and 2015, there was an increase in the number of IED installations in the Netherlands (Figure 6). This increase is largely due to an increased number of installations that dispose non-hazardous waste (from 108 installations in 2011 to 167 in 2015), but as a decrease of installations managing hazardous waste can be identified for this period, it can be assumed that the categorisation of some of the installations has shifted from hazardous to non-hazardous waste management. Furthermore, an increase of 94 installations (from 1,112 in 2011 to 1,206 in 2015) can be observed for the intensive rearing of pigs within 'other activities' (IED activity 6.6). There were also some smaller decreases in the reported number of IED installations. For example, in the mineral – other (ceramic) industry (IED activity 3.5, from 42 in 2011 to 37 in 2015) and the energy – power sector (IED activity 1.1, from 94 in 2011 to 91 in 2015).

Figure 6: Change in number of installations per industrial sector 2011 to 2015



Note: No change reported for the production of non-ferrous metal, cement, lime and magnesium oxide, and glass; not included in the chart.

Source: IED reporting / DG Environment, Personal Communication

Limitations

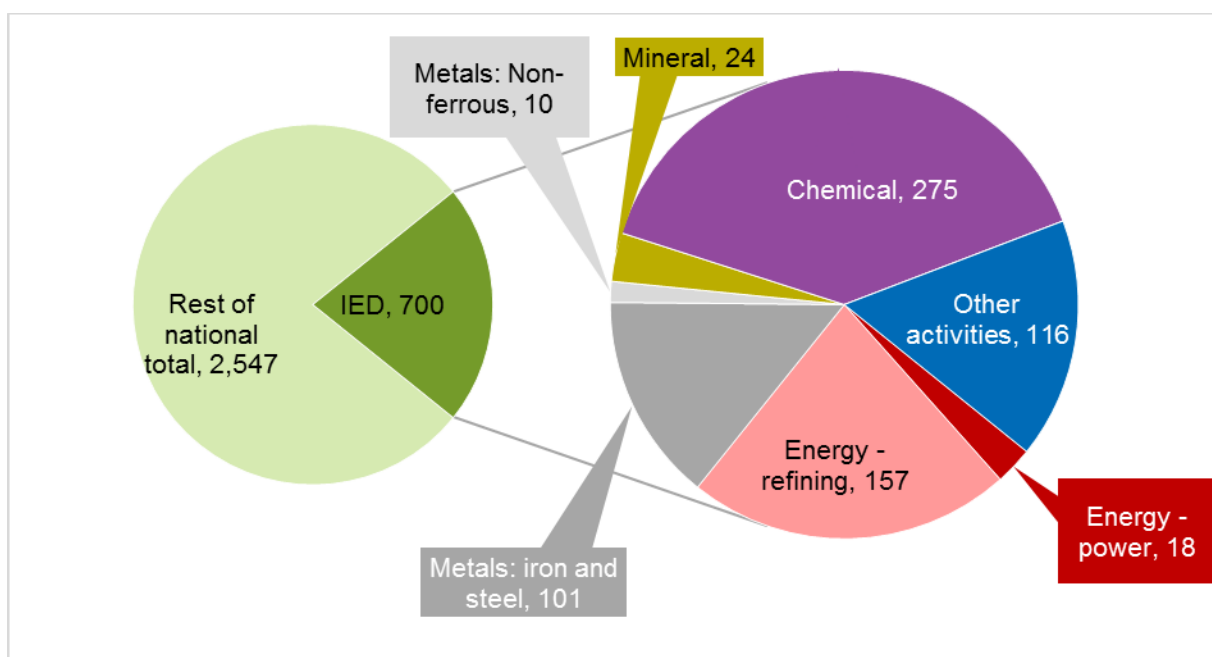
The dataset used to reflect IED activity in Member States has a limited timeseries inherent to the reporting requirement and thus the number of permitted installations is only reported for the years 2011, 2013 and 2015.

3 Resource use in industrial sectors

3.1 Energy consumption

In 2015, industrial sectors in the Netherlands accounted for around 27% of the total energy consumption in the Netherlands. The chemical sector consumed the most energy of the industrial sectors in 2015, accounting for 40% of the industrial sector energy consumption followed by the energy – refining sector (22%), ‘other activities’ (17%) and iron and steel manufacturing (14%) (Figure 7). With 21 and 8 IED installations operational in 2015 in the metals: iron and steel and the energy- -refining sectors, respectively, the relative energy consumed appears high compared to other sectors. The energy consumed by industries within ‘other activities’ can mostly be attributed to food and drink production. Energy consumption by the energy – power sector is quite low relative to the other sectors. Note that no data was reported for the waste management sector (explained in Table 4).

Figure 7: Energy consumption by industrial sector in 2015 (PJ)

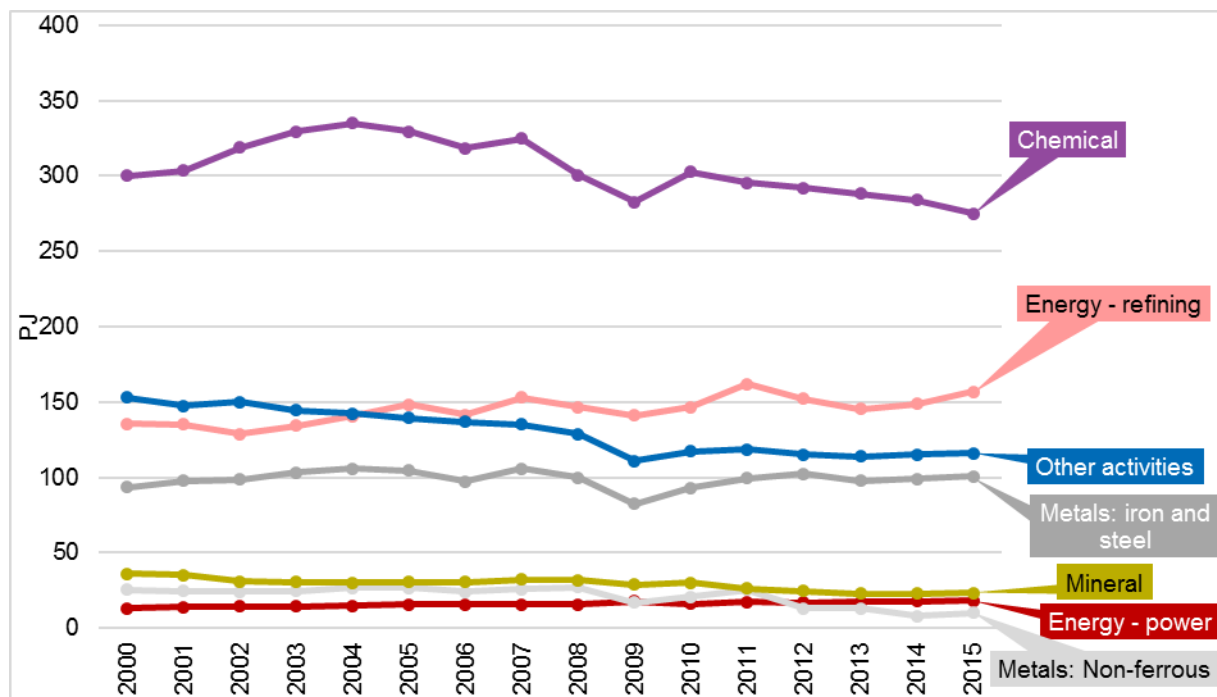


Note: Rest of national total relates to gross inland consumption minus the industrial sectors shown here. No data was reported for the waste management sector.

Source: Eurostat (2017c)

The time series in Figure 8 shows that energy consumption has remained fairly static for industrial sectors between 2000 and 2015, with a slight overall downward trend and a low point in 2009. This downward trend, which isn't obvious when considering GVA, could be due to the economic crisis in Europe in this time period. The most significant decline can be seen for the chemical sector. After an increase up to 2004, energy consumption in the sector declines fairly consistently. In 2015 it only consumed around 80% of the energy consumed at its peak in 2004. The only exception to this overall trend is the energy – refining industrial sectors, for which there has been a growth in energy consumption between 2000 and 2015.

Figure 8: Energy consumption (in PJ) of industrial sectors (2000-2015)



Note: No data was available for the waste management sector.

Source: Eurostat (2017c)

Limitations

Generally, the use of energy balance indicators is expected to lead to overreporting against IED activities as no thresholds apply to the economic activities reported against (similar to NACE classifications). The energy consumption data that have been used has only limited coverage of the waste management sector. Data for this sector is therefore expected to be underreported as only one energy balance indicator was identified as relevant to this industrial sector: the energy consumed by gasification plants for biogas. Thus, where no data for the waste management sector is identified, this is rather a limitation that the energy consumption dataset has poor representation of the waste management sector.

Table 4: Gaps in energy consumption data for the Netherlands

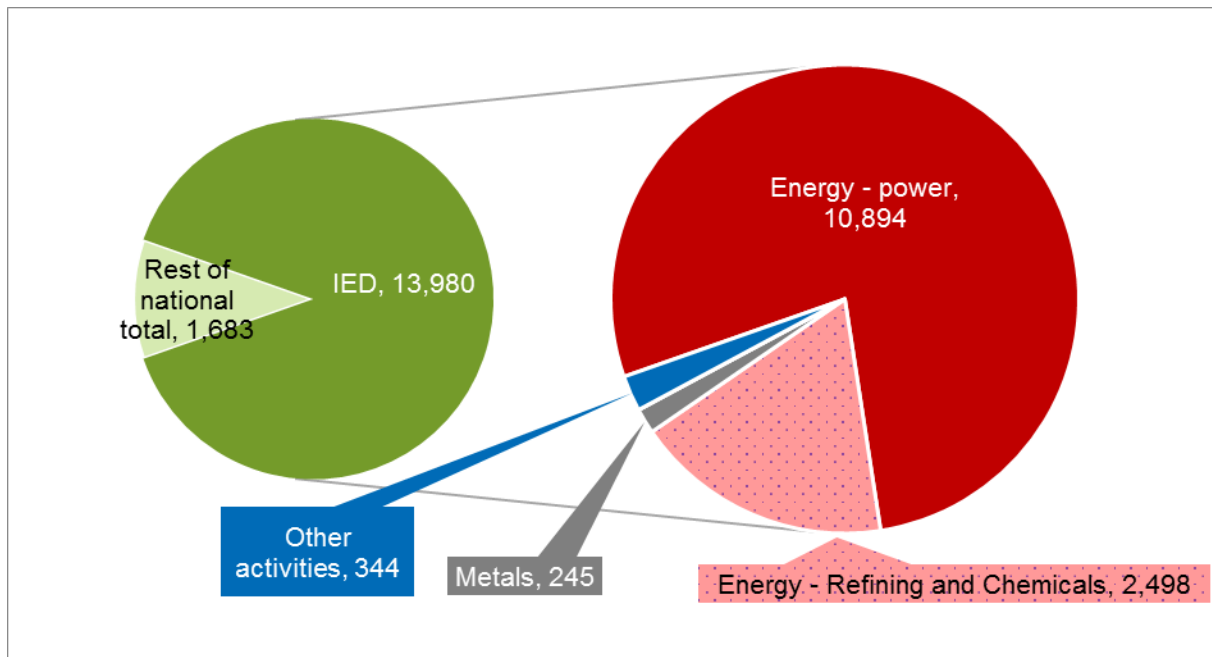
Missing data	Description	Conclusion and actions
No data for waste management	No data reported for all waste management	No action
No IED installations reported for gasification and liquefaction and coke ovens	Separate energy balance indicators are reported for this IED activity within the energy – refining and coke sector.	Respective energy balance indicators removed from energy consumption for energy – refining to avoid overreporting.

3.2 Water consumption

The data availability to show water consumption by industrial sectors in the Netherlands is not as for energy consumption. For the years 2001-2002 and 2013-2015 Eurostat data was used, for the years 2003-2012 national data instead.

According to the data available, the energy – power industrial sector consumed 10,894 million m³ water, which is by far the largest share reported, making up 78% of the total water consumed in industrial sectors and 69% of the total water consumption in the Netherlands. However, these percentages are uncertain, as the data is incomplete.

Figure 9: Water consumption (million m³) for selected industrial sectors (2015)

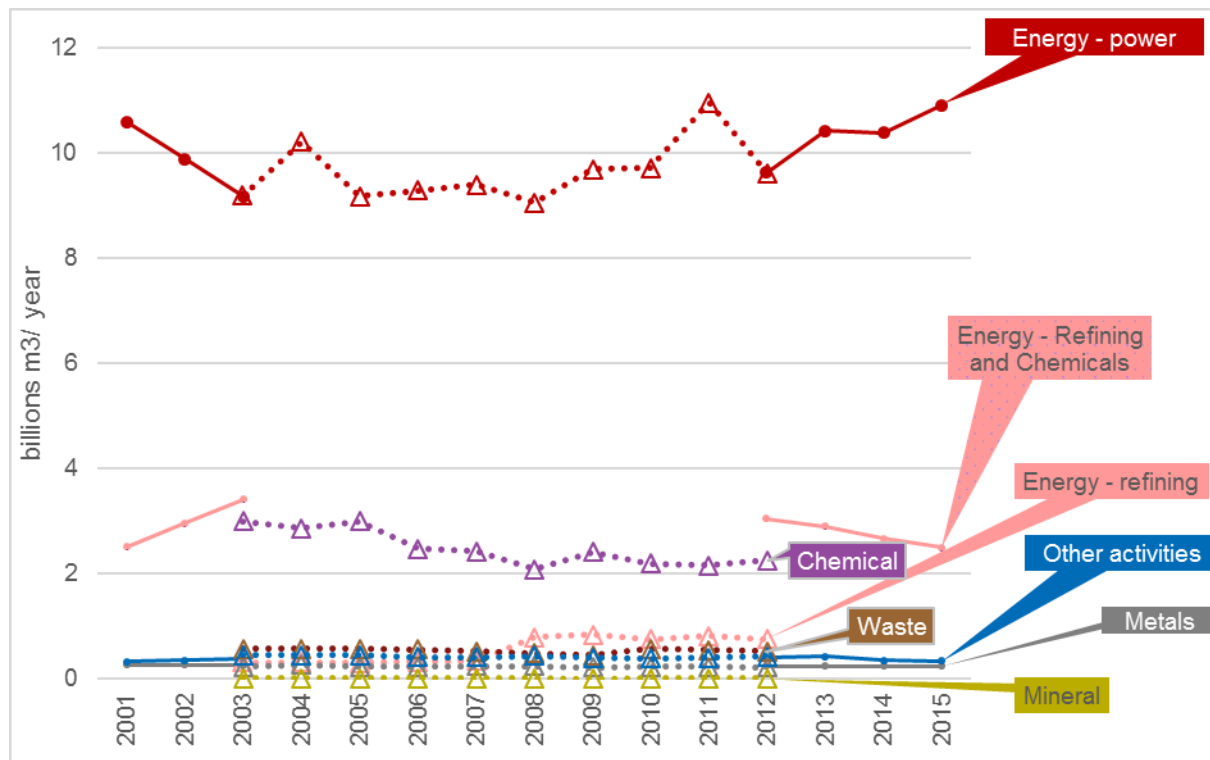


Note: Rest of national total relates to all NACE activities minus industrial sector activity shown here. No data reported for the industrial sectors: mineral, and waste management. Note that Eurostat merges the water consumption data for industrial sectors energy – refining with chemicals. 2015 data for energy – power, metals and 'other activities' were extrapolated passed on data available for 2013 and 2014.

Sources: Eurostat (2017d)

The water consumption within the energy – power sector fluctuated over the years, the recent trend is an increase (from 2012 to 2015). The water consumption of the chemicals industrial sector has been decreasing slightly and steadily. From 2012 onwards, data is given in combination with data of the energy – refining sector, the decreasing trend has been continuing for the combination of both sectors. The trends of the water consumption of the 'other activities', metals, minerals and waste management sectors have been stable over time. Note that data were merged from two different data sets.

Figure 10: Water consumption (billion m³) for selected industrial sectors (2000-2009)



Notes: This chart combines reporting to Eurostat (line with circle markers) and national accounts for water consumption (dotted lines with triangle markers). Note that Eurostat water consumption merges the industrial sectors energy – refining with chemicals whereas in national accounts the two are kept separate. 2015 data for energy – power, metals and ‘other activities’ was extrapolated based on data available for 2013 and 2014.

Sources: Eurostat (2017d); Rijksoverheid (2017)

Limitations

Limitations have arisen from the mapping owing to combined reporting of NACE classifications for energy – refining and chemicals. Water consumption by the mineral sector is combined with many other NACE activities and could not be used without significant overreporting. An additional category is reported by Eurostat to show water used for cooling; however, the data is also reported within other NACE classifications and so could not be included in the charts without double counting.

Table 5: Data gaps in water consumption data for the Netherlands

Missing data	Description	Conclusion and actions taken
Gap in Eurostat data	Data reported in Eurostat (2017d) is only available for the years 2001 to 2003 and 2012 to 2015.	Used the available Eurostat data and for the other years, data provided by national accounts were used.
Gap for sectors	For the industrial sectors minerals and waste management there was no data available at all	No action

4 Emissions from industrial sectors

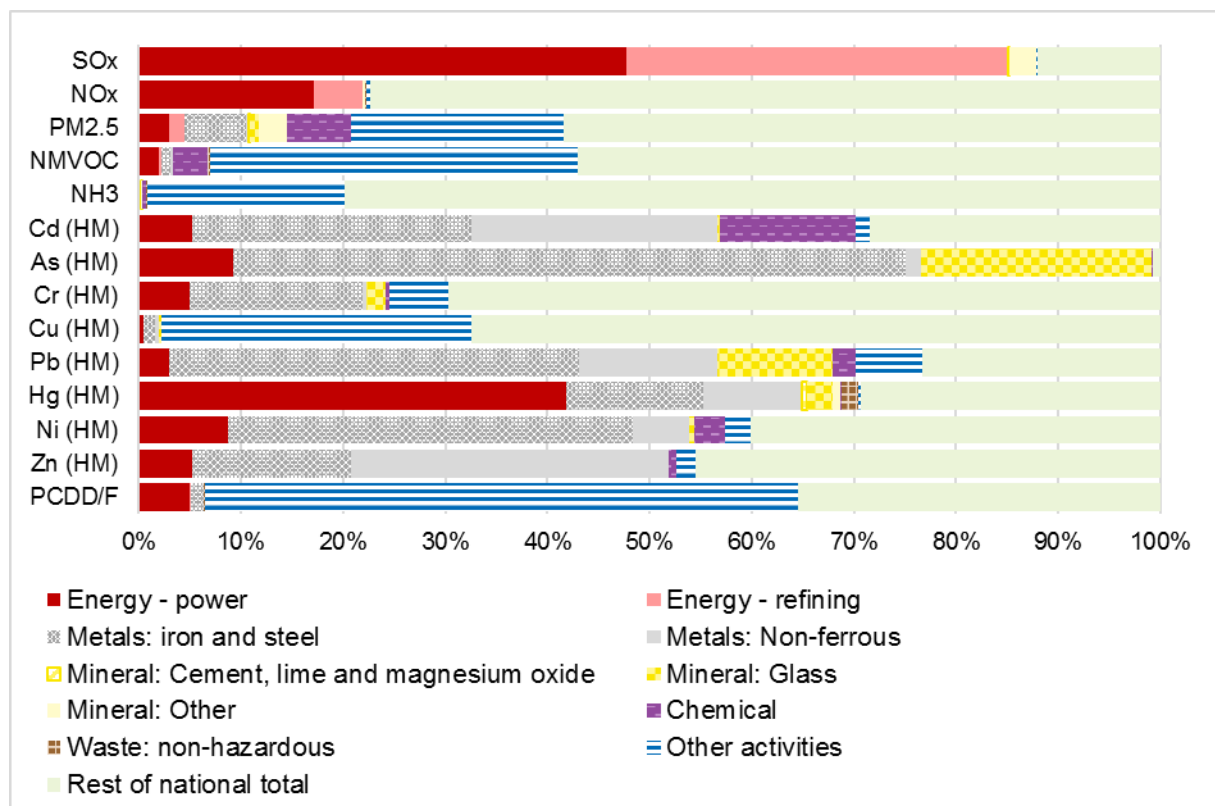
4.1 Emissions to air

Data were taken from inventories submitted by Member States under the CLRTAP (EEA, 2017a). Industrial sectors are responsible for less than half of the NO_x, PM_{2.5}, NMVOC, NH₃, Cr and Cu emissions of pollutants emitted to air.

Heavy metals appear to be more intensely emitted from industrial sectors compared to the rest of the national total and other pollutants except for SO_x (with over 50% of Cd, As, Pb, Hg, Ni and Zn emissions emanating from industrial sectors). However, in terms of absolute quantity, these pollutants are substantially smaller.

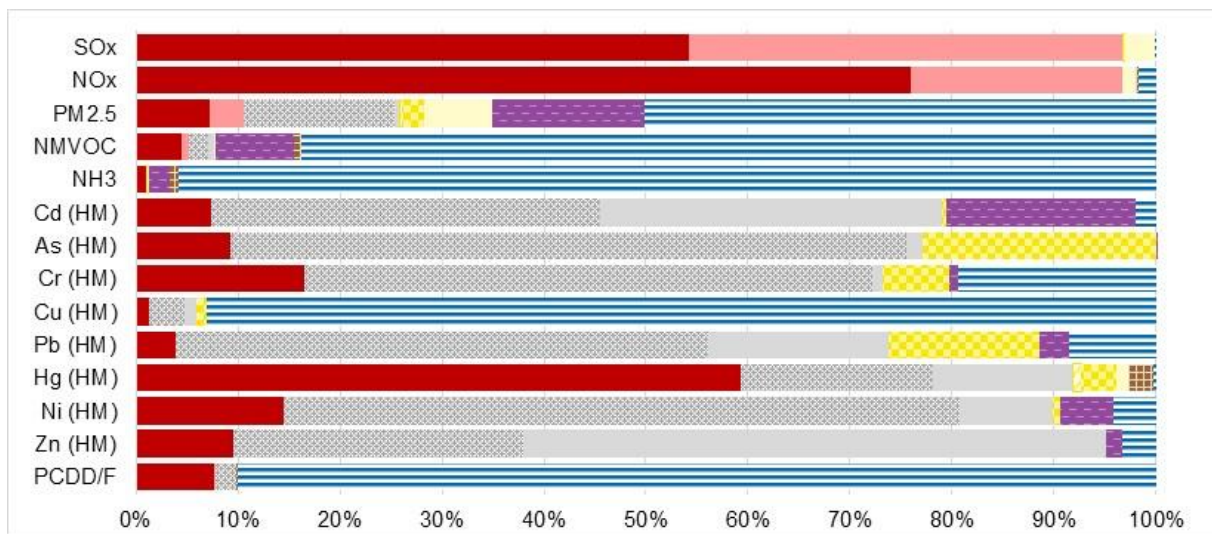
The contribution of each industrial sector to emissions varies considerably between pollutants. Energy – power, energy – refining, metal - iron and steel and ‘other activities’ (manure management as a related activity to intensive rearing of poultry and pigs) are responsible for the greatest share of emissions to air. Furthermore, the chemicals, mineral - glass and non-ferrous metals sectors also contribute a reasonable share for some pollutants. Based on the data available, the energy – power sector is mainly responsible for SO_x, NO_x and Hg emissions whilst the metal industrial sectors contribute significantly to heavy metal emissions and ‘other activities’ are the main emitter of NMVOC (mainly coating applications, other industrial processes and other solvent use), NH₃ (manure management within intensive rearing of poultry or pigs), Cu and PCDD/F emissions. However, data on Cu and PCDD/F emissions was reported for other solvent use only. Comparing this data to other countries it is doubtful that no PCDD/F emissions were emitted from other sectors. Despite the reported presence of IED installations, no emissions to air data were reported for the hazardous waste management sector.

Figure 11: Emissions to air from industrial sectors and rest of national total (2015)



Note: Rest of national total relates to the national total for the entire territory (based on fuel sold) minus the industrial sector emissions shown here. No data is reported for hazardous waste emissions.

Source: EEA (2017a)

Figure 12: Emissions to air from industrial sectors (2015)

Note: Key for this chart is shown in Figure 11.

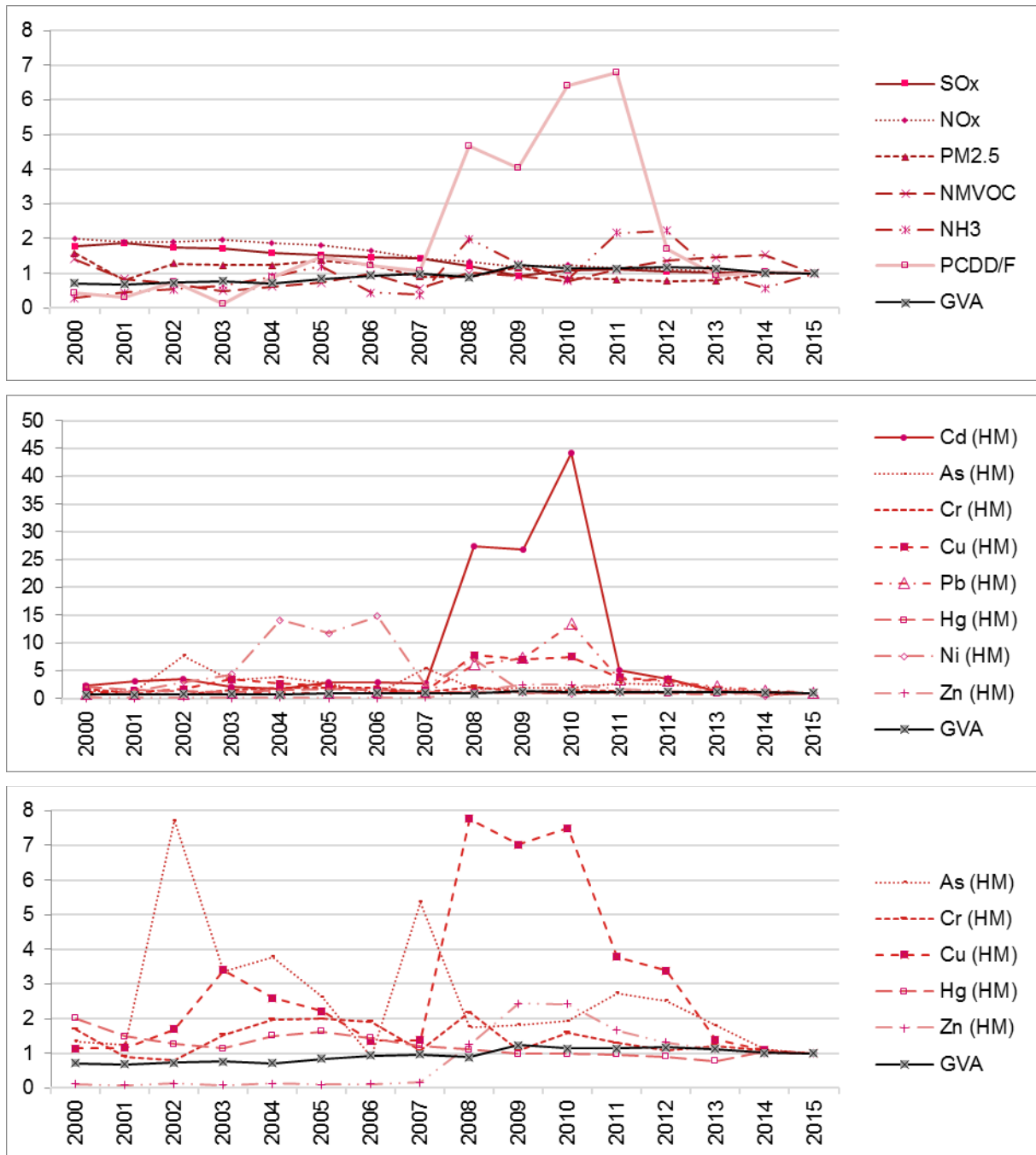
Source: EEA (2017a)

In the following subsections, emissions data are shown in indexed charts by sector. This was done to compare the development of pollutant emissions with the GVA in specific sectors in the time period 2000 to 2015. For most industrial sectors, emissions to air show decreasing trends while GVA has grown. For many sectors, a decreasing trend until 2009 can be observed. This decrease is likely to have resulted from compliance with requirements under the existing IPPC Directive. Appendix 2 includes full details on the emissions reported by industrial sector and year.

Energy industry

For the energy - power sector, there was a reduction in emissions to air for most pollutants reported in this profile between 2000 and 2009. In particular, emissions of SO_x have reduced as well as NO_x, which have reduced by over 50% (when comparing the amount emitted in 2000 with that in 2009). After 2009, emissions have fluctuated for all pollutants with no obvious trend. The emissions of the heavy metal Cd and of PCDD/F increased in 2008, but dropped again shortly afterwards and have been at a relatively low level for the last three years. The amount of emitted PCDD/F is reported in grams so the fluctuation is negligible. The GVA has slowly increased until 2009, showing a slight upwards trend since then.

Figure 13: Indexed emissions to air from the energy - power industrial sector (indexed to 2015=1)

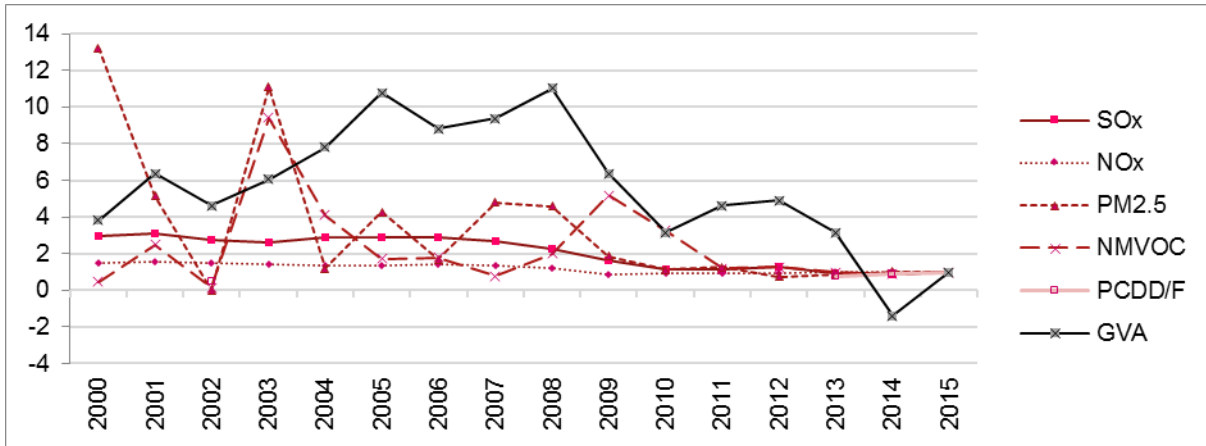


Notes: Cd, Ni and Pb removed in the third chart to make the detail visible for the other pollutants.

Source: EEA (2017a), Eurostat (2017a)

In the energy – refining sector emissions of SO_x and NO_x have reduced overall over the timeframe, with NO_x increasing slightly during the last few years. No emissions of PCDD/F were reported in the years 2000 to 2012. Emissions of PM_{2.5} have been at a constant level since 2009, before that point the levels fluctuated significantly as well as NMVOC emissions over the whole time period. No data on heavy metal emissions were reported in 2015, therefore no indexing to 2015 was possible.

Figure 14: Indexed emissions to air from energy - refining (energy industrial sector) sector (indexed to 2015=1)



Note: No data was reported for NH₃ and heavy metals in 2015. Zero emissions were reported for PCDD/F in 2000-2001 and 2003-2012. Values were not plotted for PCDD/F in these years to avoid misrepresenting the trend.

Source: EEA (2017a), Eurostat (2017a)

Metal industry

As can be seen in Figure 15, PCDD/F emissions from the iron and steel sector have fluctuated significantly from 2000 to 2013 but then dropped radically within one year. NMVOC and PM_{2.5} emissions slightly decreased until 2009, from there onwards as well as over the whole period 2000 to 2015 for NH₃, emissions have remained at a constant level without much fluctuation. For most of the heavy metals the trends have been fairly volatile although since 2010 emissions appear to be on a constant downward trend whereas the GVA has remained fairly constant.

Figure 15: Indexed emissions to air from iron and steel sector (metal industrial sector) (indexed to 2015=1)

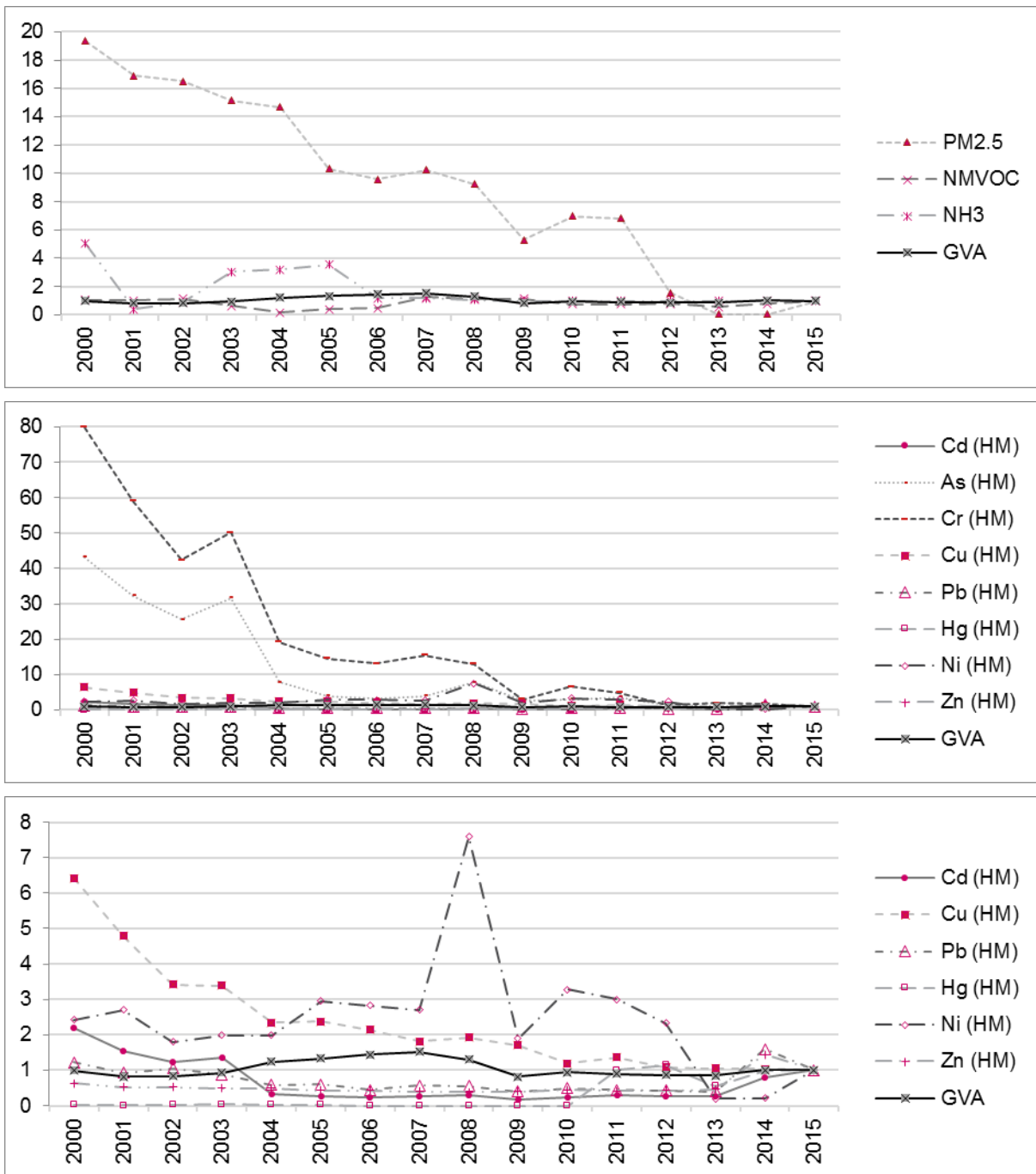


Note: No data reported for SO_x and NO_x. Zero emissions were reported for Ni in 2000-2001. Values were not plotted for Ni in these years to avoid misrepresenting the trend.

Source: EEA (2017a), Eurostat (2017a)

Within the time period 2000 to 2015, PM_{2.5} emissions from the non-ferrous metal sector decreased by a factor of 20 whereas NMVOC and NH₃ emissions have remained fairly static over time (Figure 16). Heavy metal emissions from this sector have reduced significantly in the case of Cr and As up to 2009, remaining at fairly constant levels since then. Other heavy metals have also declined: Pb (from 18.8 tonnes in 2000 to 3.5 tonnes in 2015), Zn (from 27.5 tonnes in 2000 to 15.7 tonnes in 2015) and Cu (from 680 kilograms in 2000 to 470 kilograms in 2015). So overall, a decreasing trend in emissions can be seen in this industrial sector despite fairly static GVA.

Figure 16: Indexed emissions to air from non-ferrous metal production (metal industrial sector)(indexed to 2015=1)



Note: no data was reported for PCDD/F, SO_x and NO_x. Cr and As removed in the third chart to make the detail visible for the other pollutants.

Source: EEA (2017a), Eurostat (2017a)

Mineral industry

Figure 17 shows the emission trend for cement, lime and magnesium oxide in relation to GVA for the mineral industrial sector.

SO_x emissions have decreased significantly between 2008 and 2009 and then remained relatively stable. Emissions of Hg have reduced significantly from the year 2006 and then remained at a relatively constant low level. No obvious trend can be observed for the other reported pollutant emissions, which fluctuate significantly and there are a number of data gaps (Figure 17).

Figure 17: Indexed emissions to air from cement, lime and magnesium oxide production (mineral industrial sector)(indexed to 2015=1)



Note: only data for SO_x, PM_{2.5}, NH₃ and Hg reported. Zero emissions were reported for SO_x 2000-2004 and 2006-2007, PM_{2.5} 2011-2012, and NH₃ 2000-2008. Values were not plotted for these pollutants in these years to avoid misrepresenting the trend.

Source: EEA (2017a), Eurostat (2017a)

SO_x, NMVOC and NH₃ emissions have declined in the mineral – glass sector in the time period 2000 to 2008, remaining at a fairly constant level since then until 2015 (Figure 18). PM_{2.5} emissions have increased over the whole time period showing some fluctuations. For the heavy metals no real trends can be observed.

Figure 18: Indexed emissions to air from glass production (mineral industrial sector)(indexed to 2015=1)



Note: two additional charts were provided to remove outliers. No data was reported for NO_x, Zn and PCDD/F. Zero emissions were reported for SO_x in 2004, Cd in 2000, 2002-2003, and 2008-2011, As in 2000-2004, Cr in 2000 and 2003, Cu in 2000 and 2002-2003, Hg in 2000-2009, Ni in 2000 and 2003. Values were not plotted for these pollutants in these years to avoid misrepresenting the trend.

Source: EEA (2017a), Eurostat (2017a)

For other mineral production, NH₃ emissions have reduced significantly in 2008, while most other emissions decrease slightly without much fluctuation. Although fluctuating a lot, NMVOC emissions have reduced considering the low values reported for the last few years relative to 2000 levels.

Figure 19: Indexed emissions to air from other mineral production (mineral industrial sector) (indexed to 2015=1)



Note: no data as reported for heavy metals except for Hg, for which only few data was provided.

Source: EEA (2017a), Eurostat (2017a)

Chemical industry

Data on PCDD/F emissions were only reported for several years and show some questionable trends so the trend was not evaluated. A constant downward trend for emissions in the chemical industry can be detected between 2000 and 2009 for NMVOC and NH₃, remaining at a fairly constant level afterwards. The most significant decrease is recorded for emissions of Hg: from 200 kilograms in 2000 to 20 kilograms in 2007 to amounts in the order of grams in 2015. For other heavy metals it can be observed that significantly lower emission levels have been reported after 2009.

Figure 20: Indexed emissions to air from chemical industry (indexed to 2015=1)



Note: Note: PCDD/F removed in the second chart to make the detail visible for the other pollutants. Hg removed in the fourth chart above to make the detail visible for the other pollutants. NH₃ is not shown as it is reported as zero in 2015 for this sector. Zero emissions were reported for As 2000-2002, Cu in 2000, Hg in 2008-2009, PCDD/F in 2003-2003 and 2005-2014. Values were not plotted for these pollutants in these years to avoid misrepresenting the trends.

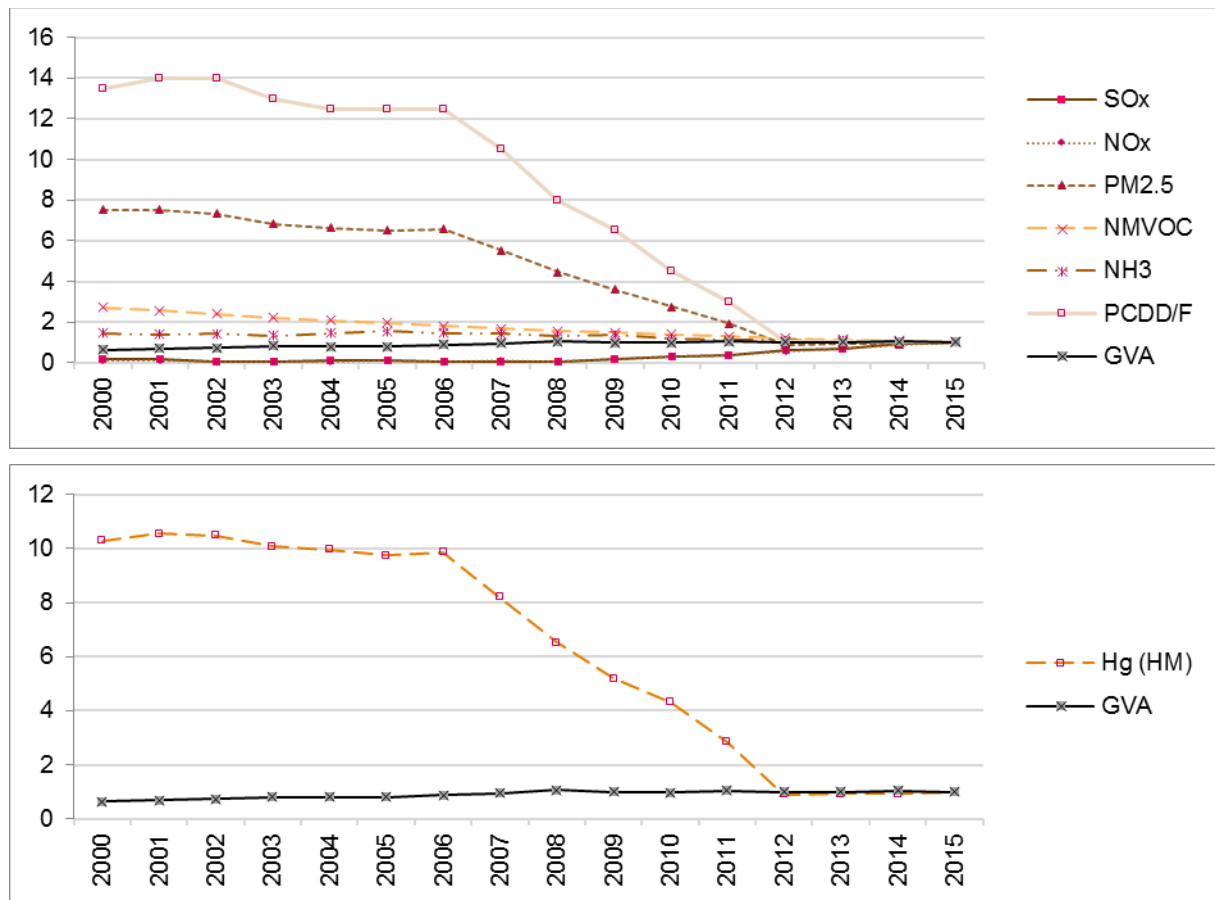
Source: EEA (2017a), Eurostat (2017a)

Waste management industry

For the hazardous waste management, there were no pollutants reported for the time period of interest from 2000 to 2015.

Emissions in the non-hazardous waste management sector for almost all pollutants show steady reductions from 2000 to 2012, remaining at a constant level afterwards. Significant reductions can be detected for PCDD/F, PM_{2.5} and Hg, in particular decreasing between 2007 and 2012. Only for SO_x a small but constant increase can be observed (Figure 21).

Figure 21: Indexed emissions to air from non-hazardous waste (waste management industrial sector) (indexed to 2015=1)



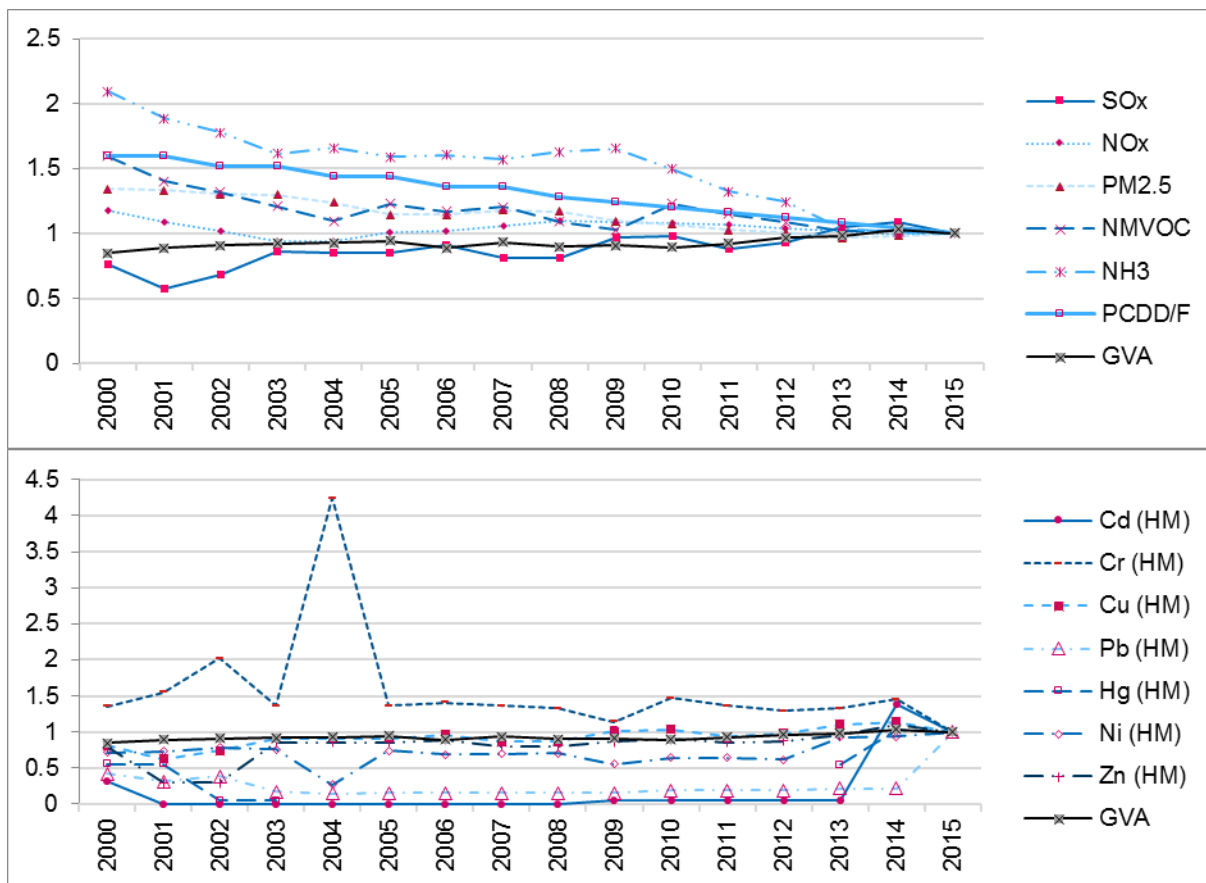
Note: Only Hg reported under heavy metals.

Source: EEA (2017a), Eurostat (2017a)

‘Other activities’

Within the ‘other activities’ industrial sector, decreases can be observed for NH₃, PCDD/F, NMVOC and PM_{2.5}. Emissions of SO_x rose slightly, while other emissions stayed at a relatively constant level with some fluctuations. Most of the heavy metals are emitted at a constant level, with an overall slight upwards trend particularly in recent years (Figure 22).

Figure 22: Indexed emissions to air from other activities (indexed to 2015=1)



Note: No data was reported for As. Zero emissions were reported for Hg in 2004-2008 and 2010-2012. Values were not plotted for Hg in these years to avoid misrepresenting the trend.

Source: EEA (2017a), Eurostat (2017a)

Limitations

The use of emissions data reported to LRTAP has generally led to overreporting against IED activities as emissions are reported by NFR classification and thus no activity thresholds apply as in the case of IED annex I activities. Furthermore, the pollutant scope for reporting to LRTAP does not include HCl or HF.

Table 6: Gaps in emissions to air data for the Netherlands

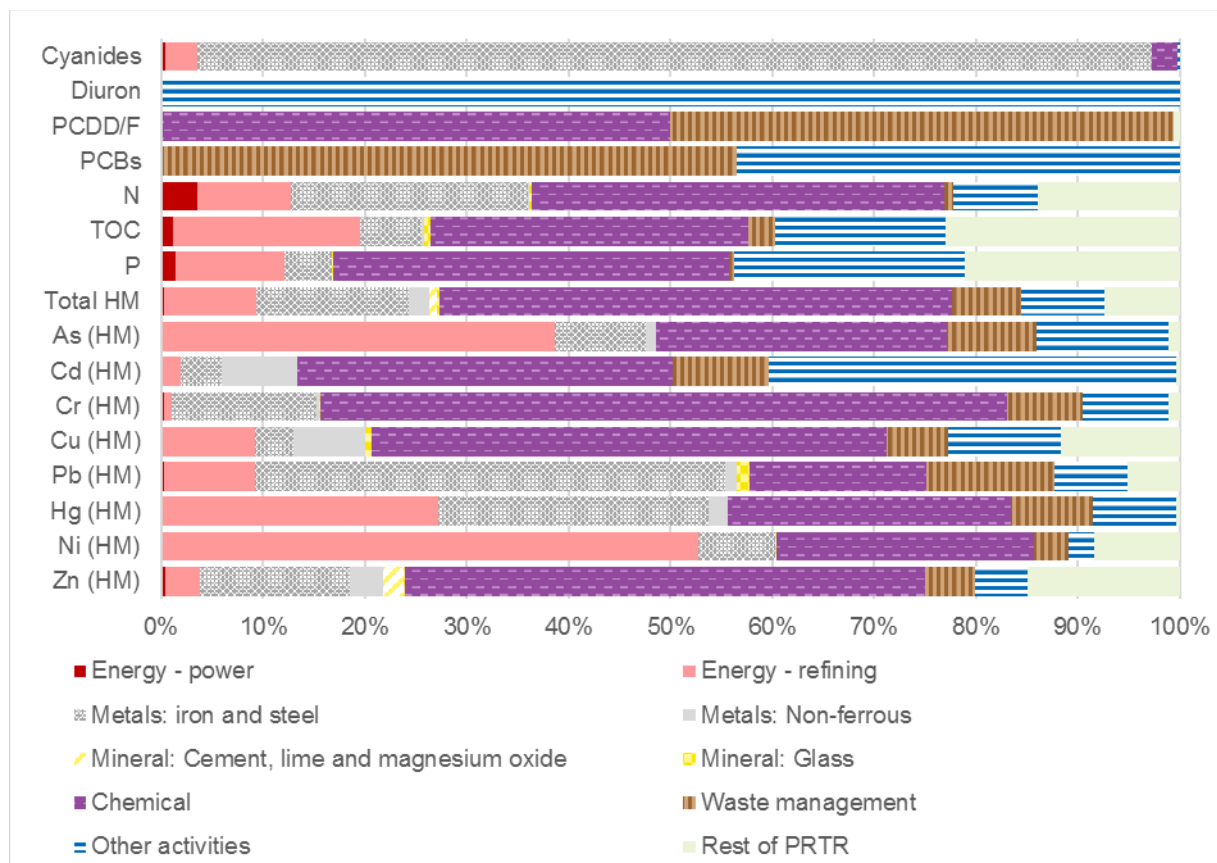
Missing data	Description	Conclusion and actions taken
Partial time series for certain pollutants and sectors	No extrapolation or interpolation undertaken as explained in the accompanying methodology paper.	No action
Data gap	No data was reported for hazardous waste	No action

4.2 Emissions to water

Emissions to water data were obtained from the national PRTR which has a broader industrial scope than the IED but is not a national total. The figures in this section, apart from Figure 23, aggregate the separate metals into a single heavy metals metric based on their relative toxicity (predicted no effect concentrations).

The available data of emissions to water for the year 2015 are shown in Figure 23. This plot presents, per pollutant, the proportion of emissions to water by the industrial sector compared to the total data reported by the Netherlands to the PRTR in 2015. Compared to the totals reported in the national PRTR, the industrial sectors are reported to contribute to the major share of emissions to water of all reported pollutants. They are reported to be the sole, or almost the sole, emitter of cyanides, diuron, PCBs, As, Cd, Cr and Hg. Among the industrial sectors, the largest contributions are from iron and steel manufacturing (cyanides, Pb), chemicals (contributing to a significant share of all pollutant emissions except for cyanides, diuron and PCBs), the waste management sector (PCBs), energy – refining (As, Hg, Ni) and ‘other activities’ (sole emitter of PCBs, contributing to all other pollutants emissions to water except for cyanides). Almost no emissions were reported for the energy – power and the mineral industrial sectors.

Figure 23: Pollutant emissions to water from IED industrial sectors and rest of PRTR total (2015)



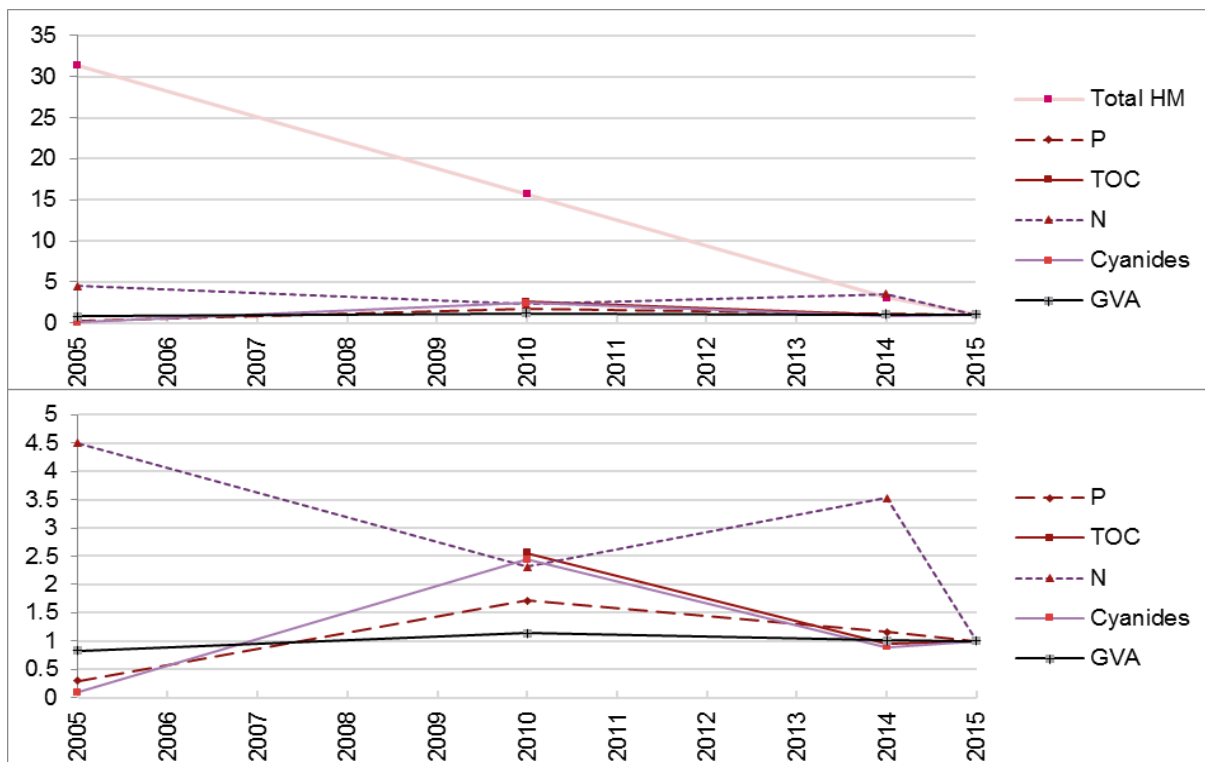
Source: Government of the Netherlands (2017)

In the following subsections, emissions data are shown in indexed charts by sector. This was done to compare the development of pollutant emissions with the GVA in specific sectors in the time period 2005 to 2015. For most industrial sectors, there is sufficient data over the time series to show a trend in the reported emissions to water; these are shown in the subsequent subsections. However, data was only reported for the years 2005, 2010, 2014 and 2015. This should be taken into mind when considering the trends presented. Full details on the emissions reported by industrial sector and year are presented at the end of this section in Table 7. Data for AOX was not reported in any sector.

Energy industry

Emissions to water from the energy-power sector were reported for some heavy metals, total P, TOC and total N for 2005, 2010, 2014 and 2015 (Figure 24). A strong decrease was recorded for all reported heavy metals. Emissions to water of total N have also decreased significantly over time whereas emissions of cyanide and total P rose in the period from 2005 to 2010, but then decreased slightly.

Figure 24: Indexed emissions to water from the energy - power sector (indexed to 2015=1)

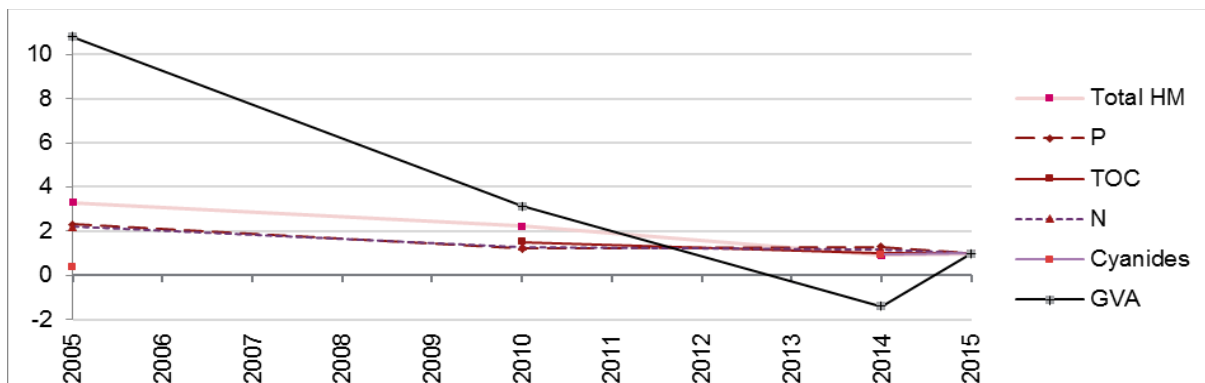


Note: No data were reported for PCBs, PCDD/Fs, diuron over a continuous time period including 2015. Total HM removed in the chart above to make the detail visible for the other pollutants.

Source: Government of the Netherlands (2017), Eurostat (2017a)

In the energy – refining sector emissions of heavy metals, P, TOC, and N decreased whereas cyanides increased slightly considering the available data reported for 2005, 2010, 2014 and 2015 (Figure 25).

Figure 25: Indexed emissions to water from the energy - refining sector (indexed to 2015=1)



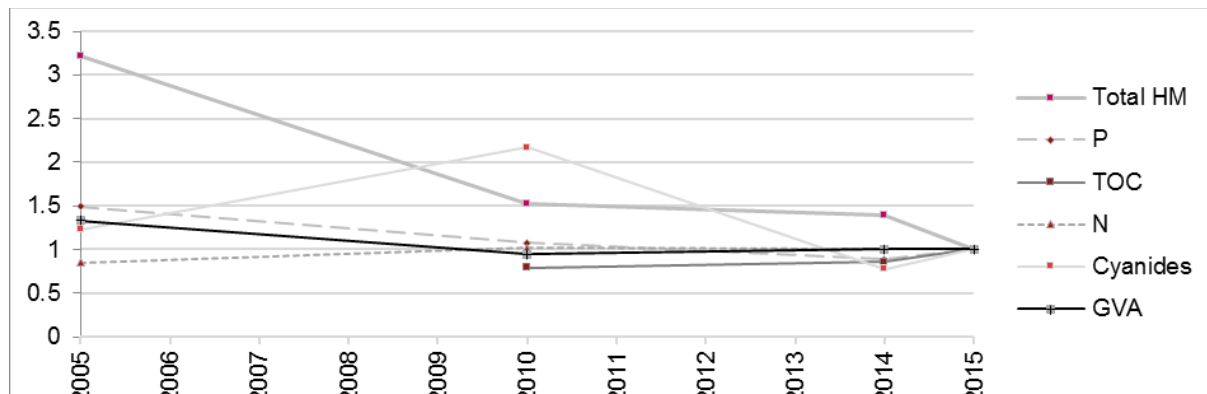
Note: No data were reported for PCBs, PCDD/Fs, diuron over a continuous time period including 2015. Limited time series, data available for 2005, 2010, 2014 and 2015. No emissions were reported for diuron, AOX and PCBs.

Source: Government of the Netherlands (2017), Eurostat (2017a)

Metal industry

As can be seen in Figure 26 and Figure 27 emissions of heavy metals to water decreased significantly in the metal industry (both for iron and steel and non-ferrous metals). A general downward trend can be observed for total P whereas for TOC an upwards trend has been reported.

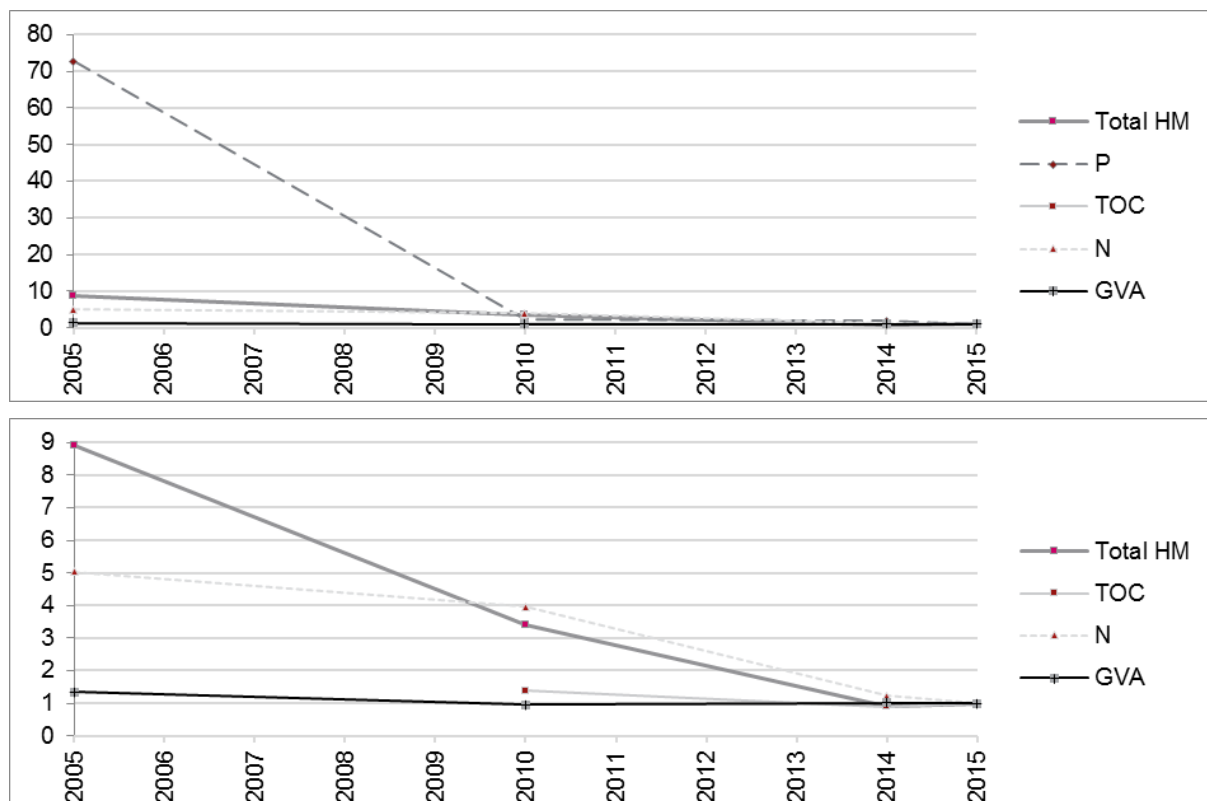
Figure 26: Indexed emissions to water from the iron and steel industrial sector (indexed to 2015=1)



Note: No data were reported for PCBs, PCDD/Fs and diuron over a continuous time period including 2015. TOC not reported for 2005.

Source: Government of the Netherlands (2017), Eurostat (2017a)

Figure 27: Indexed emissions to water from the non – ferrous metals industrial sector (indexed to 2015=1)



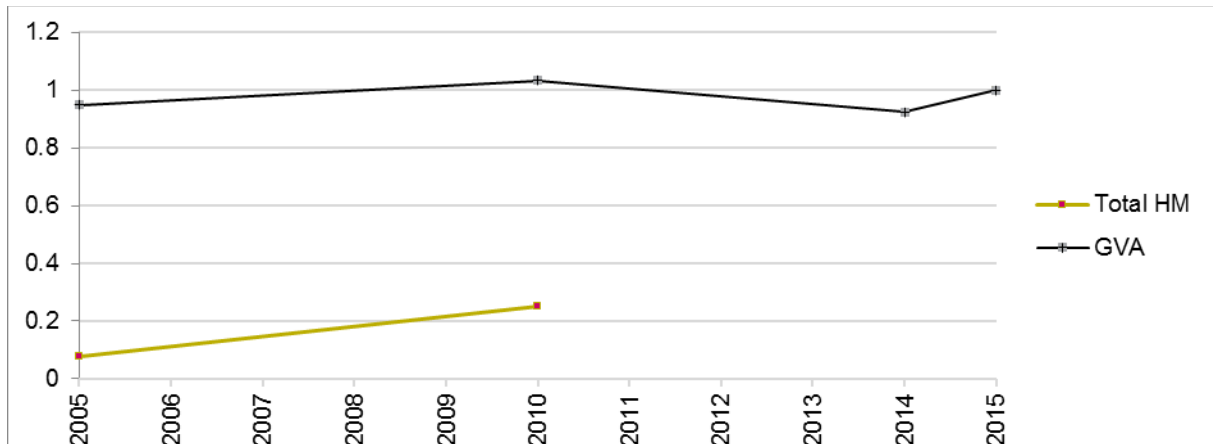
Note: No data were reported for PCBs, PCDD/Fs and diuron over a continuous time period including 2015. TOC was not reported for 2005; values not plotted. Total P removed in the second chart to make the detail visible for the other pollutants.

Source: Government of the Netherlands (2017), Eurostat (2017a)

Mineral industry

Pollutants data for the mineral - other sector was only reported in 2005. Therefore this is not presented in the figures below. In the cement, lime and magnesium oxide production sector, emissions to water of heavy metals increased significantly between 2005 and 2010. (Figure 28). In contrary, heavy metal emissions from the glass production sector have decreased significantly (Figure 29).

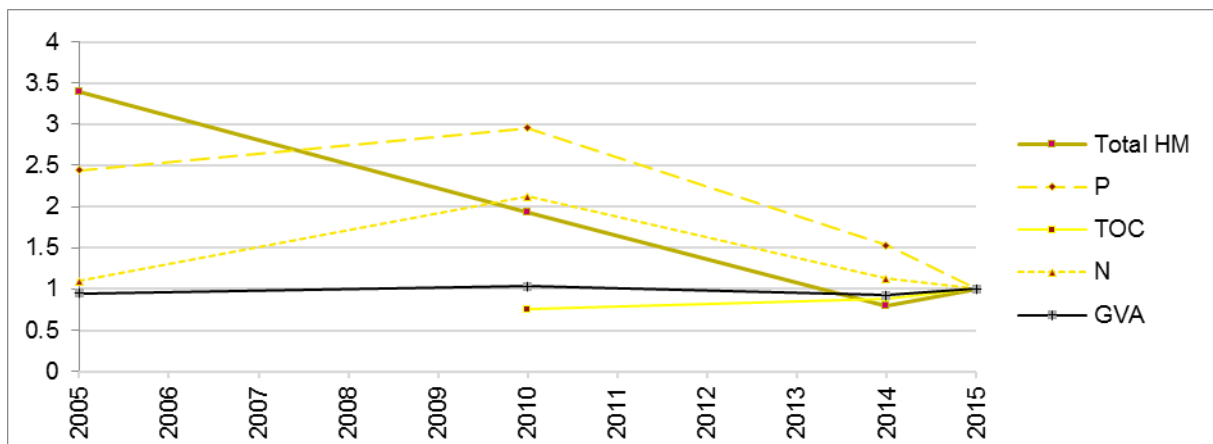
Figure 28: Indexed emissions to water from cement, lime and magnesium oxide production (mineral industrial sector) (indexed to 2015=1)



Note: Pollutants were only reported for heavy metals. No data reported for 2014; value not plotted.

Source: Government of the Netherlands (2017), Eurostat (2017a)

Figure 29: Indexed emissions to water from glass production (mineral industrial sector) (indexed to 2015=1)



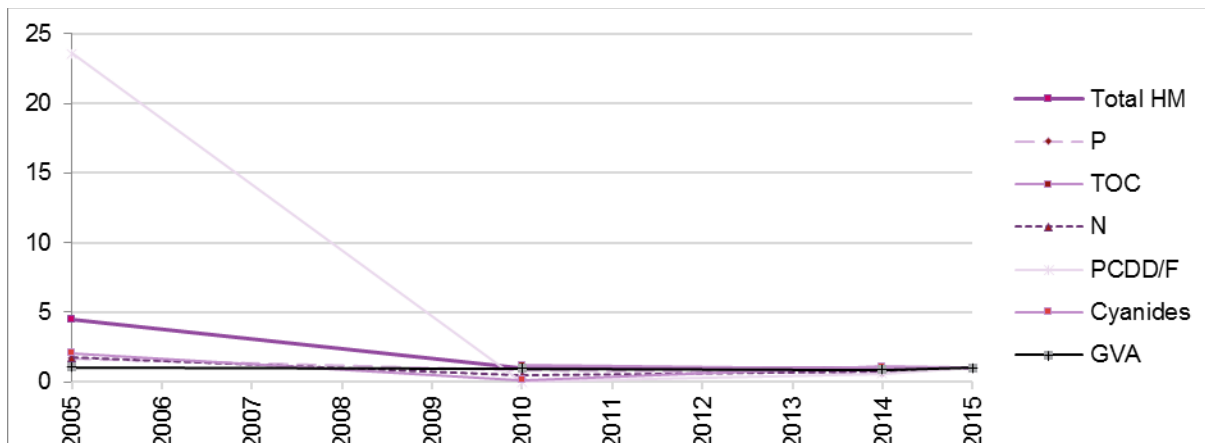
Note: No data were reported for PCDD/F, PCBs, diurons and cyanides over a continuous time period including 2015. Zero emissions reported in 2005 for TOC; value not plotted,

Source: Government of the Netherlands (2017), Eurostat (2017a)

Chemical industry

Overall emissions to water from the chemicals sector have declined up to 2010 but then remained fairly static afterwards. (Figure 30). From 2005 to 2010, the value for PCDD/F emissions decreased drastically, though in absolute terms the levels are relatively low.

Figure 30: Indexed emissions to water from the chemical sector (indexed to 2015=1)



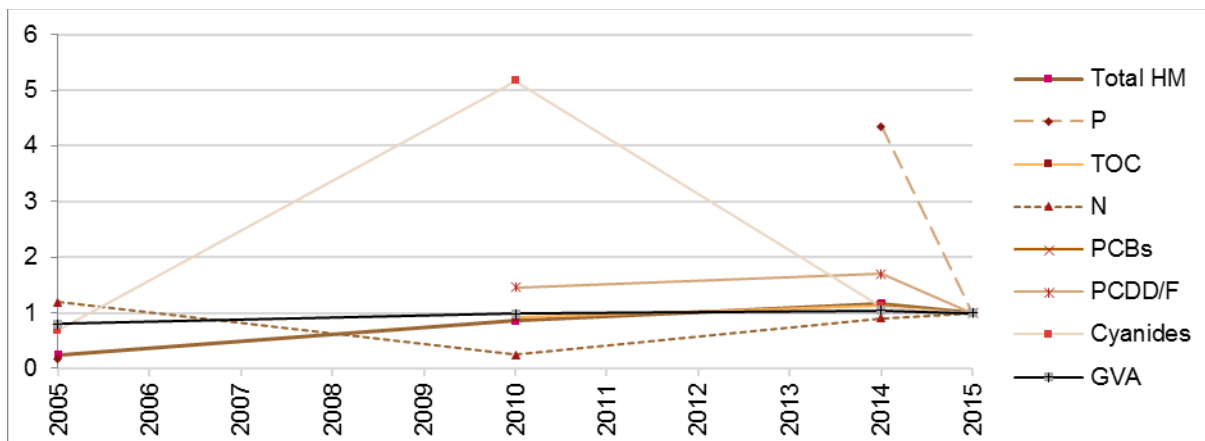
Note: No data were reported for PCBs and diurons over a continuous time period including 2015.

Source: Government of the Netherlands (2017), Eurostat (2017a)

Waste management

A breakdown of emissions to water within the waste management sector is not available; data for non-hazardous and hazardous waste is reported combined. Reported emissions data for this combined sector shows an increase in cyanides between 2005 and 2010. However, cyanides emissions decreased significantly afterwards and are reported to be at a stable level in 2014 and 2015. Emissions of P were relatively high in 2014, but dropped significantly afterwards.

Figure 31: Indexed emissions to water from the waste management sector (indexed to 2015=1)



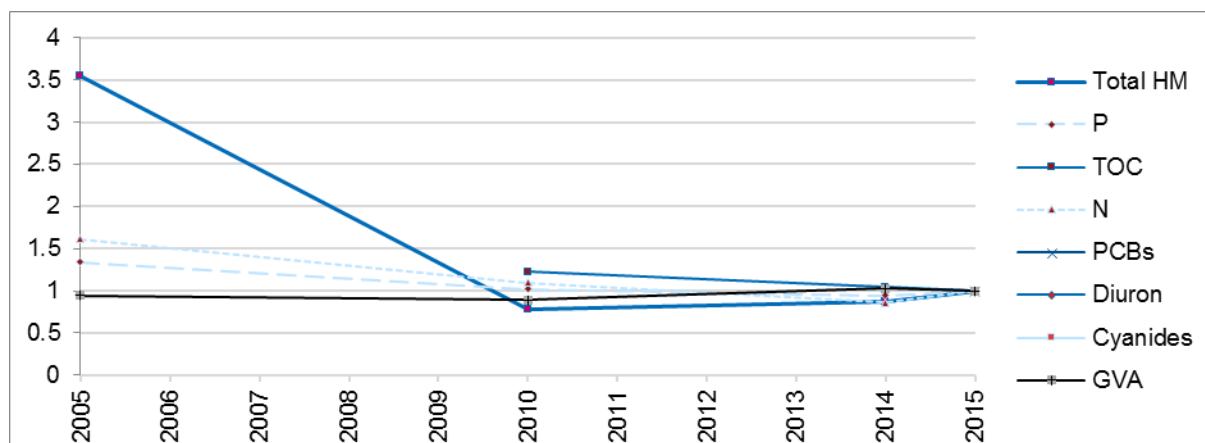
Note: No data were reported for diurons over a continuous time period including 2015. For TOC there was no data reported for 2005, for total P no data reported for 2010; values not plotted.

Source: Government of the Netherlands (2017), Eurostat (2017a)

'Other activities'

In 2015, emissions to water were reported for total heavy metals, total P, TOC, total N, PCBs, diuron and cyanides. As demonstrated in Figure 32, for 'other activities' a decrease of total heavy metal emissions can be observed between 2005 and 2010. Within this sector, almost all emissions are due to pulp, paper and wood production.

Figure 32: Indexed emissions to water from the waste management sector (indexed to 2015=1)



Note: No data were reported for PCDD/F over a continuous time period including 2015. No data reported for TOC in 2005; values not plotted. PCBs, diuron and cyanides were only reported in 2015 (no trend).

Source: Government of the Netherlands (2017), Eurostat (2017a)

Additional data for emissions to water

Additional data reported to E-PRTR for emissions to water are presented in Table 7 including for pollutants with no time series.

Table 7: Emissions to water by pollutant and industrial sector (all available data) (kg)

	2005	2010	2014	2015
Energy - power				
Total HM	18.69	9.36	1.85	0.59
P	872	4,910	3,340	2,868
TOC	-	91,012	34,133	35,559
N	364,696	187,658	285,680	81,038
Cyanides	4.50	116.96	43.00	48.00
Energy - refining				
Total HM	76.69	51.54	21.13	23.18
P	50,703	26,501	28,526	21,921
TOC	-	878,471	576,241	576,246
N	471,923	279,685	247,758	214,250
Cyanides	152	-	368	389
Metals: iron and steel				
Total HM	122.07	57.82	52.68	37.87
P	14,438	10,413	8,589	9,658
TOC	-	149,534	161,818	188,191
N	459,579	553,125	546,235	542,492
Cyanides	14,337	25,350	9,059	11,689
Metals: Non-ferrous				
Total HM	48.07	18.40	4.80	5.40
P	2,765	92	69	38
TOC	-	7,873	5,058	5,700
N	15,701	12,339	3,807	3,122
Cyanides	0.99	14.80	-	-

	2005	2010	2014	2015
Mineral: Cement, lime and magnesium oxide				
Total HM	0.15	0.48	-	1.91
N	3,000	-	-	-
Mineral: Glass				
Total HM	1.45	0.82	0.34	0.43
P	668	809	419	274
TOC	-	15,231	17,898	20,177
N	4,559	8,832	4,699	4,156
Mineral: Other				
Total HM	0.60	-	-	-
N	92.00	-	-	-
Chemical				
Total HM	580.91	125.33	122.11	128.18
P	136,721	66,790	52,984	80,008
TOC	-	1,180,830	967,341	977,947
N	1,652,024	422,877	744,401	942,540
Cyanides	664	46	361	322
Waste				
Total HM	4.23	14.60	20.04	17.09
P	168	0	4,343	998
TOC	0	74,582	92,356	81,300
N	25,014	5,120	18,902	20,979
PCBs	-	-	0.09	0.08
PCDD/F	-	0.00001	0.00001	0.000004
Cyanides	1.00	7.59	1.63	1.47
Other activities				
Total HM	73.74	16.29	18.04	20.82
P	62,823	47,709	44,120	46,773
TOC	-	643,549	548,201	524,848
N	311,793	211,696	166,626	193,040
PCBs	-	-	-	0.06
Diuron	-	-	-	0.17
Cyanides	-	-	-	17.90

Source: Government of the Netherlands (2017)

Limitations

No limitations arise as a result of the mapping to IED activities as PRTR activities are well aligned in this respect. The national PRTR data for the Netherlands does not apply the same reporting thresholds as the E-PRTR and so emissions to water reported are expected to be relatively complete and consistent between years). The PRTR has a limited timeseries.

Table 8: Gaps in emissions to water data for the Netherlands

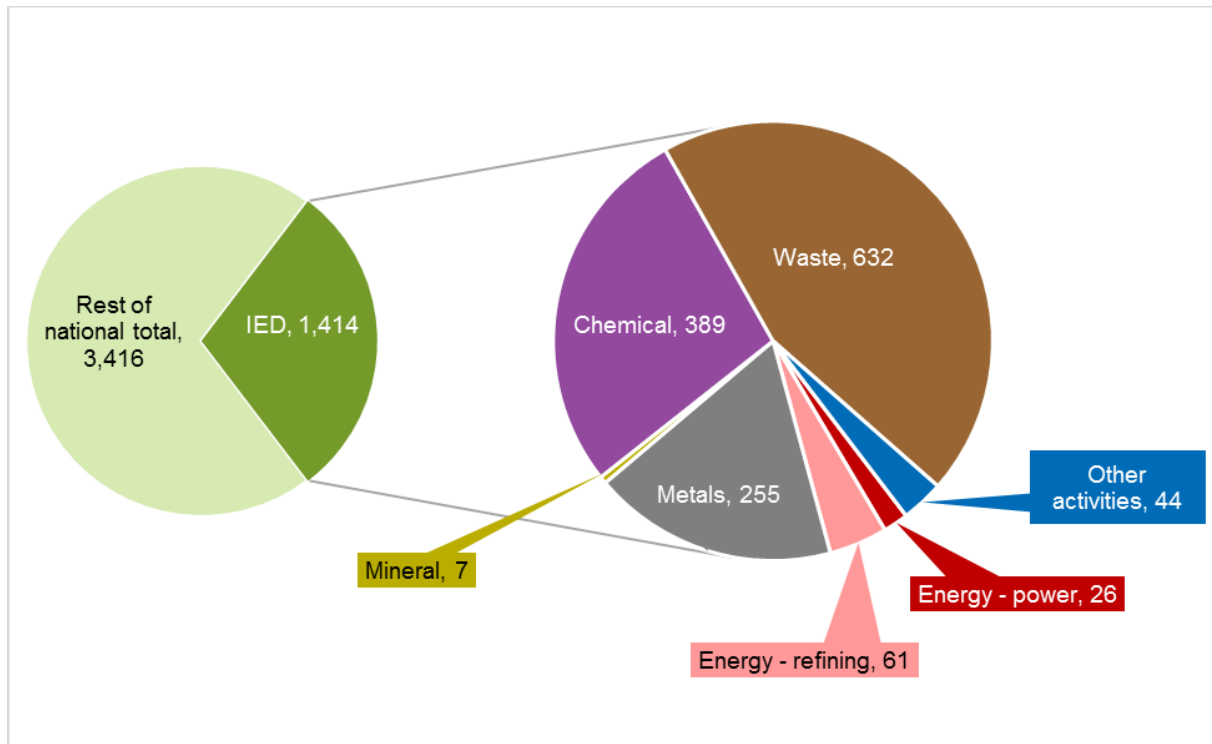
Missing data	Description	Conclusion and actions taken
Limited time-series	Data only reported for 2005, 2010, 2014 and 2015 in the national PRTR	No action
Missing pollutants	Often data are reported per industrial sector for only a few pollutants. In general no data for AOX	No action
Insufficient granularity	No distinction between hazardous and non-hazardous waste	Waste management emissions reported at sector level

5 Waste generated by industrial sectors

The data presented in this section is the generation of waste by waste category (hazardous and non-hazardous) (Eurostat, 2017e). Data is reported by Member States biennially.

Industrial sectors account for approximately 30% of total hazardous waste generated in the Netherlands (Figure 33). Within the industrial sectors, the waste management sector generates the largest quantity (47%), followed by the chemicals sector (28%) and the metals sector (18%).

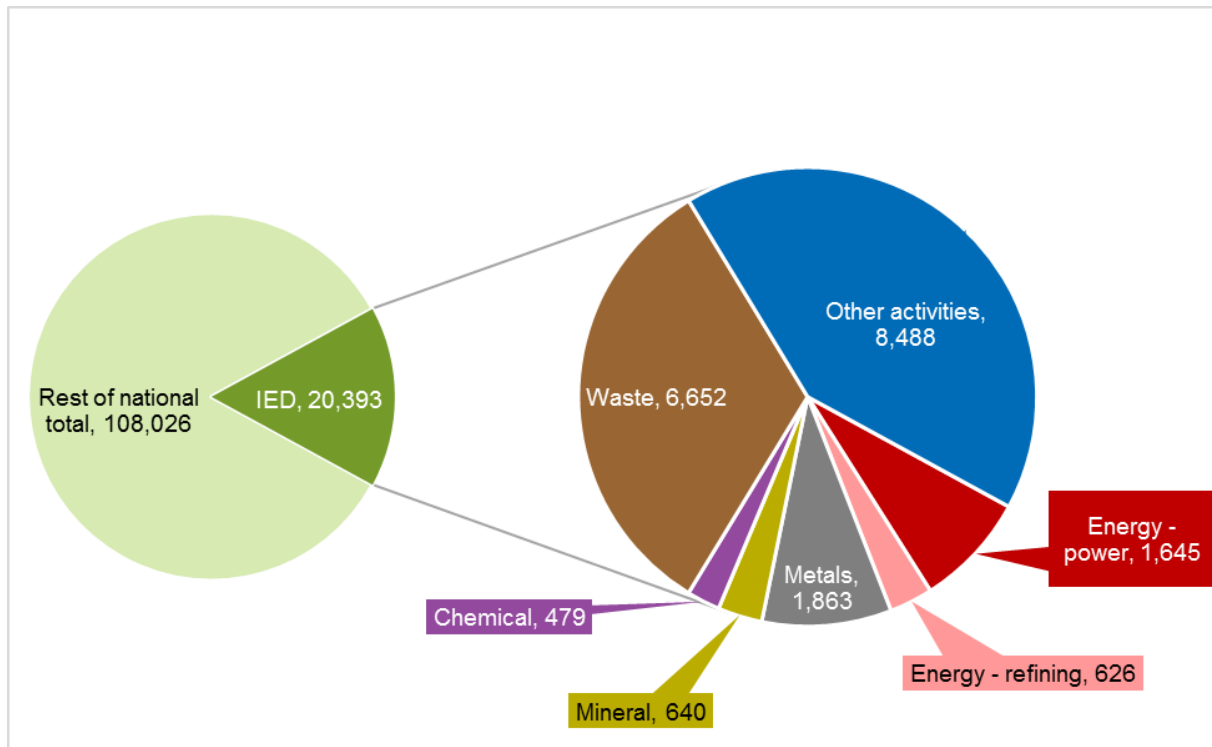
Figure 33: Hazardous waste generation by industrial sector in 2014 (kt)



Note: Rest of national total relates to all NACE activities minus the industrial sectors shown here.

Source: Eurostat (2017e)

Industrial sectors also account for a significant but smaller share (around 15%) of total non-hazardous waste generated (Figure 34) with the waste management industrial sector again accounting for a considerable volume of this (33%). The largest quantity of waste generated by the 'other activities' sector (42%).

Figure 34 Non-hazardous waste generation by industrial sector in 2014 (kt)

Note: Rest of national total relates to all NACE activities minus the industrial sectors shown here.

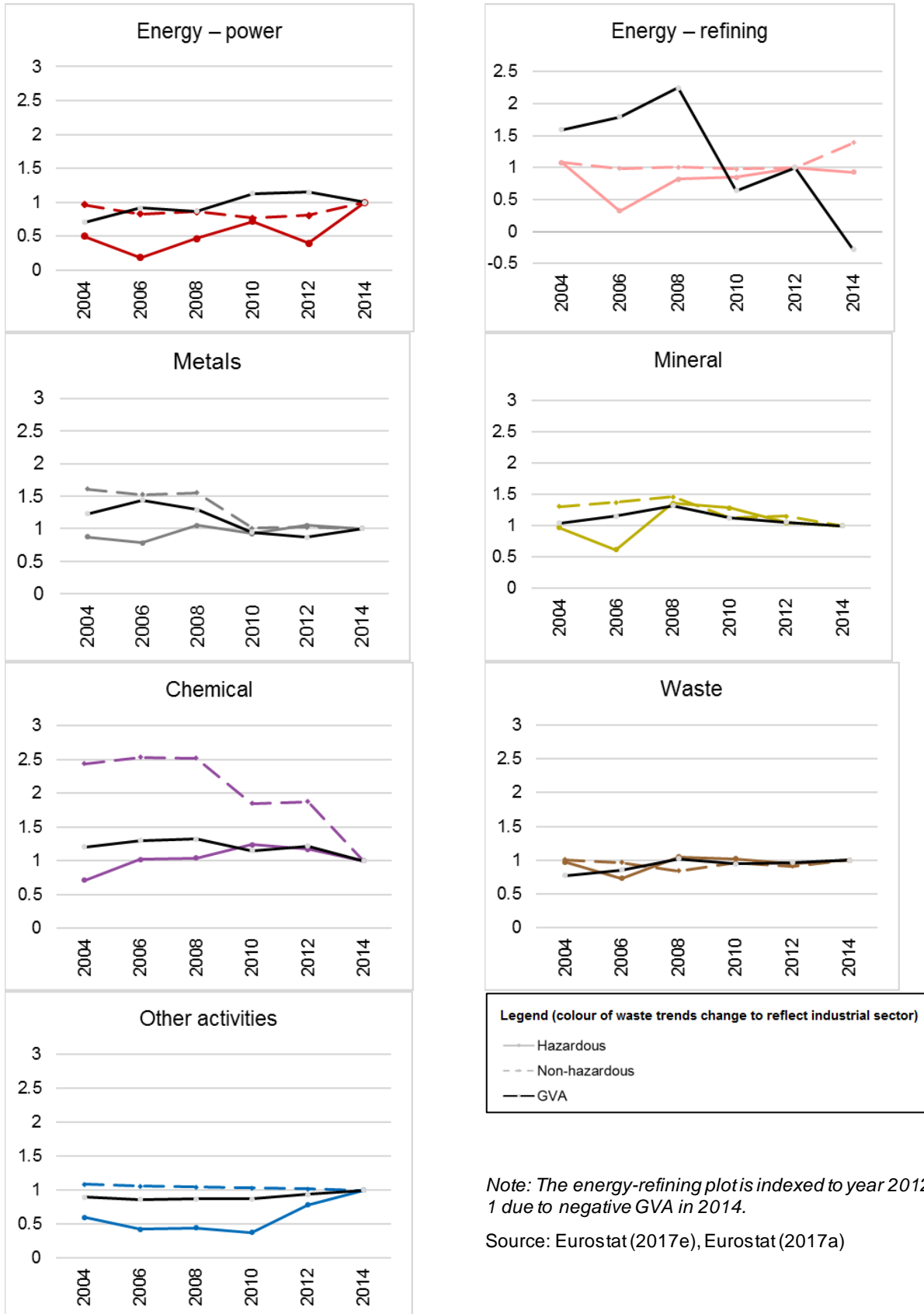
Source: Eurostat (2017e)

Non-hazardous waste generation has generally decreased between 2004 and 2014 across the different industrial sectors (about 10%). A strong decrease of over 50% was reported for the chemicals sector with a small increase for the energy – refining sector. For hazardous waste the trend goes in the other direction: an increase by 15% in the period from 2004 and 2014, especially due to significant increases in hazardous waste generated in the energy – power, metals and chemical sectors and in ‘other activities’.

Limitations

The use of NACE classifications for reporting has generally led to overreporting for waste generation data against each industrial sector compared to a scope strictly limited to the IED. No data could be included within ‘other activities’ to reflect the IED activity intensive rearing of poultry or pigs as reporting was not at the appropriate level of NACE classification.

Figure 35: Hazardous and non-hazardous waste generation by industrial sector relative to GVA (indexed; 2014 = 1, and for energy-refining indexed to 2012)



6 Challenges and Pressures

This section identifies the political and environmental challenges and pressures related to sectors or specific activities which are within the scope of the IED, and in particular whether the impact of these in a region or Member State is substantially above the EU average for that activity or sector. It is about the specific circumstances of the environmental impact of the industrial sectors or activities in that Member State which may have been indicated for example by public complaint, high profile media attention, political intervention, implementation of a specific national policy and/or which are evident from literature or analysis².

As shown in Section 2, key industries in the Netherlands in terms of the reported number of IED installations are intensive rearing of poultry or pigs (62% of total in 2015), followed by hazardous waste management (13%) and non-hazardous waste management (7%). The sectors identified as making the largest contribution to the Dutch economy as measured by GVA are food and drink production within the 'other activities' industrial sector (32% of total industrial sector GVA), chemicals (27% of total industrial sector GVA) and energy – power (15%).

The industrial sectors identified in Section 4 as contributing the largest burden to the environment for emissions to air were: the energy-power sector for SO_x and Hg, energy- refining for SO_x, 'other activities' mainly for PM_{2.5}, NMVOC, NH₃, Cu and PCDD/F, iron and steel manufacturing for most of the heavy metals, non-ferrous metal production for Cd and Zn and glass production for As. The chemicals industry (contributing to a significant share of all pollutant emissions except for cyanides, diuron and PCBs), the energy – refining sector (mainly As, Hg, Ni), iron and steel manufacturing (mainly cyanides, Pb), waste management (mainly PCBs) and other activities (sole emitter of diuron, contributing to all other pollutants emissions to water except for cyanides) were identified as having significant environmental burdens for emissions to water whereas the waste management, chemical and metals industrial sectors mainly contribute to hazardous and non-hazardous waste generation.

Note that intensive rearing of poultry and pigs is also expected to be an important sector as regards environmental pollution. However, no data could be evaluated for this sector, except emissions to air data from manure management resulting from intensive rearing of poultry or pigs. These data show that emissions from manure management from intensive rearing of poultry or pigs is responsible for nearly 20% of total national NH₃ emissions and it is almost the sole emitter amongst the industrial sectors. NH₃ emissions have also been flagged as a key challenge by the Dutch competent authorities (Table 9). Another challenge identified by the national authorities is mainly related to the combustion of fuels in large combustion plants, the refining of mineral oil and gas and intensive rearing of poultry or pigs (and to a lesser extent waste incineration) and the fact that there are stricter national limits in place which means that the IED does not offer any incentive to make further reductions in these sectors.

² The challenges and pressures included here do not concern the implementation of the IED.

Table 9: Key challenges identified in the Netherlands

Ambition level of operators due to different limit values	NL-1
IED activities / sectors	Cross-sectoral challenge: <ul style="list-style-type: none"> • 1.1 Combustion of fuels in installations with a total rated thermal input of 50 MW or more • 1.2. Refining of mineral oil and gas • 6.6 Intensive rearing of poultry or pigs • 5.2 Waste incineration
Medium and pollutants	Emissions to air (main pollutants concerned include dust (particulate matter), NO _x and hazardous substances), water and soil.
Description	<p>A cross-sector challenge in the Netherlands is that the associated emission limit values defined in the sector-specific BREFs are often higher (less strict) than the ones defined in the Dutch binding regulations and permits. This addresses specifically the sectors mentioned above. This means that there is no incentive from the IED to improve the pollution levels in these sectors in the Netherlands.</p> <p>In the Netherlands the national stricter limit values are a challenge as it results in lower competitiveness of the companies in comparison with the companies in other Member States. Challenge is about harmonization in environmental emission policy and more equal market conditions.</p> <p>This fact also negatively influences the feasibility of environmental goals like low carbon industry and the WHO guidelines on air quality. A special reference is made in this context to large combustion plants and refineries.</p>
Years applicable / current	Ongoing since 2008 (start of IPPC directive implementation).
Related infringement cases	None at EU level Due to the inconsistency between local and European regulations various local cases have been taken to court, some of those resulted in questions to the EU Court of Justice (e.g. http://curia.europa.eu/juris/document/document.jsf?text=&docid=81538&pageIndex=0&doclang=en&mode=lst&dir=&occ=first&part=1&cid=274260)
Public complaints	Operators (private sector), which have a strong lobby at parliament level, have raised complaints at high political national levels. They complain about the disadvantageous economic position they have towards industries in other EU countries, where less strict emission levels (BREF) are permitted (see above).
Media Attention	The issues have not received significant media attention.
Political interventions	<p>Political intervention has been taken place. For example, flexible regulations on SO₂ and NO_x emissions were granted to some refineries and large combustion plants.</p> <p>The Parliament has required national authorities to attend to hearings at the parliament house. A recent example are the debates on the phase-out of coal fired power plants:</p> <p>https://www.rijksoverheid.nl/documenten/kamerstukken/2017/01/19/ka-merbrief-kolencentrales-in-nederland (Annex 5 and 6 are in English)</p>
Policies implemented to address challenge	Some companies have been permitted to have higher emissions than set in the national binding rules. In most of these cases, the competent

Ambition level of operators due to different limit values		NL-1
	<p>authorities first need to allow this explicitly by setting a permit condition that deviates from the general binding rule. The concerned companies emit more than average installations in the Netherlands and use the full emission ranges of the IED, thus harmonising to EU average instead of better performing techniques.</p> <p>Fiscal incentives have also been provided to companies to help promote better performance in order to reach the stricter national limit values.</p>	
Related policies	This issue also concerns other policies such as the National Emissions Ceilings law (NEC Directive), which established stricter emission ceilings in the national regulation.	
References	IED expert from Ministry of Infrastructure and Environment Directorate Climate, Air and Noise, member of Article 13 Forum and Article 75 Committee IED	

High emission levels of dust, ammonia (air) and nitrate (soil) from intensive rearing of poultry and pigs		NL-2
IED activities / sectors	6.6 Intensive rearing of poultry or pigs	
Medium and pollutants	Emissions to air (dust, ammonia) and water (nitrate)	
Description	<p>The Netherlands have the highest livestock density of European countries and therefore had a gross N balance of around 190 kg N per ha in 2008. In this regard, they face several challenges covering intensive rearing of pigs or poultry, which are inter alia environmental pollution (ammonia emissions, agriculture also contributes to 14% of national greenhouse gas emissions), antibiotic overuse, external costs, devaluing the countryside and animal rights abuse. One specific challenge is the high emission levels of ammonia and nitrates. The ammonia levels are above the currently applicable national emission ceiling. In areas with high poultry density air quality emission levels for fine particles are exceeded. Considering the emission levels which have to be achieved in the Netherlands, the IRPP BREF allows relatively high levels of pollution, which is a challenge as they are too high to achieve the national environmental Dutch goals.</p>	
Years applicable / current	Ongoing since 1980s	
Related infringement cases	None	
Public complaints	Public complaints were mainly related to odour, but this is changing now to health concerns.	
Media Attention	<p>High media attention exists due to odour complaints by the population and more recently due to health concerns (i.e. bacterial hazards in the air). The scientific community also has a strong presence in media. Intervention was carried out by NGOs and scientists, see for example: https://www.rijksoverheid.nl/documenten/rapporten/2016/07/07/rapport-veehouderij-en-gezondheid-omwonenden</p>	
Political interventions	General binding rules (GBR) on ammonia, nitrate and dust.	

High emission levels of dust, ammonia (air) and nitrate (soil) from intensive rearing of poultry and pigs		NL-2
Policies implemented to address challenge	General binding rules on ammonia, nitrate and dust levels. It is unclear to what extent the introduction and implementation of the GBR has resolved the challenge.	
Related policies	Further related policies are the Nature conservation policy ³ (due to the expansion of pig farms), the public health policy and the NEC Directive ⁴	
References	EC 2017: Commission Staff Working Document. The EU Environmental Implementation Review Country Report – The Netherlands. IED expert from Ministry of Infrastructure and Environment, Directorate Climate, Air and Noise, member of Article 13 Forum and Article 75 Committee IED	

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⁴ Directive 2016/2284/EU on the reduction of national emissions of certain atmospheric pollutants

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Appendices

Appendix 1 Mapping industrial sectors across data sources for the Netherlands.

Appendix 2 Emissions to air by pollutant and industrial sector (detail)

Appendix 1 - 1 1: Mapping industrial sectors across data sources for the Netherlands

Industrial sector	GVA†	Employment	Energy consumption‡	Water consumption	Water consumption	Emissions to air	Emissions to water	Waste generated
	Eurostat (2017a)	Eurostat (2017b)	Eurostat (2017c)	Eurostat (2017d)	Poyry and VITO (2012)	EEA (2016c)	EEA (2017)	Eurostat (2017e)
Sector classification	NACE Rev 2	NACE Rev 2	Energy balance indicator	NACE Rev 2	Own definitions	NFR14 sector classification	E-PRTR	NACE Rev 2
Time series available	2000-2015, annually	2008-2015, annually	2000-2015, annually	2000-2015, annually	No time series	2000-2014, annually	2007-2015, annually	2004-2014, every 2 years
Energy power	D (electricity, gas, steam and air conditioning supply)	D35 (electricity, gas, steam and air conditioning supply)	B_101301 - Own Use in Electricity, CHP and Heat Plants	D (electricity, gas, steam and air conditioning supply)	Cooling in power generation	1A1a Public electricity and heat production; 1A2a-f Stationary combustion in manufacturing industries and construction	Power generation (1c)	D (electricity, gas, steam and air conditioning supply)
Energy - refining	C19 (coke and refined petroleum products)	C19 (coke and refined petroleum products)	B_101307 - Petroleum Refineries; B_101320 - Non-specified (Energy)	DATASETS COMBINED: C19 (coke and refined petroleum products) AND C20 (chemicals) and C21 (pharmaceutical products)	Processing and cooling in the oil refinery sector	1A1b Petroleum refining; 1A1c Solid fuels and other energy industries	Refining (1a), gasification and liquefaction (1b), coke ovens (1c)	C19 (coke and refined petroleum products)
Metals: iron and steel	C24 (basic metals)	C24 (basic metals)	B_101805 - Iron and Steel	C24 (basic metals)	Cooling processes in the iron and steel sector. No estimate	2C1 Iron and steel	Iron and steel manufacturing (2a-d)	C24-C25 (basic metals; fabricated metal products, except machinery and equipment)
Metals: non-ferrous			B_101810 - Non-Ferrous Metals			2C2-7 Non-ferrous metals	Non-ferrous metal production (2e)	C23 (non-metallic mineral products)
Minerals, in aggregate (cement, lime and magnesium oxide, glass and other)	C23 (non-metallic mineral products)	C23 (non-metallic mineral products)	B_101820 - Non-Metallic Minerals	Insufficient granularity in reported data	Processing in the non-metal mineral products	2A1 Cement; 2A2 Lime; 2A3 Glass; 2A6 Other	Cement, lime and magnesium oxide (3c); Glass (3e); Other (3f-g)	C23 (non-metallic mineral products)
Chemical	C20 (chemicals); C21 (pharmaceutical products)	C20 (chemicals); C21 (pharmaceutical products)	B_101815 - Chemical and Petrochemical	DATASETS COMBINED: C20 (chemicals) and C21 (pharmaceutical products) AND C19 (coke and refined petroleum products)	No estimates	2B1 Ammonia; 2B6 Titanium dioxide; 2B2 Nitric acid; 2B7 Soda ash; 2B3 Adipic acid; 2B10a Other; 2B5 Carbide; 2J Production of POPs	Chemical industry (4a-f)	C20-C22 (chemicals; pharmaceuticals; rubber and plastic products)
Waste: hazardous	E37-E39 (water supply; sewerage, waste management and remediation)	E38 (waste collection, treatment and disposal activities; materials recovery)	No indicator	Insufficient granularity in reported data	No estimates	5C1bi Industrial waste incineration 5C1biv Sewage sludge incineration; 5C1bii Hazardous waste incineration; 5C1bvi Other waste incineration; 5C1biii Clinical waste incineration	Hazardous waste (5a)	E37-E39 (water supply; sewerage, waste management and remediation)
Waste: non-hazardous			B_101318 - Gasification plants for biogas	Insufficient granularity in reported data		5A Solid waste disposal on land; 5C1a Municipal waste incineration; 5B1 Composting; 5C1bv Cremation; B2 Anaerobic digestion at biogas facilities; 5D2 Industrial wastewater handling	Non-hazardous waste (5b-e; g)	
Other activities (paper and board, pulp, textiles, tanning, food and drink products, intensive rearing of pigs and poultry, and surface treatment)	C10-C12 (food and drinks and tobacco)	C10 (food products); C11 (drink products)	B_101830 - Food and Tobacco		Processing in the food industry (sugar and beer subsectors)	2H Food and beverages industry	Food and drink (8a-c)	C10-C12 (food products; drink products; tobacco)
	C13-C15 (textiles; wearing apparel; leather)	C13-C15 (textiles; wearing apparel; leather)	B_101835 - Textile and Leather	DATASETS COMBINED: C10-12 (food and drinks and tobacco); C13-15 (textiles; wearing apparel; leather); C16-17 (paper and wood products)	Processing and cooling in the textile sector		Pre-treatment or dyeing of textile fibres or textiles (9a); Tanning of hides and skins (9b)	C13-C15 (textiles; wearing apparel; leather)
	C16 (wood products)	C16 (wood products);	B_101851 - Wood and Wood Products		No estimates	2I Wood processing		C16 (wood products)
	C17 (paper and paper products)	C17 (paper and paper products)	B_101840 - Paper, Pulp and Print		Processing in the pulp and paper industry	2H1 Pulp and paper industry	Pulp, paper and wood production (6a-c)	C17-C18 (paper and paper products; printing)
	Insufficient granularity reported data	Insufficient granularity reported data	No indicators	Insufficient granularity in reported data	No estimates	3B4gi Manure management - Laying hens; 3B4gii Manure management - Broilers	Intensive rearing of poultry and pigs (7a)	Insufficient granularity in reported data
	Insufficient granularity reported data	Insufficient granularity reported data	No indicators	Insufficient granularity in reported data	No estimates	2D3d Coating applications; 2D3e Degreasing; 2D3f Dry cleaning; 2D3g Chemical products; 2D3h Printing; 2D3i Other solvent use; 2G Other product use; 2H3 Other industrial processes	Surface treatment (2f; 9c); Production of carbon (9d)	Insufficient granularity in reported data
Rest of national total	All NACE activities	All NACE activities	B_100900 – Gross inland consumption	All NACE activities	National total for the entire territory (based on fuel sold)	National total for all E-PRTR activities reported	All NACE activities plus households	

Notes: † Number of IED installations is reported against IED activities for years 2011, 2013 and 2015. ‡ Additional Energy Balance indicators are applicable to the industrial sector categories but not included here as no data reported for the Netherlands (excluded indicators are: B_101312 - Coke Ovens; B_101314 - Gas Works; B_101316 - Coal Liquefaction Plants; B_101317 - Liquefaction (LNG) / regasification plants; B_101319 - Gas-to-liquids (GTL) plants (energy); B_101315 - Blast Furnaces)

Appendix 2 - 1 2: Emissions to air by pollutant and industrial sector (detail)

Notes: Emissions rounded to two decimal places except in cases, where more decimal places were necessary to show the real value. Industrial sectors and pollutants with no data reported across the timeseries have been removed.

Pollutant	Unit (emissions per unit)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Energy - power																	
SO _x	Gg (1000 tonnes)	25.46	27.21	25.14	24.58	22.84	21.97	21.28	20.48	17.42	13.15	15.45	15.93	15.12	14.85	14.65	14.45
NO _x	Gg (1000 tonnes)	78.69	74.13	75.04	77.06	73.02	70.24	64.82	56.37	51.97	46.66	49.04	44.58	42.99	41.57	38.29	39.16
PM _{2.5}	Gg (1000 tonnes)	0.61	0.30	0.49	0.47	0.47	0.53	0.48	0.35	0.34	0.45	0.33	0.31	0.30	0.30	0.38	0.38
NM VOC	Gg (1000 tonnes)	3.73	2.21	1.84	1.30	1.62	1.94	2.61	1.52	2.71	2.42	2.04	2.95	3.62	3.88	4.08	2.66
NH ₃	Gg (1000 tonnes)	0.07	0.11	0.13	0.16	0.22	0.29	0.10	0.09	0.48	0.30	0.20	0.52	0.54	0.24	0.13	0.24
Cd (HM)	Mg (tonne)	0.08	0.10	0.11	0.07	0.05	0.09	0.09	0.09	0.91	0.89	1.46	0.17	0.12	0.04	0.03	0.03
As (HM)	Mg (tonne)	0.08	0.08	0.46	0.20	0.23	0.16	0.05	0.32	0.11	0.11	0.12	0.16	0.15	0.11	0.07	0.06
Cr (HM)	Mg (tonne)	0.29	0.15	0.13	0.26	0.33	0.34	0.32	0.18	0.37	0.18	0.27	0.22	0.18	0.20	0.18	0.17
Cu (HM)	Mg (tonne)	0.19	0.19	0.29	0.57	0.44	0.37	0.23	0.23	1.31	1.18	1.26	0.64	0.57	0.24	0.19	0.17
Pb (HM)	Mg (tonne)	0.20	0.19	0.21	0.27	0.27	0.25	0.29	0.25	1.55	1.86	3.41	0.87	0.79	0.55	0.36	0.25
Hg (HM)	Mg (tonne)	0.47	0.35	0.30	0.27	0.35	0.38	0.34	0.28	0.26	0.23	0.23	0.23	0.21	0.18	0.25	0.23
Ni (HM)	Mg (tonne)	0.09	0.23	0.50	0.75	2.41	2.02	2.53	0.39	1.22	0.19	0.16	0.17	0.17	0.21	0.08	0.17
Zn (HM)	Mg (tonne)	0.59	0.41	0.68	0.45	0.69	0.52	0.57	0.81	6.56	12.72	12.63	8.64	6.83	5.89	5.23	5.22
PCDD+PCDF	g	0.45	0.34	0.81	0.14	0.95	1.57	1.30	1.12	4.99	4.29	6.84	7.23	1.81	1.01	1.09	1.07

Pollutant	Unit (emissions per unit)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Energy - refining																	
SO _x	Gg (1000 tonnes)	33.49	35.12	30.77	29.76	32.46	32.37	32.62	30.12	25.97	18.14	13.00	12.85	14.20	10.30	9.98	11.33
NO _x	Gg (1000 tonnes)	16.17	16.80	16.20	15.58	14.48	14.34	15.31	14.26	13.34	8.99	9.93	10.30	10.21	10.74	10.92	10.73
PM _{2.5}	Gg (1000 tonnes)	2.40	0.93	0.0030	2.01	0.22	0.77	0.30	0.87	0.83	0.34	0.20	0.23	0.13	0.16	0.18	0.18
NMVOG	Gg (1000 tonnes)	0.21	1.12	0.06	4.21	1.83	0.76	0.79	0.35	0.90	2.31	1.46	0.53	0.57	0.44	0.39	0.45
NH ₃	Gg (1000 tonnes)	0.01	-	-	-	0.03	0.01	0.02	0.02	0.0045	-	-	-	-	-	-	-
Cd (HM)	Mg (tonne)	0.01	0.01	0.0041	0.0040	0.01	0.0027	0.0032	0.01	0.01	0.0010	-	-	-	-	-	-
As (HM)	Mg (tonne)	-	0.0001	0.0000	0.0000	0.79	0.78	0.01	0.01	0.0039	0.0020	-	-	-	-	-	-
Cr (HM)	Mg (tonne)	0.42	0.45	0.24	0.24	0.08	0.07	0.06	0.10	0.08	0.03	-	-	-	-	-	-
Cu (HM)	Mg (tonne)	0.12	0.13	0.05	0.05	0.02	0.0023	0.01	0.04	0.02	0.03	-	-	-	-	-	-
Pb (HM)	Mg (tonne)	0.01	0.02	0.01	0.01	0.01	0.0011	0.01	0.03	0.02	0.19	-	-	-	-	-	-
Hg (HM)	Mg (tonne)	0.04	0.05	0.02	0.01	0.01	0.0013	0.0011	0.0019	0.0008	0.0020	-	-	-	-	-	-
Ni (HM)	Mg (tonne)	17.39	21.47	9.85	10.13	8.64	6.39	5.68	6.67	5.73	1.37	-	-	-	-	-	-
Zn (HM)	Mg (tonne)	0.51	0.58	0.46	0.54	0.48	0.51	0.24	0.67	0.51	0.20	-	-	-	-	-	-
PCDD+PCDF	g	-	-	0.01	-	-	-	-	-	-	-	-	-	-	0.02	0.02	0.02
Metals: iron and steel																	
SO _x	Gg (1000 tonnes)	-	0.04	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-
NO _x	Gg (1000 tonnes)	0.07	0.05	0.02	-	-	-	-	-	-	0.01	-	-	-	-	-	-
PM _{2.5}	Gg (1000 tonnes)	1.46	1.23	1.12	1.16	1.18	1.09	1.06	1.14	1.00	0.92	0.98	0.93	0.76	0.80	0.80	0.78
NMVOG	Gg (1000 tonnes)	1.60	1.41	1.58	1.41	1.11	1.31	1.23	1.19	1.18	0.98	1.30	1.40	1.34	1.14	1.10	1.14
NH ₃	Gg (1000 tonnes)	0.02	0.02	0.02	0.02	0.02	0.04	0.05	0.03	0.03	0.0021	0.02	0.02	0.03	0.02	0.02	0.03
Cd (HM)	Mg (tonne)	0.41	0.63	0.92	0.71	0.69	0.66	0.69	0.91	0.73	0.69	0.83	0.67	0.43	0.35	0.21	0.17
As (HM)	Mg (tonne)	0.34	0.27	0.21	0.21	0.15	0.25	0.32	0.39	0.31	0.30	0.31	0.62	0.46	0.41	0.43	0.43
Cr (HM)	Mg (tonne)	0.91	0.93	1.45	1.07	1.14	0.97	0.91	1.07	0.84	0.73	0.73	0.67	0.82	0.73	0.62	0.57
Cu (HM)	Mg (tonne)	0.68	0.78	2.00	0.98	0.74	0.70	0.74	0.98	0.74	0.98	1.56	1.46	1.49	0.80	0.44	0.47
Pb (HM)	Mg (tonne)	18.84	23.01	26.93	24.65	25.42	22.95	22.39	28.84	23.38	24.45	29.86	17.47	11.29	9.45	3.35	3.46
Hg (HM)	Mg (tonne)	0.09	0.12	0.12	0.12	0.21	0.21	0.20	0.24	0.26	0.24	0.19	0.25	0.19	0.17	0.06	0.07
Ni (HM)	Mg (tonne)	-	-	0.04	0.04	0.58	0.54	0.57	1.03	0.68	0.66	0.75	1.03	0.81	0.82	0.80	0.78
Zn (HM)	Mg (tonne)	27.50	27.50	27.96	28.34	23.05	19.02	26.44	24.66	19.11	15.71	24.81	26.02	27.65	19.93	17.52	15.73
PCDD+PCDF	g	1.40	1.47	2.10	1.65	1.78	1.40	1.77	2.15	2.15	1.98	1.72	1.98	1.20	2.75	0.15	0.27

Pollutant	Unit (emissions per unit)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Metals: Non-ferrous																	
PM _{2.5}	Gg (1000 tonnes)	0.57	0.50	0.49	0.45	0.43	0.30	0.28	0.30	0.27	0.16	0.21	0.20	0.05	0.0019	0.0016	0.03
NMVOG	Gg (1000 tonnes)	0.33	0.32	0.35	0.20	0.05	0.12	0.15	0.40	0.35	0.35	0.23	0.24	0.24	0.17	0.25	0.31
NH ₃	Gg (1000 tonnes)	0.02	0.0015	0.0034	0.01	0.01	0.01	0.0045	0.0044	0.0040	0.0037	0.0037	0.0037	0.0037	0.0037	0.0038	0.0038
Cd (HM)	Mg (tonne)	0.33	0.23	0.19	0.21	0.05	0.04	0.03	0.04	0.05	0.02	0.04	0.05	0.04	0.04	0.12	0.15
As (HM)	Mg (tonne)	0.43	0.32	0.25	0.31	0.08	0.04	0.03	0.04	0.08	0.03	0.03	0.04	0.01	0.01	0.01	0.01
Cr (HM)	Mg (tonne)	0.86	0.64	0.46	0.54	0.21	0.16	0.14	0.17	0.14	0.03	0.07	0.05	0.02	0.02	0.02	0.01
Cu (HM)	Mg (tonne)	0.95	0.71	0.50	0.50	0.35	0.35	0.31	0.27	0.28	0.25	0.18	0.20	0.16	0.16	0.15	0.15
Pb (HM)	Mg (tonne)	1.43	1.08	1.23	1.02	0.68	0.70	0.53	0.66	0.64	0.47	0.57	0.52	0.49	0.47	1.86	1.17
Hg (HM)	Mg (tonne)	0.0011	0.0009	0.0010	0.0020	0.0013	0.0014	0.0000 48	0.0000 47	0.0000 47	0.0000 10	0.0000 08	0.05	0.06	0.03	0.05	0.05
Ni (HM)	Mg (tonne)	0.26	0.29	0.20	0.21	0.21	0.32	0.30	0.29	0.82	0.20	0.35	0.32	0.25	0.02	0.02	0.11
Zn (HM)	Mg (tonne)	20.06	16.27	16.52	15.30	15.60	13.49	13.64	12.77	12.05	12.34	13.86	13.06	13.31	14.44	45.11	31.43
PCDD+PCDF	g	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mineral: Cement, lime and magnesium oxide																	
SO _x	Gg (1000 tonnes)	-	-	-	-	-	0.03	-	-	0.29	0.07	0.07	0.09	0.07	0.04	0.03	0.04
PM _{2.5}	Gg (1000 tonnes)	0.03	0.02	0.02	0.01	0.02	0.04	0.04	0.04	0.03	0.02	0.03	-	-	0.02	0.02	0.02
NMVOG	Gg (1000 tonnes)	-	0.0003	-	-	-	-	-	-	-	0.0001	-	0.03	0.03	-	-	-
NH ₃	Gg (1000 tonnes)	-	-	-	-	-	-	-	-	-	0.10	0.03	0.03	0.02	0.02	0.02	0.03
Cu (HM)	Mg (tonne)	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	-	-	-	-
Hg (HM)	Mg (tonne)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.01	0.01	0.01	0.01	0.0036	0.02	0.0031	0.0032
Mineral: Glass																	
SO _x	Gg (1000 tonnes)	0.59	1.29	1.27	0.0017	-	0.03	0.0034	0.0033	0.0034	0.0034	0.0031	0.0033	0.0031	0.0029	0.0029	0.0031
NO _x	Gg (1000 tonnes)	0.46	0.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM _{2.5}	Gg (1000 tonnes)	0.01	0.06	0.06	0.0011	0.06	0.05	0.07	0.09	0.07	0.06	0.06	0.07	0.05	0.06	0.09	0.11
NMVOG	Gg (1000 tonnes)	0.02	0.06	0.10	0.09	0.06	0.07	0.06	0.03	0.0006	0.0007	0.0003	0.0004	0.0004	0.0003	0.0007	0.0008
NH ₃	Gg (1000 tonnes)	0.19	0.22	0.15	0.15	0.12	0.14	0.15	0.13	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01
Cd (HM)	Mg (tonne)	-	0.0010	-	-	0.0020	0.0034	0.0030	0.0020	-	-	-	-	0.0014	0.0013	0.0012	0.0021
As (HM)	Mg (tonne)	-	-	-	-	-	0.09	0.09	0.08	0.07	0.14	0.14	0.16	0.19	0.17	0.14	0.15
Cr (HM)	Mg (tonne)	-	0.04	0.18	-	0.12	0.13	0.18	0.09	0.06	0.05	0.06	0.05	0.06	0.06	0.06	0.07

Pollutant	Unit (emissions per unit)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cu (HM)	Mg (tonne)	-	0.01	-	-	0.0010	0.01	0.02	0.03	0.03	0.0030	0.01	0.01	0.01	0.01	0.0030	0.13
Pb (HM)	Mg (tonne)	2.90	2.56	1.54	-	2.47	1.37	1.82	1.75	1.54	1.49	0.84	0.73	0.80	0.88	0.99	0.98
Hg (HM)	Mg (tonne)	-	-	-	-	-	-	-	-	-	-	0.01	0.01	0.01	0.01	0.01	0.01
Ni (HM)	Mg (tonne)	-	0.16	0.03	-	0.04	0.02	0.12	0.03	0.05	0.0030	0.01	0.01	0.0040	0.01	0.01	0.01
Mineral: Other																	
SO _x	Gg (1000 tonnes)	0.91	1.12	1.16	0.80	0.88	0.92	0.93	0.93	0.94	0.92	0.80	0.88	0.82	0.74	0.75	0.79
NO _x	Gg (1000 tonnes)	0.51	0.73	0.72	0.45	0.49	0.51	0.52	0.52	0.53	0.54	0.48	0.68	0.68	0.70	0.70	0.70
PM _{2.5}	Gg (1000 tonnes)	0.34	0.54	0.78	0.36	0.35	0.35	0.35	0.35	0.35	0.35	0.36	0.35	0.35	0.35	0.36	0.36
NMVOG	Gg (1000 tonnes)	0.15	0.17	0.42	0.04	0.18	0.06	0.04	0.15	0.10	0.28	0.07	0.42	0.07	0.07	0.07	0.07
NH ₃	Gg (1000 tonnes)	0.29	0.29	0.31	0.30	0.28	0.29	0.29	0.30	0.06	0.05	0.03	0.03	0.03	0.03	0.03	0.03
Hg (HM)	Mg (tonne)	-	-	-	-	-	-	-	-	-	0.0032	-	0.0046	0.0046	0.0046	0.0046	0.0046
Zn (HM)	Mg (tonne)	0.47	0.47	0.48	0.47	-	-	-	-	-	-	-	-	-	-	-	-
Chemical																	
NO _x	Gg (1000 tonnes)	0.80	0.79	0.94	0.22	-	-	-	-	-	-	-	-	-	-	-	-
PM _{2.5}	Gg (1000 tonnes)	0.81	0.86	1.06	0.79	0.90	0.88	0.85	0.79	0.57	0.80	0.98	0.81	0.89	1.01	0.84	0.80
NMVOG	Gg (1000 tonnes)	12.59	10.92	10.44	10.08	10.05	7.92	7.85	7.52	6.30	5.15	5.72	5.47	7.43	5.64	5.27	4.65
NH ₃	Gg (1000 tonnes)	1.81	1.76	1.46	1.54	2.14	1.45	1.26	1.06	0.79	0.68	0.63	0.54	0.45	0.60	0.55	0.52
Cd (HM)	Mg (tonne)	0.03	0.56	0.88	1.26	0.85	0.80	1.04	0.57	0.10	0.09	0.10	0.13	0.12	0.09	0.09	0.08
As (HM)	Mg (tonne)	-	-	-	0.0002	0.0050	0.01	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Cr (HM)	Mg (tonne)	0.12	0.05	0.07	0.23	0.07	0.07	0.06	0.15	0.07	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cu (HM)	Mg (tonne)	-	0.03	0.02	0.07	0.05	0.06	0.01	0.22	0.01	0.0049	0.02	0.01	0.01	0.01	0.01	0.0050
Pb (HM)	Mg (tonne)	1.07	2.08	2.96	3.74	2.45	2.20	2.55	1.68	0.67	0.26	0.24	0.30	0.26	0.21	0.19	0.19
Hg (HM)	Mg (tonne)	0.20	0.09	0.06	0.05	0.05	0.05	0.04	0.02	-	-	0.00009	0.00001	0.00002	0.00001	0.00001	0.00010
Ni (HM)	Mg (tonne)	0.22	0.10	0.09	0.13	0.04	0.03	0.02	0.08	0.07	0.03	0.06	0.06	0.07	0.07	0.07	0.06
Zn (HM)	Mg (tonne)	6.29	5.69	3.07	5.27	6.32	4.95	5.76	3.41	1.59	1.10	1.66	1.63	1.82	1.00	0.60	0.87
PCDD+PCDF	g	0.03	1.03	-	-	0.0016	-	-	-	-	-	-	-	-	-	-	0.0016
Waste: non-hazardous																	
SO _x	Gg (1000 tonnes)	0.0007	0.0007	0.0004	0.0003	0.0005	0.0004	0.0002	0.0003	0.0003	0.0009	0.0016	0.0019	0.0031	0.0035	0.0048	0.01
NO _x	Gg (1000 tonnes)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.04	0.06	0.07	0.09	0.10

Pollutant	Unit (emissions per unit)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
PM _{2.5}	Gg (1000 tonnes)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0043	0.0034	0.0026	0.0019	0.0009	0.0009	0.0009	0.0010
NMVOC	Gg (1000 tonnes)	0.98	0.92	0.86	0.79	0.75	0.70	0.65	0.60	0.56	0.53	0.50	0.46	0.44	0.41	0.38	0.36
NH ₃	Gg (1000 tonnes)	0.32	0.31	0.31	0.29	0.32	0.34	0.32	0.31	0.29	0.30	0.25	0.24	0.24	0.23	0.23	0.22
Hg (HM)	Mg (tonne)	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.08	0.06	0.05	0.04	0.03	0.01	0.01	0.01	0.01
PCDD+PCDF	g	0.27	0.28	0.28	0.26	0.25	0.25	0.25	0.21	0.16	0.13	0.09	0.06	0.02	0.02	0.02	0.02
Other activities																	
SO _x	Gg (1000 tonnes)	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.03
NO _x	Gg (1000 tonnes)	1.06	0.98	0.92	0.85	0.85	0.91	0.92	0.96	0.99	0.98	0.97	0.96	0.93	0.92	0.89	0.90
PM _{2.5}	Gg (1000 tonnes)	3.59	3.55	3.48	3.47	3.30	3.05	3.06	3.15	3.13	2.92	2.86	2.75	2.68	2.59	2.63	2.67
NMVOC	Gg (1000 tonnes)	79.66	70.05	65.95	60.49	54.85	61.31	58.52	60.26	54.63	51.31	61.49	57.38	54.24	50.87	50.89	49.99
NH ₃	Gg (1000 tonnes)	51.65	46.48	43.87	39.84	40.89	39.16	39.55	38.75	40.18	40.73	36.92	32.59	30.73	25.63	24.98	24.67
Cd (HM)	Mg (tonne)	0.0028	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0004	0.0004	0.0004	0.0004	0.01	0.01
Cr (HM)	Mg (tonne)	0.27	0.31	0.40	0.27	0.84	0.27	0.28	0.27	0.26	0.23	0.29	0.27	0.26	0.26	0.29	0.20
Cu (HM)	Mg (tonne)	9.98	7.68	9.10	11.21	11.16	11.14	11.84	10.61	10.72	12.42	12.66	11.50	12.07	13.55	14.04	12.28
Pb (HM)	Mg (tonne)	0.24	0.18	0.22	0.10	0.08	0.09	0.08	0.08	0.08	0.09	0.11	0.11	0.11	0.12	0.12	0.56
Hg (HM)	Mg (tonne)	0.0006	0.0006	0.0001	0.0001	-	-	-	-	-	0.0011	-	-	-	0.0006	0.0011	0.0011
Ni (HM)	Mg (tonne)	0.04	0.04	0.04	0.04	0.01	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.05
Zn (HM)	Mg (tonne)	1.47	0.55	0.54	1.59	1.58	1.58	1.65	1.48	1.48	1.59	1.66	1.58	1.61	1.76	2.04	1.84
PCDD+PCDF	g	20.00	20.00	19.00	19.00	18.00	18.01	17.00	17.00	16.00	15.50	15.00	14.50	14.00	13.50	13.00	12.50



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