Industrial emissions policy country profile – Italy

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

bipro
Part of Ramboll Environ

ED 62698 | Issue Number 3 | Date 09/02/2018

Customer:

European Commission – DG Environment

Customer reference:

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

Confidentiality, copyright & reproduction:

Contact:

Tim Scarbrough
Ricardo Energy & Environment
30 Eastbourne Terrace, London, W2 6LA,
United Kingdom

t: +44 (0) 1235 75 3159
e: tim.scarbrough@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Yasmina Beltran Mondragon, Elisabeth Zettl (BiPRO)

Approved By:

Ben Grebot

Date:

09 February 2018

Ricardo Energy & Environment reference:

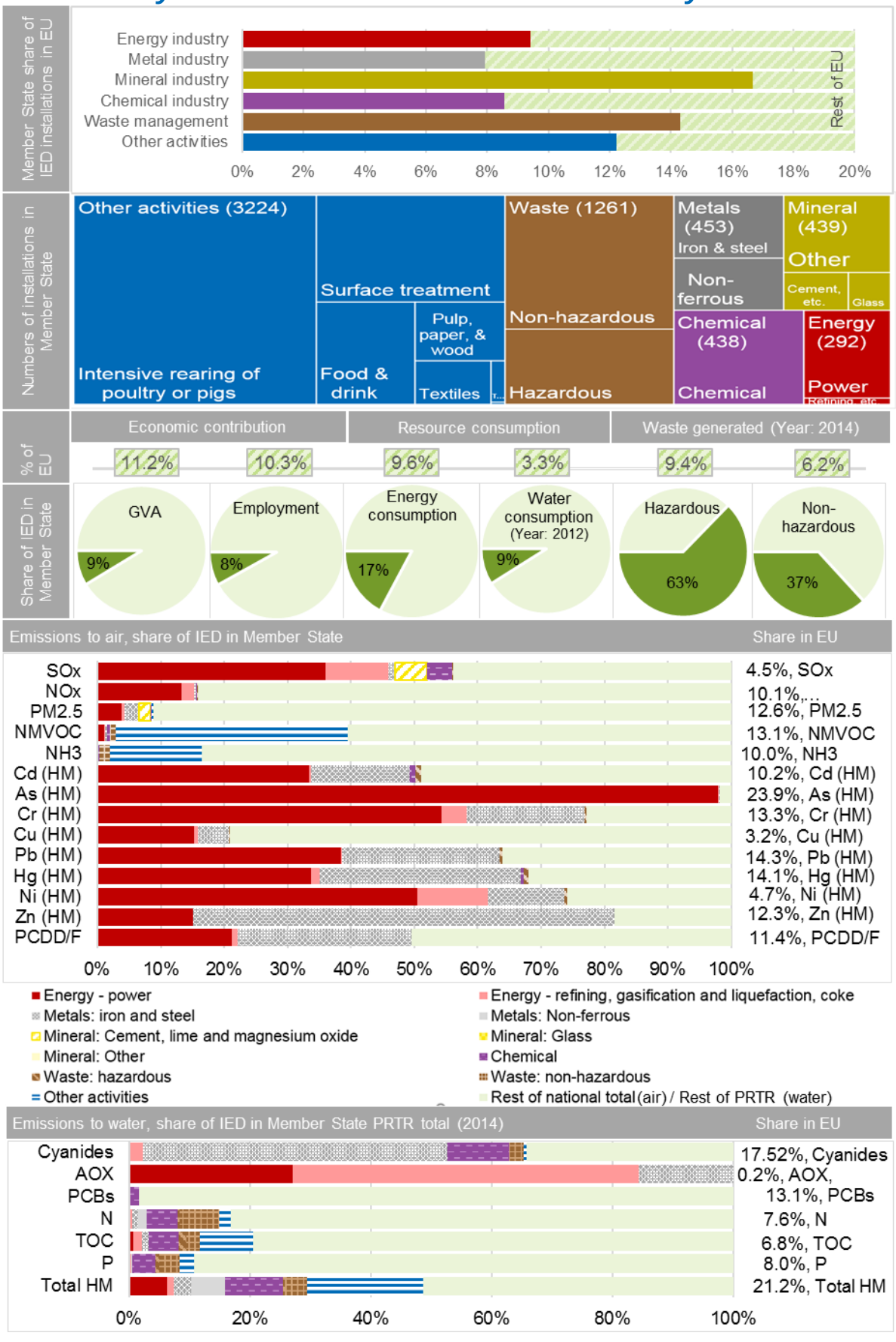
Ref: ED62698- Issue Number 3

Table of contents

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
IT	Italy
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
NMVOC	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 Italy



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 Italy.

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 Italy and how they have been addressed.

The profile also identifies the impact of industrial sectors or activities in Italy, 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

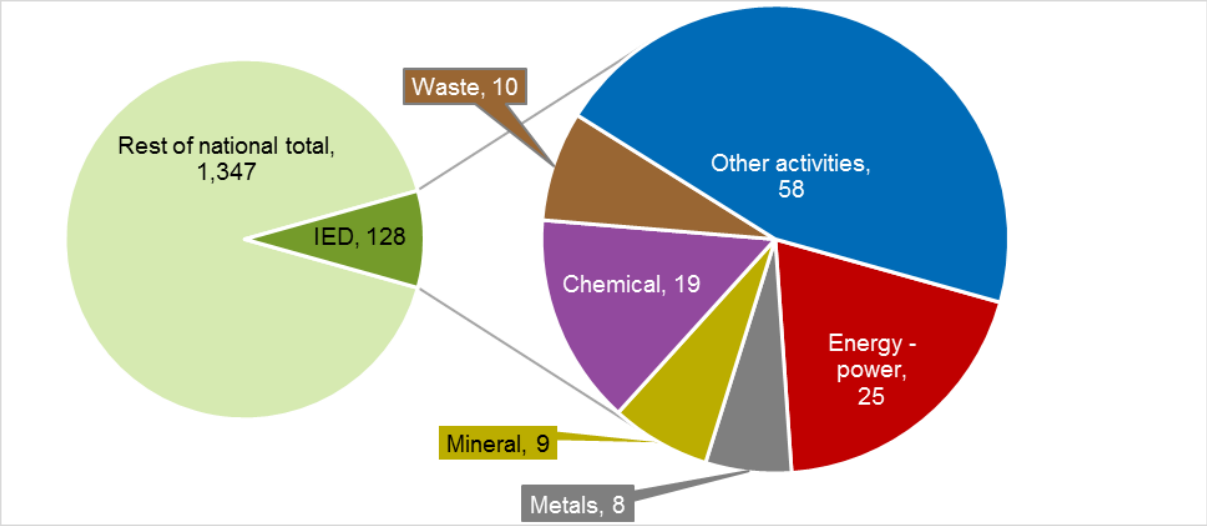
The contribution of industrial sectors to Italy's economy is assessed using the gross value added (GVA) and employment indicators.

Industrial sectors contribute 129 billion EUR; a relatively small share of the total national GVA in Italy (approximately 9%) in 2015 (illustrated in Figure 1). 'Other activities' account for the largest contribution of the industrial sectors (45% of total GVA for the industrial sectors), followed by the energy – power (20%) and chemical (15%) sectors (see Figure 1). The key contributors to the GVA within 'other activities' are food and drink production, amounting to 25 billion EUR (~43% of GVA for 'other activities') and textiles and tanning, amounting to 23 billion EUR (~40%).

A negative value was reported for the GVA for the energy – refining, gasification and liquefaction and coke sector in 2014 and 2015 (-758 and 459 million EUR, respectively); this has not been included in Figure 1. These negative values may be explained by the amount of subsidies received by the sector as GVA is calculated in Eurostat as output (at basic prices) minus intermediate consumption (at purchaser prices) [1] . Thus, it may be that for the year 2014 and 2015 the amount of subsidies received were higher than the output value.

The relative share of GVA by industrial sector shows a similar snapshot for employment in 2015, although the share of employees is greater for minerals compared to energy - power (Figure 2). For employment, 'other activities' account for the largest contribution (50% of total industrial sector employment), followed by the chemical (13%), mineral (11%), metal (10%) and waste (9%) industrial sectors. Taken together, the GVA and employment data indicate that the chemical and energy-power sectors together with 'other activities' (comprising mainly textiles, tanning, and food and drink production) are the most significant industrial sectors for the economy in Italy. Whilst the mineral, metal and waste industrial sectors contribute significantly with a similar share as chemicals to employment, they are less significant when considering GVA.

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

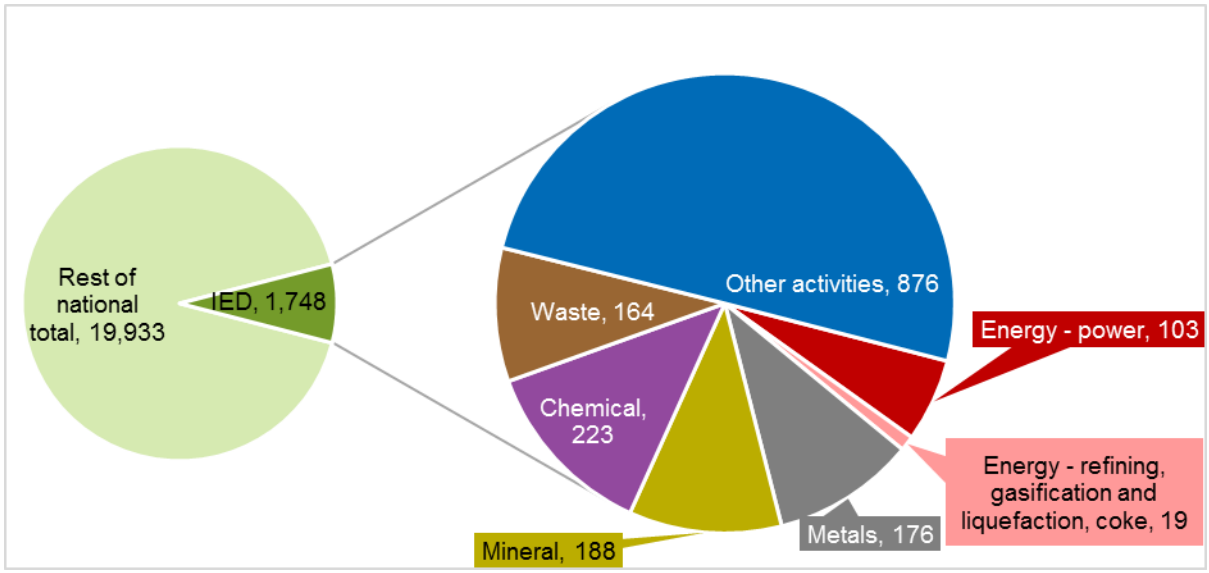


Note: Rest of national total means all NACE reporting minus the industrial sectors shown here. Values extrapolated for 2015 for metals, mineral, waste, 'other activities'. Negative *GVA reported in 2015 for the energy – refining, gasification and liquefaction and coke sector (not included in the chart).*

Source: Eurostat (2017a)

[1] Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Gross_value_added

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



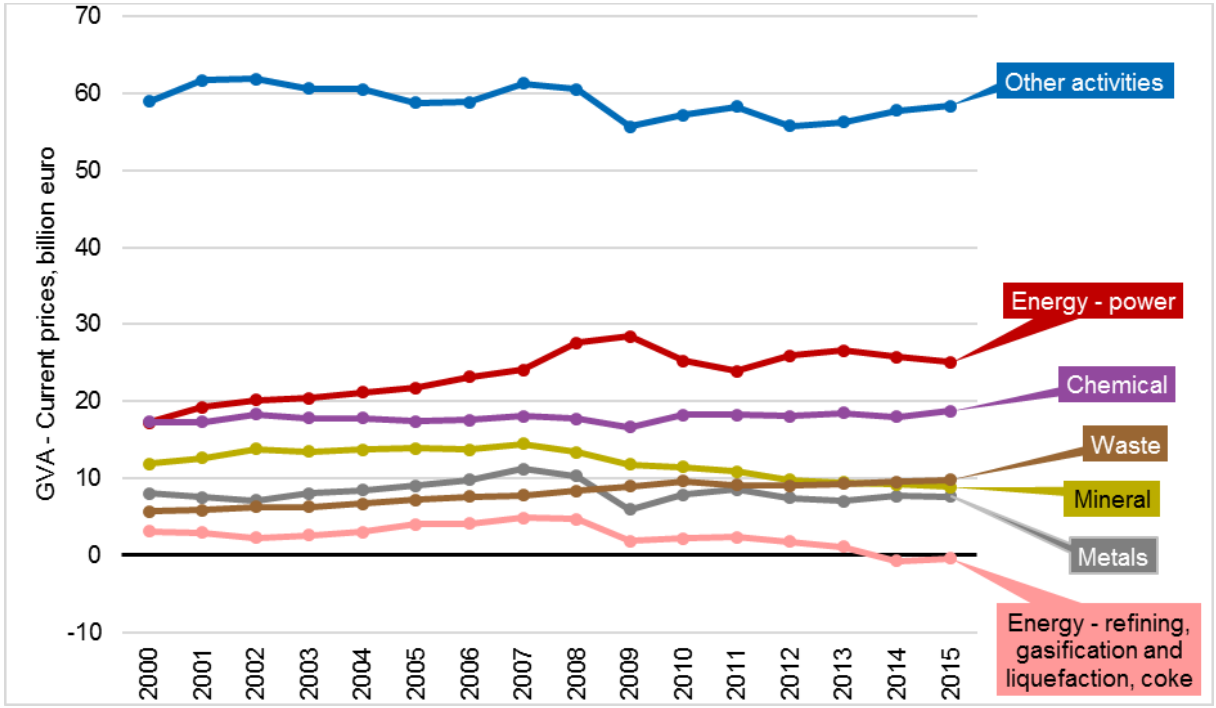
Note: Rest of national relates to all NACE reporting minus the industrial sectors shown here.

Source: Eurostat (2017b)

The GVA stayed fairly static for most of the industrial sectors. The mineral and energy – refining industrial sector show a slight decrease while the GVA of energy – power and waste increased slightly. (Figure 3).

A quite similar as very static trend can be seen considering the employment data (Figure 4). As regards 'other activities', a decrease in employment has been observed from 2008 to 2010. However, from 2010 to 2012 employment has increased again, remaining at a fairly static level since then.

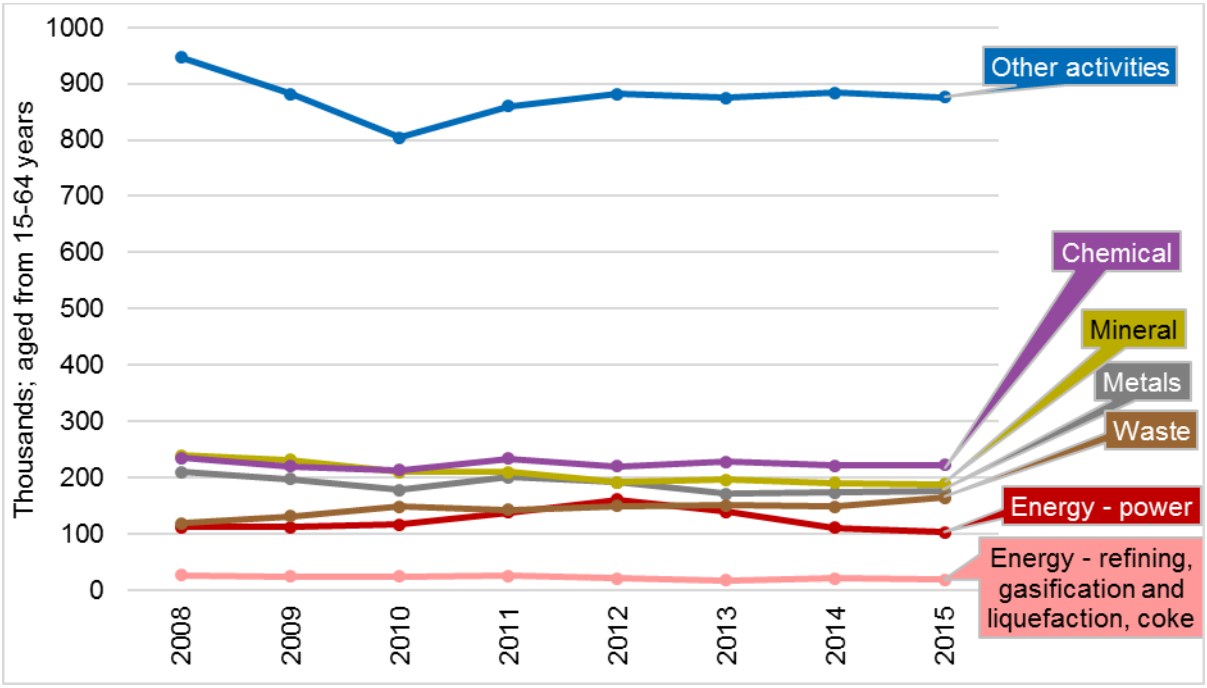
Figure 3: Gross value added of industrial sectors (2000-2015)



Note: Values extrapolated for 2015 for metals, mineral, waste, 'other activities'.

Source: Eurostat (2017a)

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



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 GVA data for Italy

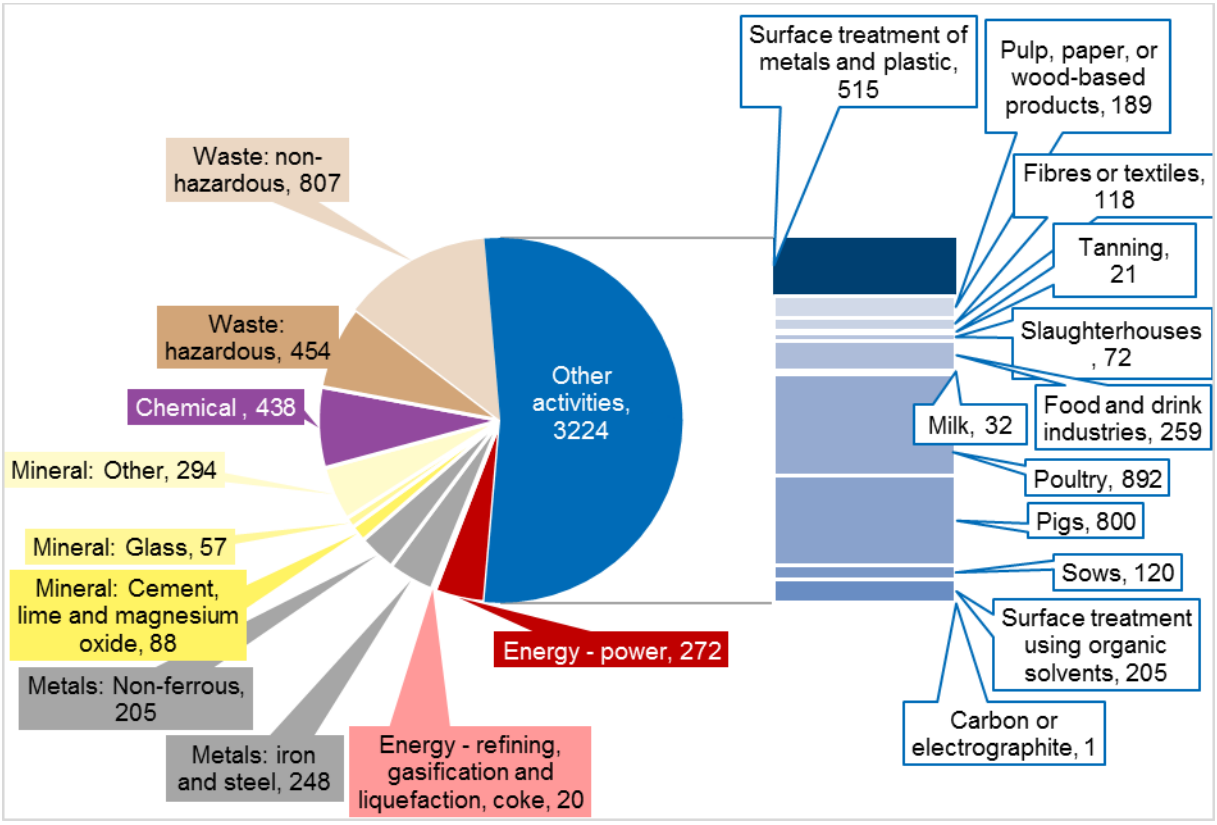
Missing data	Description	Conclusion and actions taken
Data gaps in time series	Lack of GVA data for some industrial sectors (metals, mineral, waste, 'other activities') for 2015	Extrapolation has been carried out when preceded by 3 years of data

2.2 Number of IED installations

The main industrial sector in Italy in 2015, according to the reported number of permitted IED installations, is intensive rearing of poultry or pigs (IED activity 6.6), comprising 30% of total IED installations in 2015 (Figure 5, Table 3). This is followed by the waste management (21%) industrial sector and the surface treatment industrial sector (including both the surface treatment of metals and plastics and surface treatment using organic solvents, accounting together for 12% of the permitted installations in Italy), although these industrial sectors are not significant contributors to GVA.

According to this same dataset, most IED activities are carried out in Italy, except for temporary storage of hazardous waste (IED activity 5.5) and underground storage of hazardous waste (IED activity 5.6).

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

Between 2011 and 2015, there was a small decline in the number of IED installations permitted in Italy (Figure 6). This decline is mainly due to a reduction in the number of reported permitted installations for intensive rearing of poultries and pigs within the 'other activities' industrial sector. Also the number of IED installations in the energy – power and the mineral industrial sector were reduced significantly. Increases were reported for the waste management and the non-ferrous metals industrial sector.

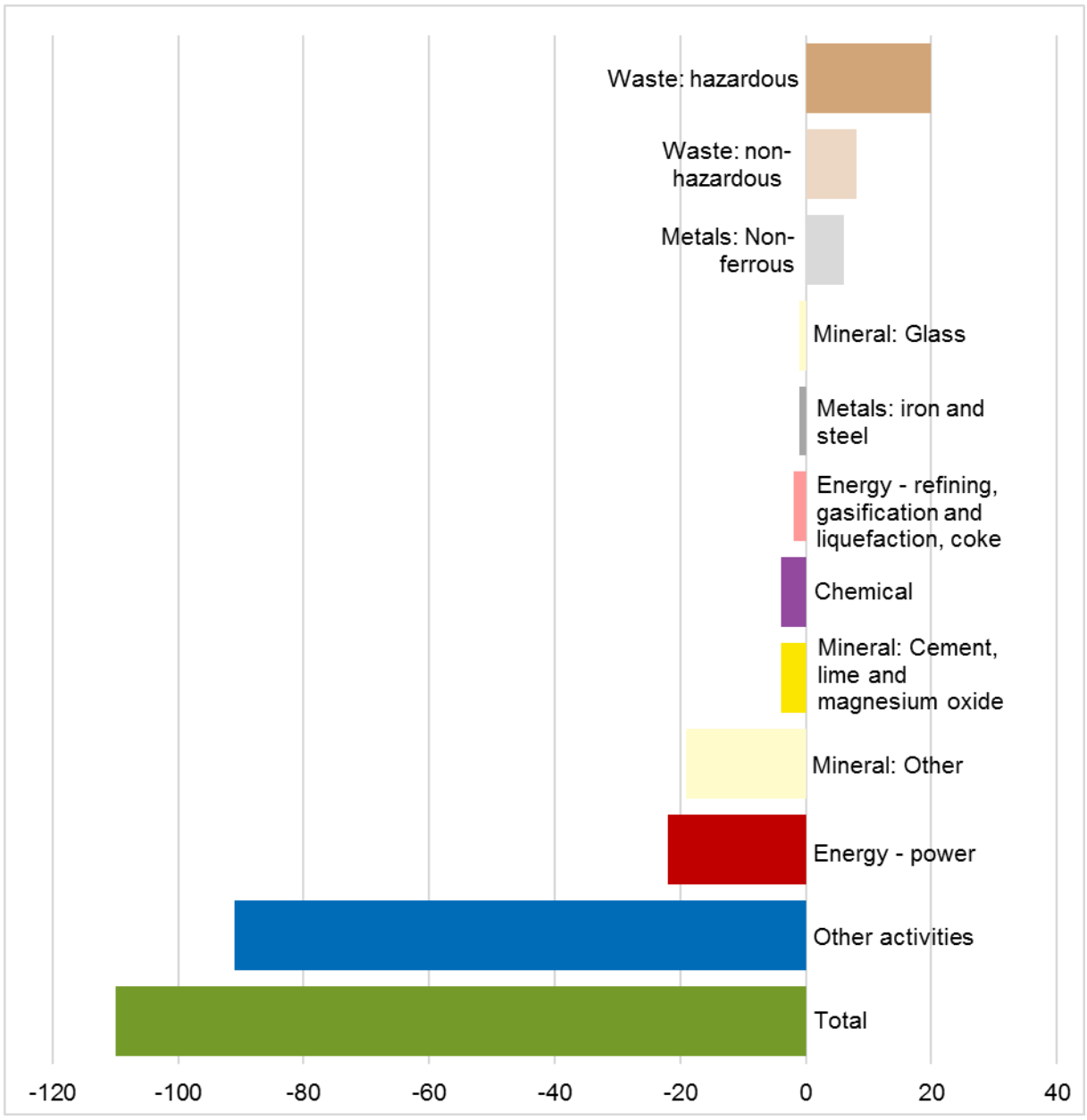
Table 3: Number of installations in 2011 and 2015 by industrial sector, with IED activity detail

Industrial sector, with IED activity detail		2011	2015	Change in number of IED installations 2011 to 2015
Energy: power	*1.1 Combustion*	**294**	**272**	**-22**
Energy: refining, gasification and liquefaction, coke ovens		**22**	**20**	**-2**
	1.2 Refining	*17*	*15*	*-2*
	1.3 Production of coke	*4*	*4*	*0*
	1.4 Gasification or liquefaction	*1*	*1*	*0*
Metals: iron and steel		**249**	**248**	**-1**
	2.1 Metal ore	*2*	*2*	*0*
	2.2 Pig iron or steel	*46*	*45*	*-1*
	2.3 Processing of ferrous metals	*119*	*118*	*-1*
	2.4 Ferrous metals foundries	*82*	*83*	*1*
Metal: non-ferrous	*2.5 Processing of non-ferrous metals*	**199**	**205**	**6**
Mineral: Cement, lime and magnesium oxide	*3.1 Cement, lime and magnesium oxide*	**92**	**88**	**-4**
Metal: glass	*3.3 Glass*	**58**	**57**	**-1**
Mineral: Other		**313**	**294**	**-19**
	3.4 Mineral fibres	*13*	*12*	*-1*
	3.5 Ceramic	*300*	*282*	*-18*
Chemical		**442**	**438**	**-4**
	4.1 Organic chemicals	*226*	*226*	*0*
	4.2 Inorganic chemicals	*78*	*72*	*-6*
	4.3 Phosphorus-, nitrogen- or potassium-based fertilisers	*15*	*15*	*0*
	4.4 Plant protection products	*15*	*16*	*1*
	4.5 Pharmaceutical products	*102*	*102*	*0*
	4.6 Explosives	*6*	*7*	*1*
Waste: hazardous	*5.1 Disposal / recovery*	**434**	**454**	**20**
Waste: non-hazardous		**799**	**807**	**8**
	5.2 co-/ incineration of hazardous and non-hazardous waste	*55*	*55*	*0*
	5.3 Disposal of non-hazardous	*298*	*319*	*21*
	5.4 Landfills	*391*	*379*	*-12*
	6.5 Disposal of animal carcases	*55*	*54*	*-1*
Other activities		**3315**	**3224**	**-91**
	6.1 Pulp, paper, or wood-based products	*189*	*189*	*0*
	6.2 Textiles	*126*	*118*	*-8*
	6.3 Tanning	*21*	*21*	*0*
	6.7 Surface treatment using organic solvents	*221*	*205*	*-16*
	2.6 Surface treatment of metals and plastics	*431*	*515*	*84*
	6.4 (a) Slaughterhouses	*71*	*72*	*1*
	6.4 (b) Food and drink	*263*	*259*	*-4*
	6.4 (c) Milk	*33*	*32*	*-1*
	6.6 (a) Poultry	*878*	*892*	*14*
	6.6 (b) Pigs	*953*	*800*	*-153*
	6.6 (c) Sows	*128*	*120*	*-8*
	6.8 Carbon or electrographite	*1*	*1*	*0*
Total		**6,217**	**6,107**	**-110**

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. No data for permitted installations carrying out IED activity 6.11 was reported and therefore not included in this table.

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

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



Source: IED reporting / DG Environment, Personal Communication

Limitations

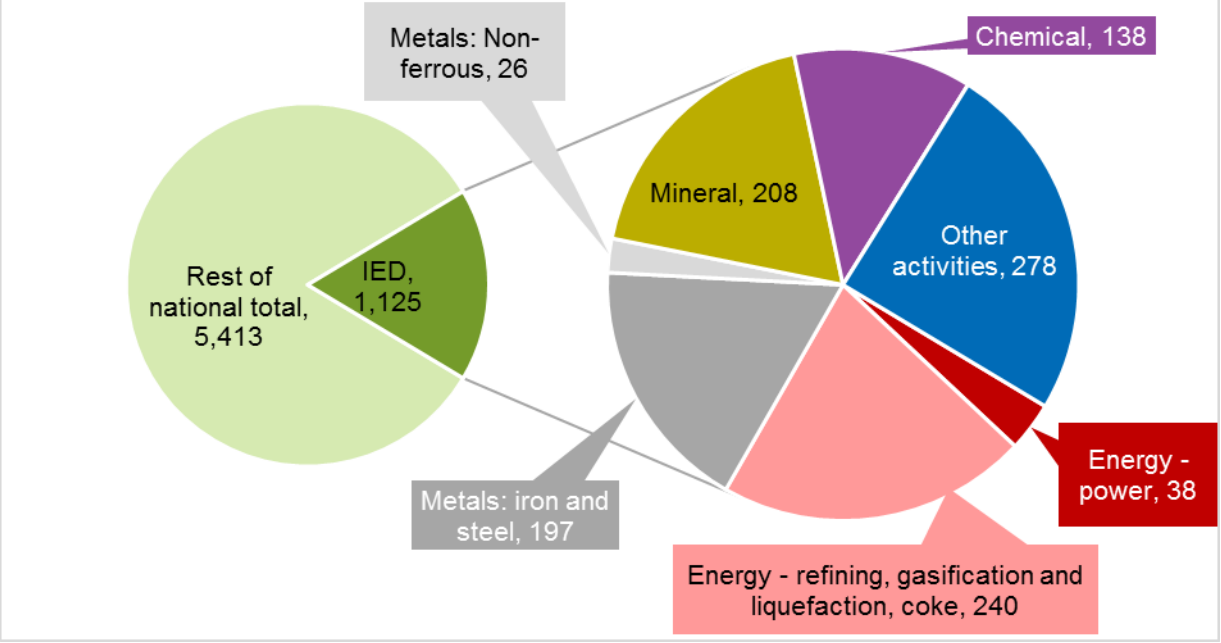
The dataset used to reflect IED activity in Member States has a limited timeseries inherent to the reporting requirement and thus the number of permitted installations is only reported for the years 2011, 2013 and 2015.

3 Resource use in industrial sectors

3.1 Energy consumption

Industrial sectors contribute to approximately 17% of the total energy consumption in Italy in 2015. Together with the overall number of reported permitted installations and contribution to the economy, the energy - refining, gasification, liquefaction and coke sector appears to be the most energy intensive sector in Italy (Figure 7). Other significant industrial sectors are iron and steel production and minerals. The energy consumed by 'other activities', while significant, suggests a lower intensity owing to the larger number of installations and contribution to the economy (whereby less energy is consumed on average per installation and relative output in terms of contribution to the economy is higher (added GVA per consumed PJ)). The relative energy consumed by the non-ferrous metal and the energy - power industrial sectors is quite low; particularly when compared to number of reported permitted installations (199 and 294 installations, respectively).

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



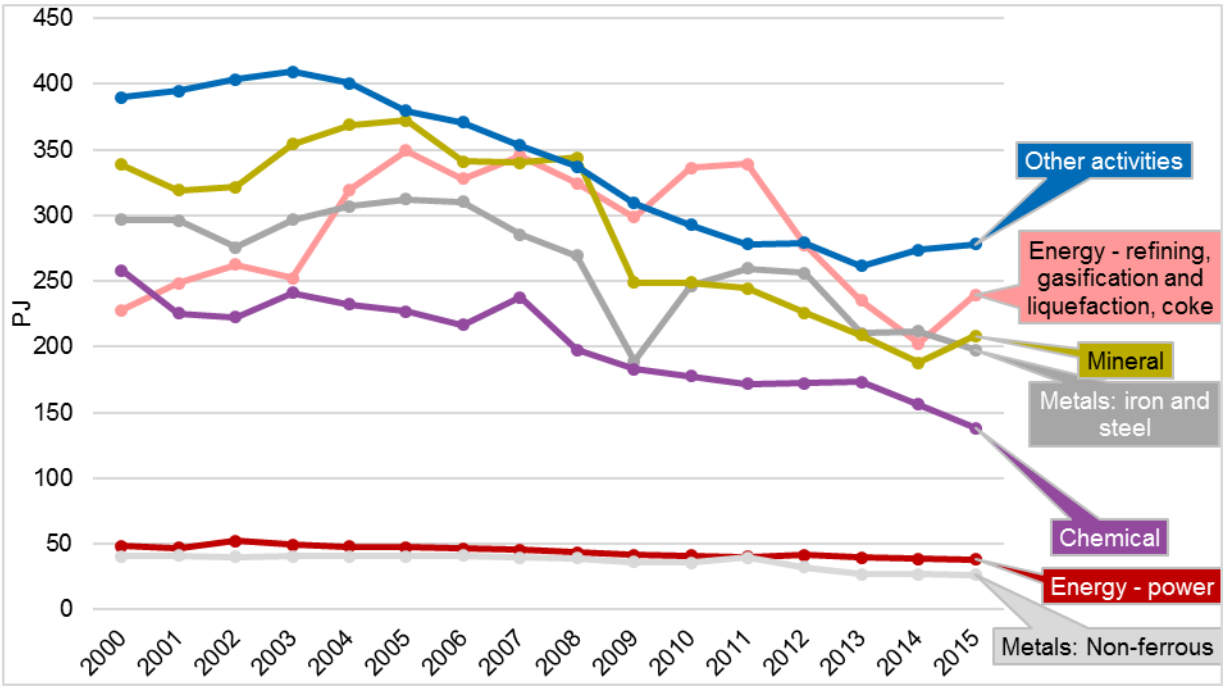
Note: Rest of national total relates to gross inland consumption minus the industrial sectors shown here. No data were available for energy consumption in the waste management industrial sector.

Source: Eurostat (2017c)

The time series in Figure 8 show that energy consumption has generally decreased for all industrial sectors from 2000 to 2015, except for energy - refining, gasification, liquefaction and coke, which has had quite a volatile trend with 2015 consumption now very similar to that in 2000. This decline for some industrial sectors (energy - power, metals- iron and steel, mineral, chemical and 'other activities') between 2011 and 2015 could be due to a reduced number of permitted installations from 2011 to 2015. However, energy consumption by the non-ferrous metals industrial sector has slightly decreased, despite the reported increase in number of permitted installations, from 199 in 2011 to 205 in 2015. The overall decrease could be due to increased energy efficiency of installations and energy management systems.

No energy consumption data is available for the waste management industrial sector. This is a significant gap in the data in light of the number of installations within this industrial sector operating in Italy, as well as the waste generated by these sectors (see section 5).

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



Note: No data were available for energy consumption in the waste management industrial 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 Italy

Missing data	Description	Conclusion and actions
Data gap	No data reported for waste management	No action taken.

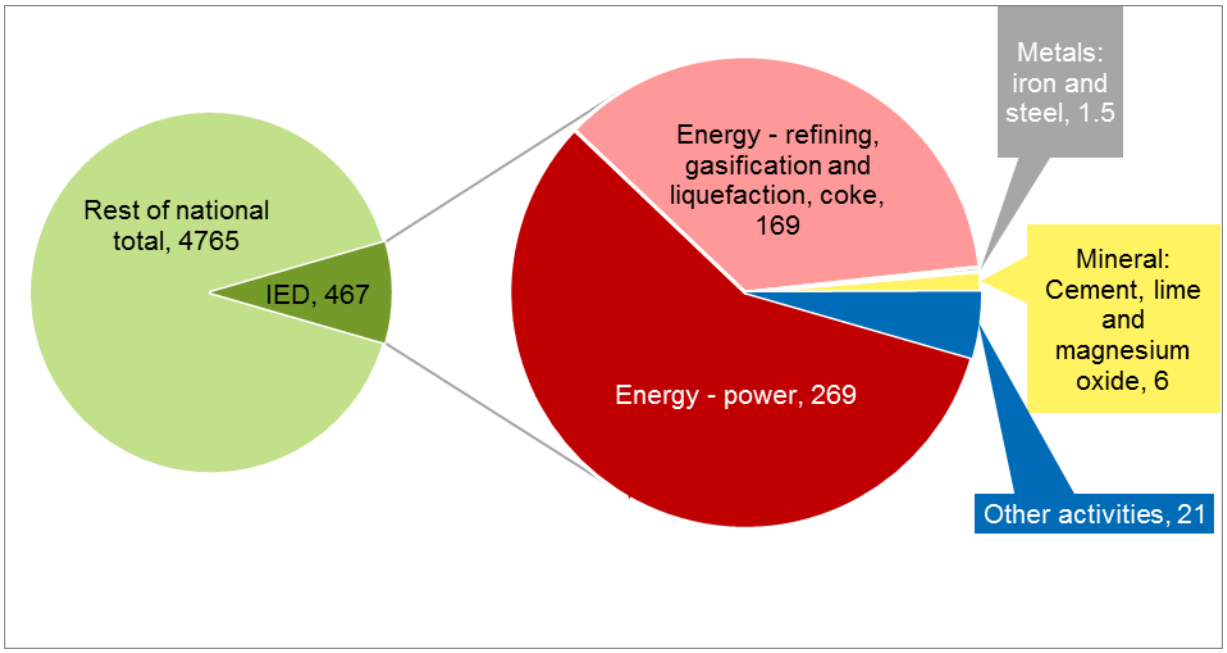
3.2 Water consumption

The data availability to show water consumption by industrial sectors in Italy is poor. Very limited data is available in Eurostat (2017d) for the national total (with the latest data reported for 2010).

Data showing consumption by industrial sector rely on estimates of water consumption by Poyry and VITO (2012) for a limited number of industrial sectors (Figure 9). These estimates are not specific to a year, but could be considered representative for the period 2005 to 2012. For Italy, the modelled data only provides estimates for energy - power, energy - refining, gasification, liquefaction and coke, minerals - cement production, metals - iron and steel, pulp and paper and food (the latter two falling within 'other activities'). However, these estimates have some limitations, as reported below.

In light of the other data presented in this profile, the lack of water consumption data for the chemical, glass and other minerals and waste management sectors and a number of the sectors included within 'other activities' are considered to be major gaps.

Figure 9: Estimates of water consumption (million m^3) for selected industrial sectors



Note: Rest of national total relates to all NACE reporting minus the industrial sectors shown here. Data are estimated and only refer to some IED sectors. Data for total water consumption is provided by Eurostat (for the year 2012).

Sources: Eurostat (2017d) Poyry & VITO (2012)

Limitations

The Poyry and VITO (2012) model inputs are generally not clearly reported and there are some potential limitations based on what has been provided (particularly in terms of the year of the model inputs and the reliability of some the assumptions made). Limitations have also arisen from the mapping between the study and industrial sectors owing to broader definitions used in the modelling leading to overreporting against IED activities.

Table 5: Data gaps in water consumption data for Italy

Missing data	Description	Conclusion and actions taken
Data gap in time series and sectoral disaggregation	Data reported in Eurostat (2017d) is only available for 2010 as a total across all NACE activities. Owing to the lack of data disaggregated by industrial sector, water consumption estimates for these sectors relies on modelled values.	Estimates used from Poyry & VITO (2012) for water consumption by industry and actual data used for the national total.

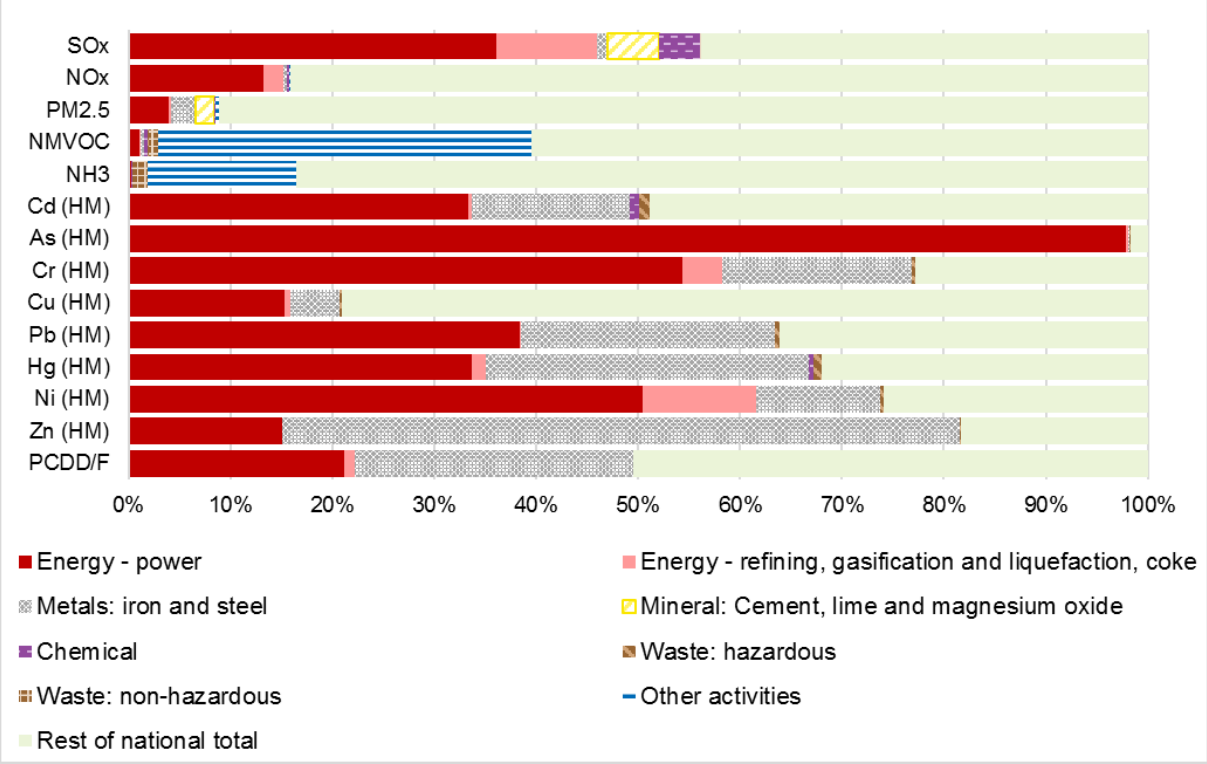
4 Emissions from industrial sectors

4.1 Emissions to air

Data were taken from inventories submitted by Member States under the CLRTAP (EEA, 2017a). Overall, considering available data, industrial sectors are responsible for more than half the emissions of a number of pollutants emitted to air including SO_x, and all of the heavy metals except for Cu (Figure 10). Industrial sectors appear to contribute much lower proportions to total emissions of NO_x, $PM_{2.5}$ and NH_3.

For most pollutants, the energy – power sector contributes by far the greatest proportion of emissions to total industrial emissions (in particular, SO_x, NO_x, Cd, As, Cr, Cu, Pb, Hg and Ni) (Figure 11). The iron and steel sector also contributes a reasonable proportion to total industrial emissions for $PM_{2.5}$, PCDD/F and almost all heavy metals (Cr, Cu, Pb, Hg, Ni and Zn). However, the cement, lime and magnesium oxide production mineral industrial sector also emits a substantial amount of $PM_{2.5}$ emissions to air. For specific pollutants, 'other activities' contributes a significant proportion to total industrial emissions. This includes NH_3 (primarily from intensive rearing of poultry and pigs) and NMVOC (Figure 11). Whilst a number of permitted installations have been reported to be in operation in Italy, only limited emissions to air data were reported for the mineral industrial sector (only limited data were reported for cement, lime and magnesium oxide production, and none for the glass or other mineral sectors), and no data were reported in 2015 for the non-ferrous metal industrial sector.

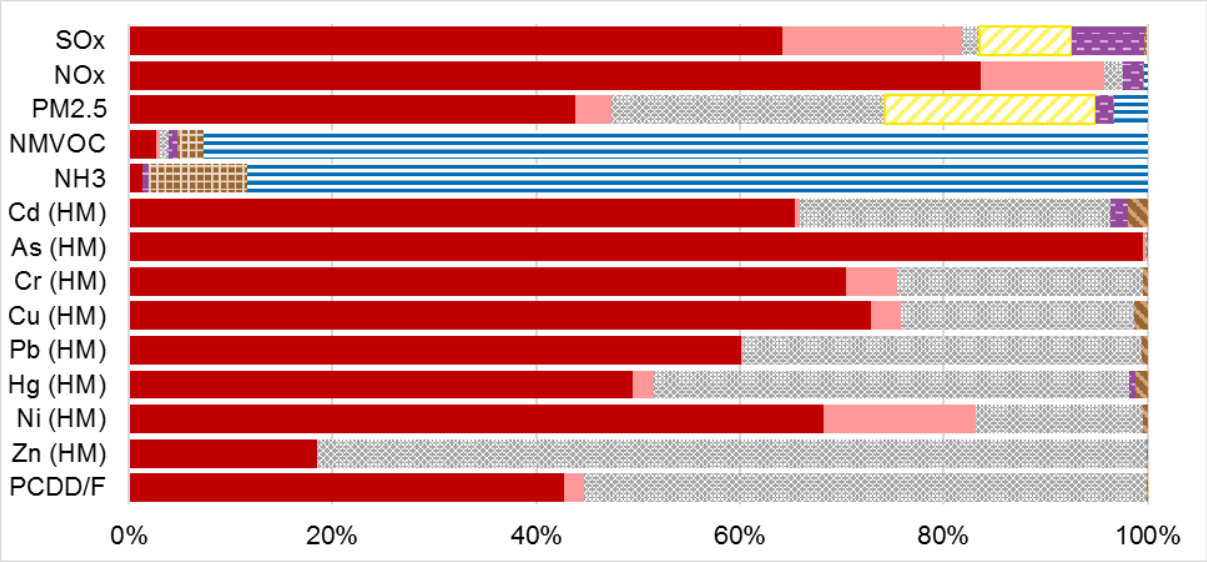
Figure 10: Emissions to air from industrial sectors and rest of national total (2015)



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.

Source: EEA (2017a)

Figure 11: Emissions to air from industrial sectors (2015)



Note: The key for this chart is shown in Figure 10

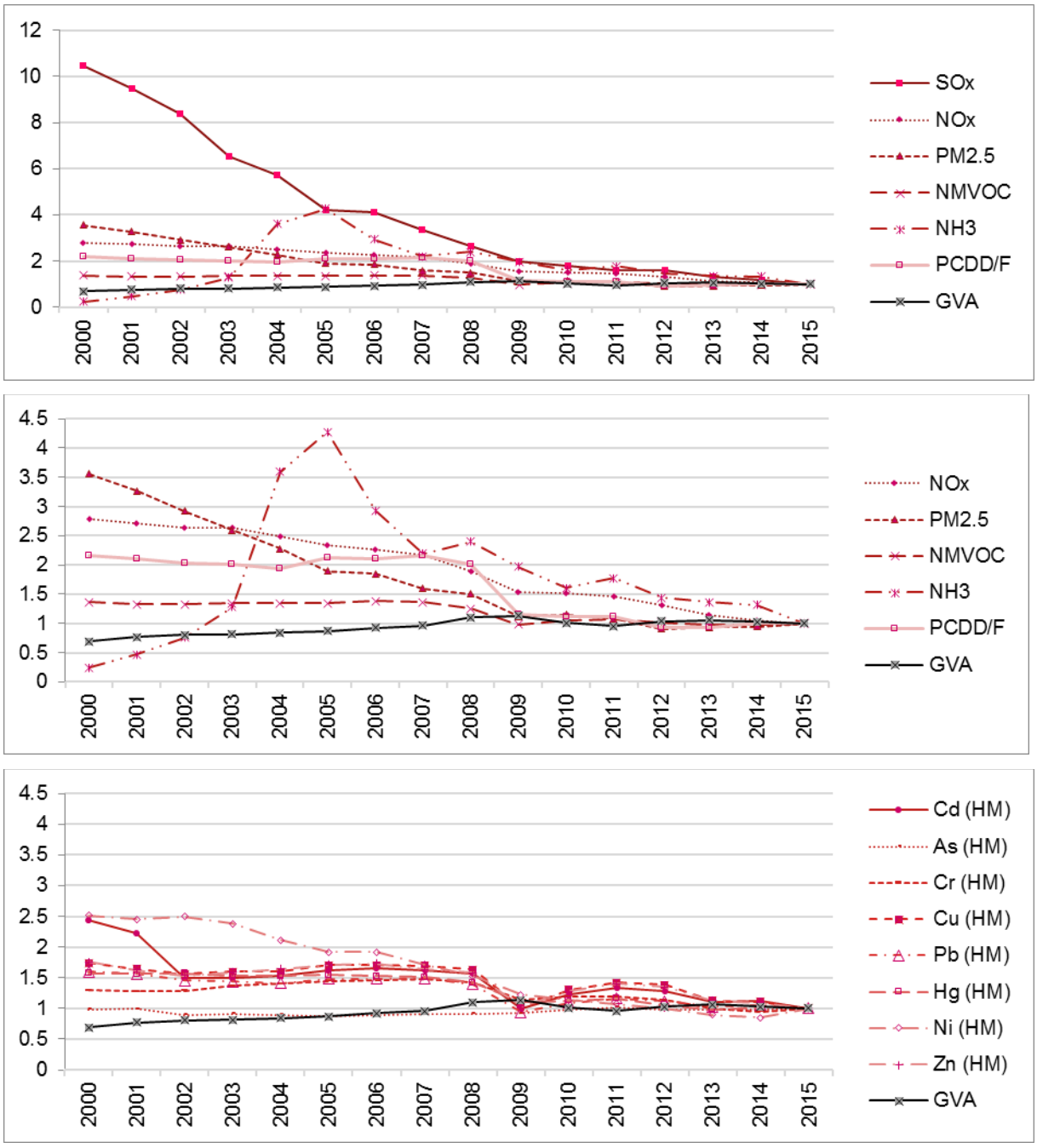
Source: EEA (2017a)

In the following subsections, emissions to air are shown in indexed charts by sector, with the exception of the non-ferrous metal, the mineral – glass and the mineral – other sectors, for which no data was reported on emissions to air. This was done to compare the development of pollutant emissions with the GVA in specific sectors in the time period 2000 to 2015. Appendix 2 includes full details on the emissions reported by industrial sector and year. Overall, emission reductions can be observed for most of the industry sectors for the last years. This is likely to be linked to the economic trend in the last years as well as to the progressive enforcement of the IPPC Directive and IED and the associated implementation of BAT in Italy (Italian Ministry of Environment, 2018).

Energy industry

For the energy - power industrial sector, there was a decrease in emissions to air for all pollutants between 2000 and 2015 except for NH_3, which increased up to 2005 and then decreased afterwards, and As which has remained relatively constant (Figure 12). It is unclear why there was a peak in NH_3 emissions in 2005. The decrease in emissions for other pollutants was more obvious in the time period 2000 to 2010. As regards SO_x, for this period a significant decrease can be observed. These reductions in SO_x emissions are expected to have resulted from compliance with the Large Combustion Plant Directive which had a significant impact on SO_x emissions across the EU in that time period. GVA has increased gradually in this period. Although to a lesser degree, the trend for heavy metal emissions shows ongoing fluctuations after 2009, in line with GVA.

Figure 12: Indexed emissions to air from the energy - power industrial sector (indexed to 2015=1)

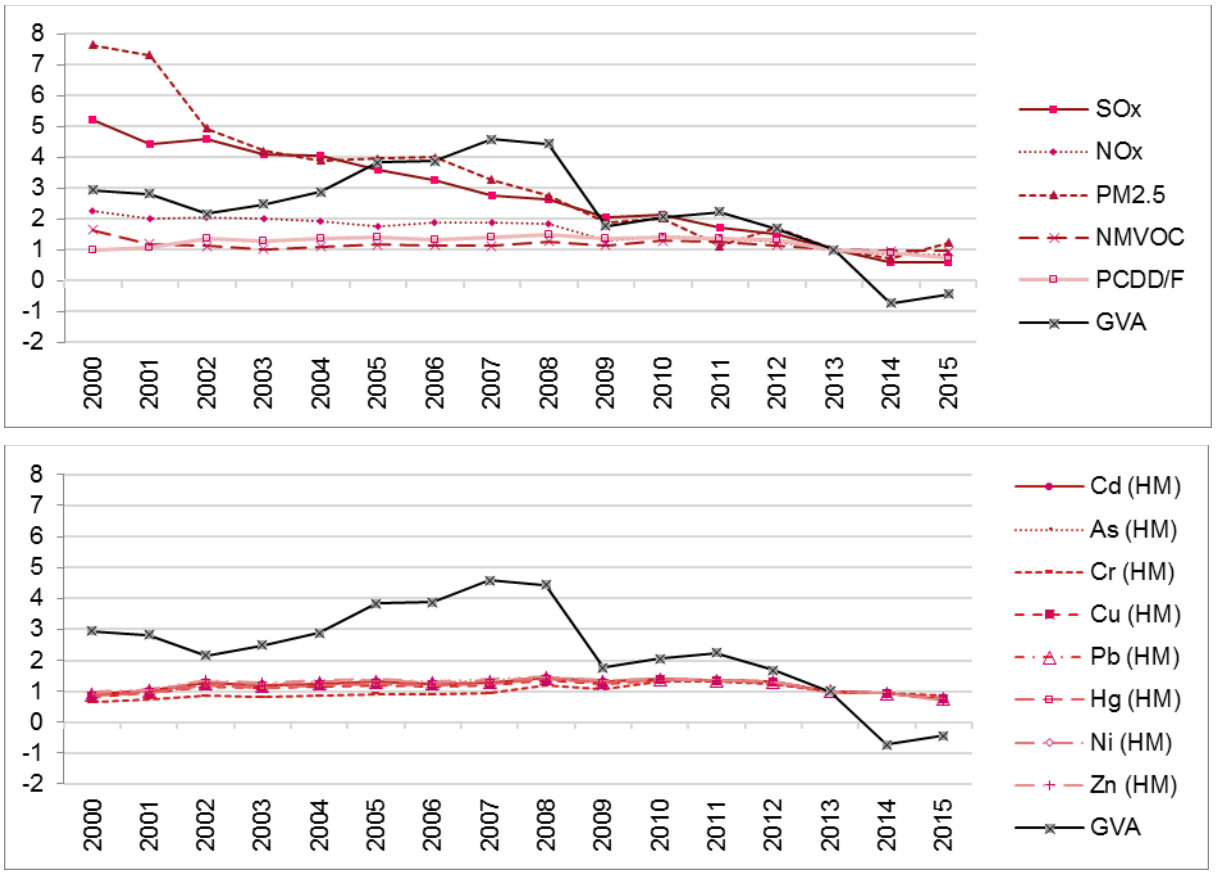


Note: All pollutants are reported; To make the detail for the other pollutants more visible, SO_x was removed in the second chart.

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

In the energy - refining, gasification and liquefaction and coke industrial sector, emissions were reported for all pollutants, except for NH_3. Heavy metal emissions have remained relatively static over the observed time period, whereas other pollutant emissions all decreased in this industrial sector except for PCDD/F (see Figure 13). For SO_x and also for $PM_{2.5}$, a stronger decrease in emissions can be observed. Emission reductions could be due to compliance with the Large Combustion Plant Directive. GVA has decreased over time with some fluctuations.

Figure 13: Indexed emissions to air from energy - refining, gasification and liquefaction, coke (energy industrial sector) sector (indexed to 2013=1)



Note: NH_3 not reported. Data indexed to 2013, as negative GVA values were reported for 2014 and 2015

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

Metal industry

In the iron and steel metal production sector, all emissions have slightly increased until 2007, decreased until 2009, increased again until 2011 and decreased again afterwards (Figure 14). Note that the trend lines for emissions from the iron and steel industrial sector are generally the same for all pollutants from 2000 to 2015. This may indicate that the emission factors used for this sector in this national emission inventory are static over time, with changes in all pollutants driven by changes in activity levels. The same trend can be observed for GVA. A reason for the drop in 2009 could be the economic crisis in Europe in this time period. Overall, emissions have slightly decreased from 2000 to 2015 except for NO_x, Hg and PCDD/F emissions. Data on NH_3 emissions was not reported.

In the non-ferrous metal industrial sector no data on emissions to air was reported.

Figure 14: Indexed emissions to air from iron and steel metal production (metal industrial sector) (indexed to 2015=1)

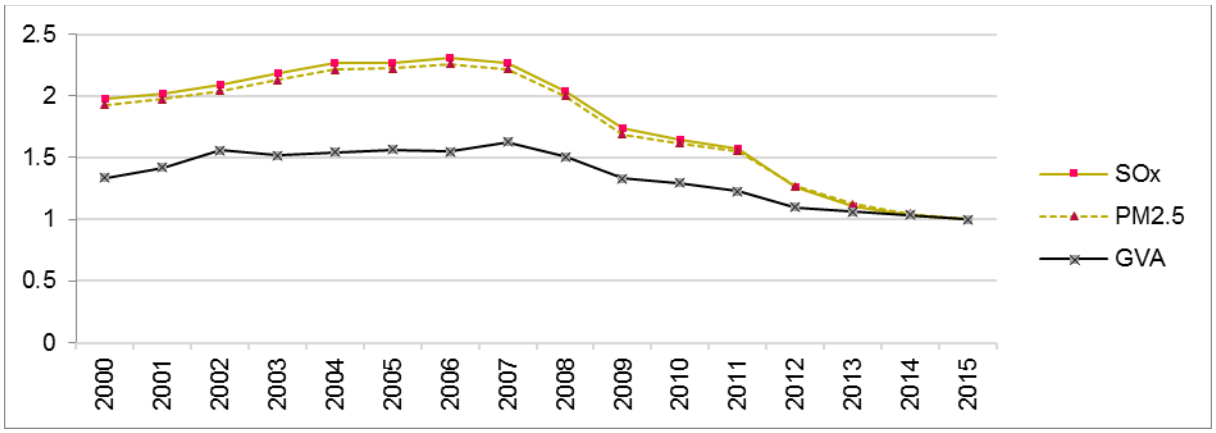
Note: All pollutants reported except NH_3.

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

Mineral industry

In the mineral - cement, lime and magnesium oxide industrial sector only SO_x and $PM_{2.5}$ emissions were reported. For both pollutants, emissions slightly increased until 2006, followed by a downward trend until 2015. Note that the trend lines are the same for both pollutants from 2000 to 2015. This may indicate that the emission factors used for this sector in this national emission inventory are static over time, with changes in all pollutants driven by changes in activity levels. The GVA trend shows the same development as the pollutant emission trends. No emissions data were reported for the mineral – glass and the other minerals industrial sectors.

Figure 15: Indexed emissions to air from cement, lime and magnesium oxide production (mineral industrial sector) (indexed to 2015=1)



Note: Only SO_x and $PM_{2.5}$ data reported.

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

Chemical industry

Within the chemical industrial sector, all pollutant emissions have decreased from 2000 to 2015, except for NH_3, which fluctuated significantly (Figure 16). Heavy metal emissions were only reported for Cd and Hg. Considering the relatively static GVA it can be concluded that relative emissions have been reduced over time.

Figure 16: Indexed emissions to air from chemical industrial sector (indexed to 2015=1)

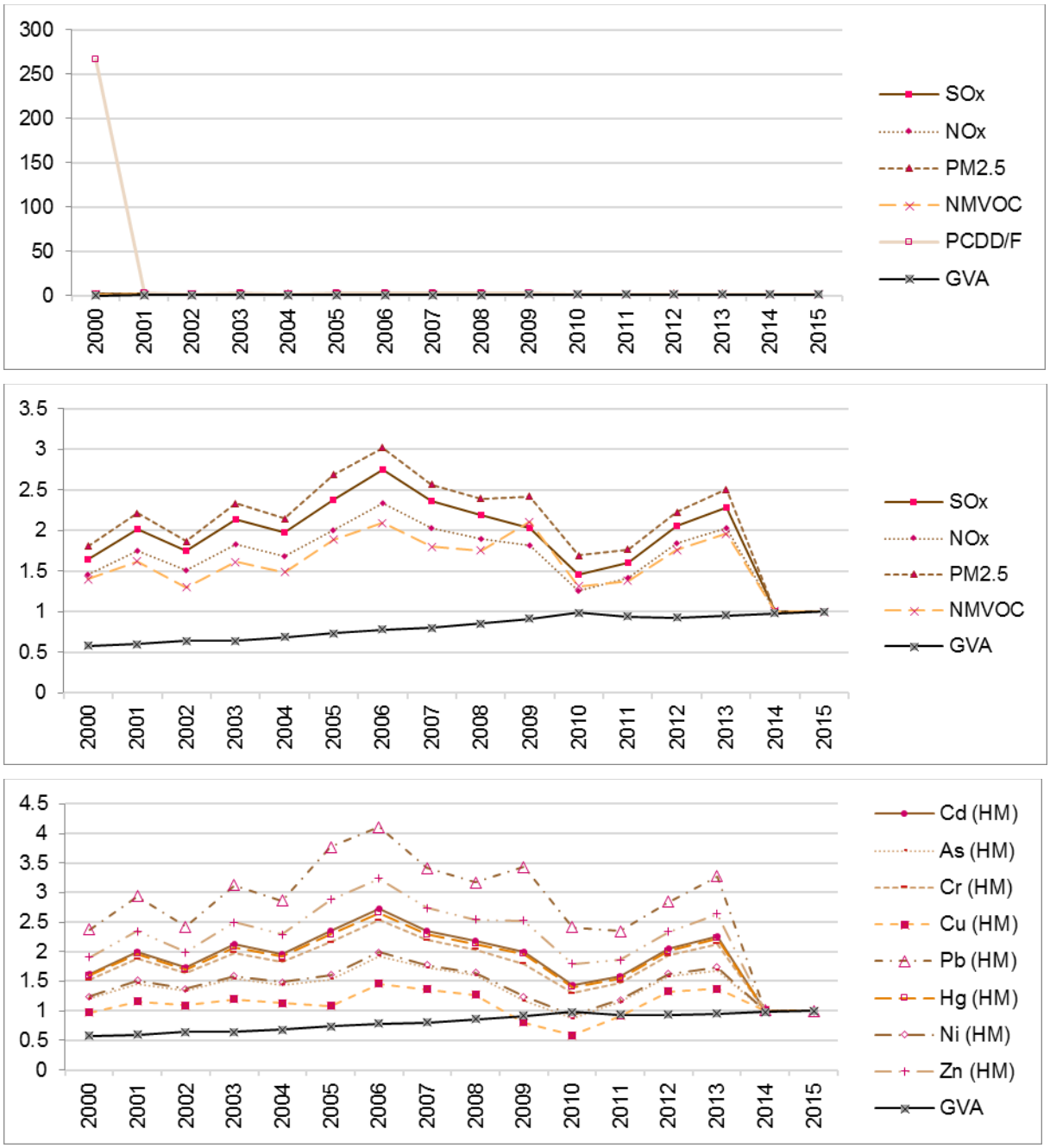
Note: All non-heavy metal pollutants reported except PCDD/F. Only Cd and Hg reported for heavy metals.
Source: EEA (2017a), Eurostat (2017a)

Waste management industry

Within the hazardous waste management industrial sector, all emissions have decreased over time, except for Cu, which remained relatively static. It can be observed, that all heavy metal pollutant emissions increased with some variations until 2006, decreased afterwards continuously until 2010, increased again until 2013 (with the exception of Cu), and decreased again afterwards (Figure 17). The trend lines for heavy metal emissions from the hazardous waste management industrial sector follow the same fluctuations between 2000 to 2015. This may indicate that the emission factors used for this sector in this national emission inventory are static over time, with changes in all pollutants driven by changes in activity levels.

No data on NH_3 emissions was reported for the hazardous waste management sector. The emission value for PCDD/F in 2000 is expected to be an outlier. Therefore, a further figure excluding PCDD/F is provided (Figure 17). No connection can be seen between the pollutant emission trend and the GVA trend, which has steadily increased over time.

Figure 17: Indexed emissions to air from hazardous waste (waste management industrial sector) (indexed to 2015=1)

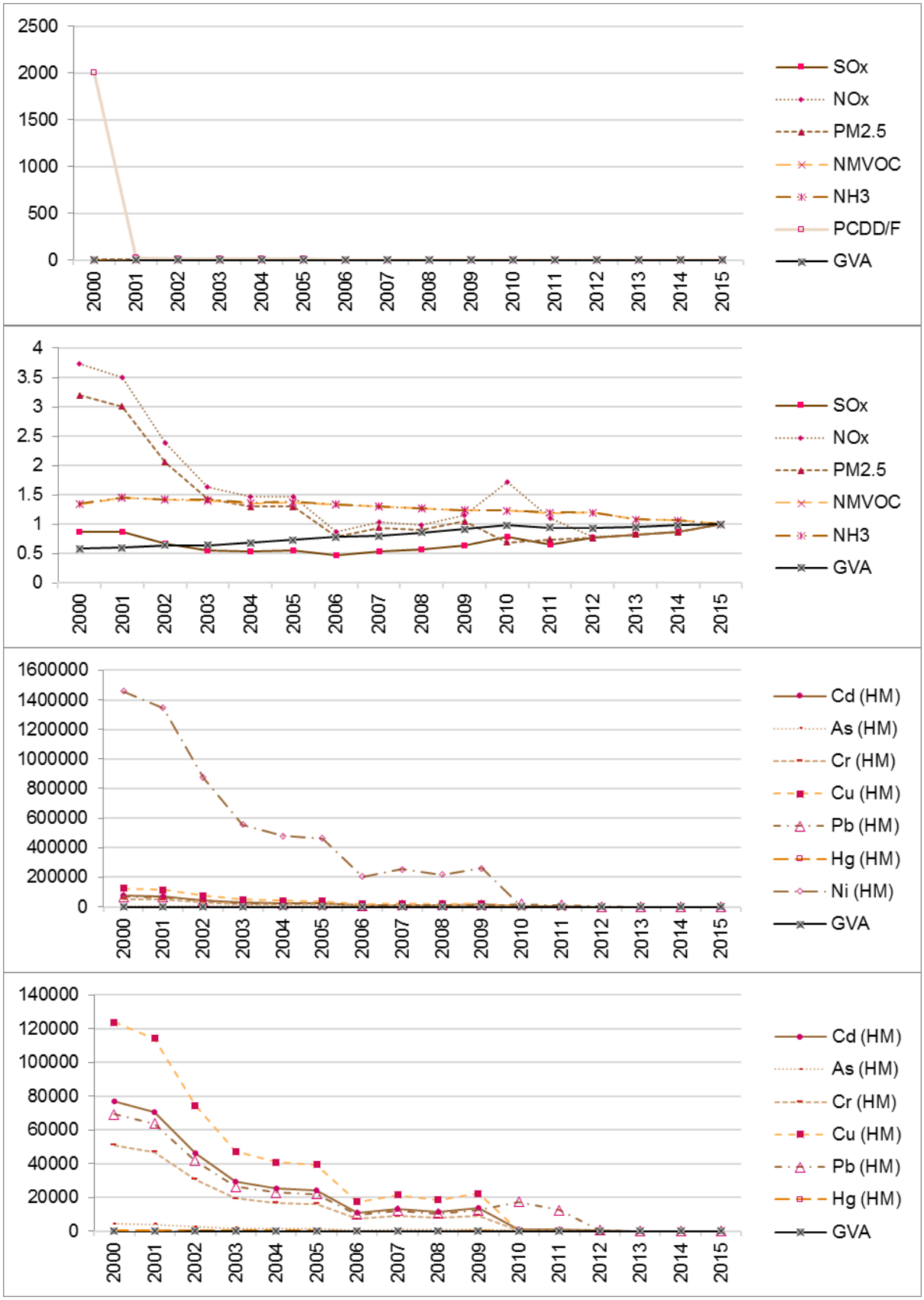


Note: All non-heavy metal pollutants reported except NH_3; and PCDD/F is removed from the second chart as an outlier to make the detail for the other pollutants showing more visible.

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

In the non-hazardous waste management industrial sector, almost all pollutants decreased from 2000 to 2010, especially NO_x, $PM_{2.5}$ and heavy metals, despite a continuous GVA increase. From 2010 to 2015, a more static trend can be observed. Overall NO_x emissions slightly increased (Figure 18). The emission value for PCDD/F in 2000 is expected to be an outlier. Therefore, a further graph, excluding PCDD/F, is provided (Figure 18). No data on Zn emissions was reported for this sector.

Figure 18: Indexed emissions to air from the non-hazardous waste industrial sector (indexed to 2015=1)

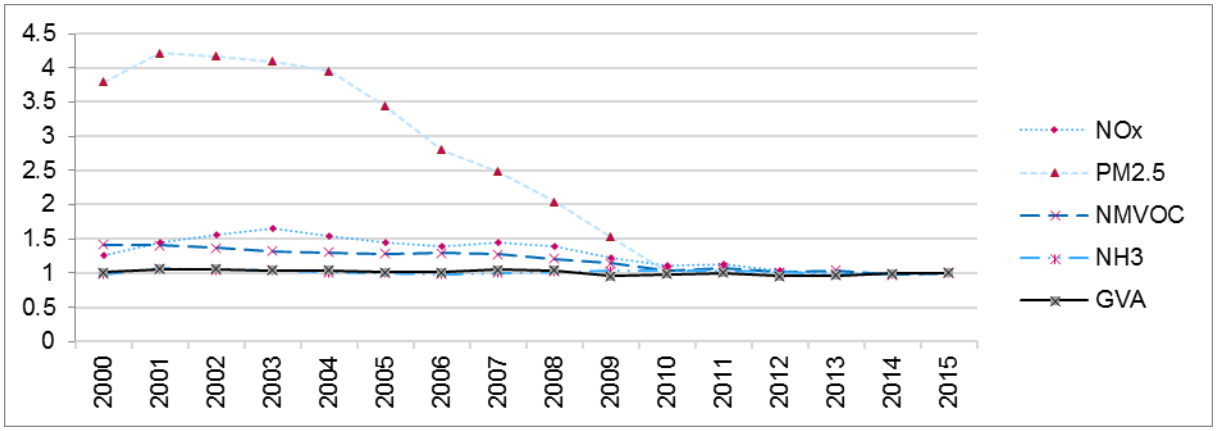


Note: No Zn reported. Outliers removed. PCDD/F removed from the first chart and Ni from the third chart to make detail for other pollutants more visible.
Source: EEA (2017a), Eurostat (2017a)

'Other activities'

Within the 'other activities' industrial sector only data for NO_x, $PM_{2.5}$, NMVOC and NH_3 emissions has been reported. All pollutant emissions have decreased from 2000 to 2015, except for NH_3 emissions which have remained relatively static over time in line with the GVA in this sector (Figure 19).

Figure 19: Indexed emissions to air from other activities (indexed to 2015=1)



Note: All non-heavy metal pollutants reported except SO_x and PCDD/F. No heavy metals data reported.

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 Italy

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 gaps	No data reported for the non-ferrous metal, the mineral – glass and the other minerals industrial sectors .	No action

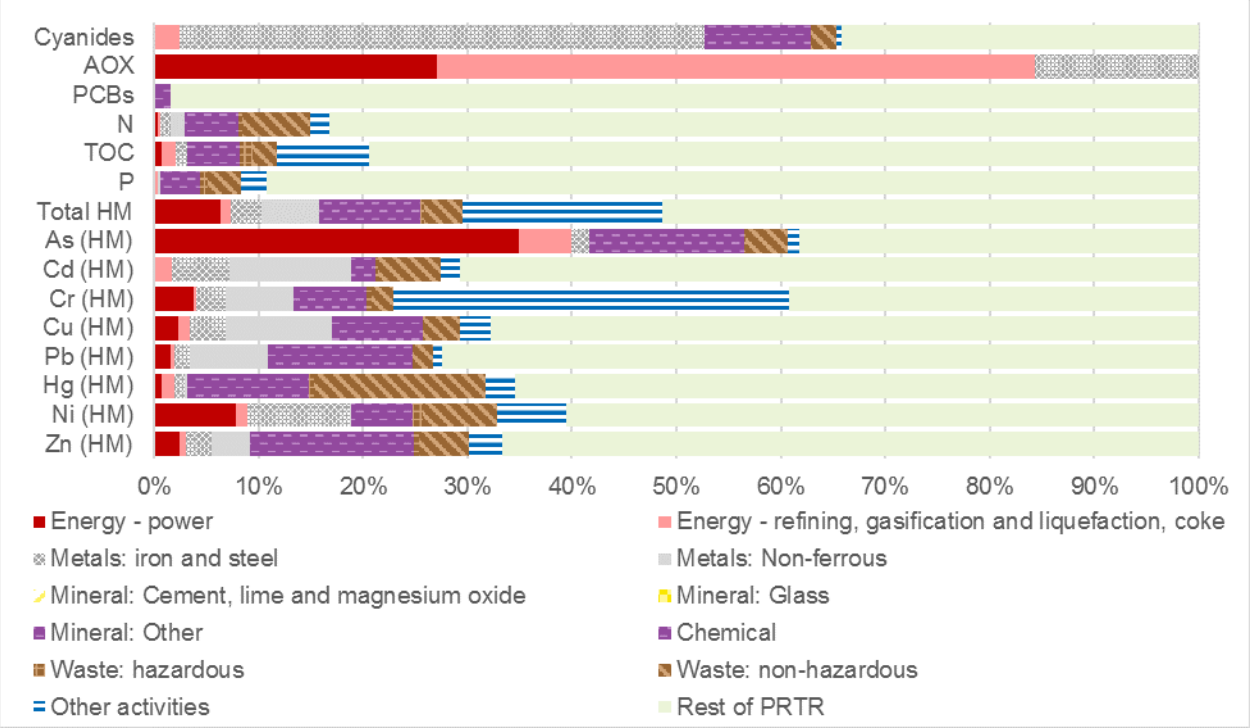
4.2 Emissions to water

Data for emissions to water is taken from the E-PRTR (EEA, 2017), which has a broader industrial scope than the IED but is not a national total. The figures in this section, apart from Figure 20, aggregate the separate metals into a single heavy metals metric based on their relative toxicity (predicted no effect concentrations).

Pollutant emissions are reported for all industrial sectors except the mineral – cement, lime and magnesium oxide and the mineral – other industrial sectors. Within 'other activities', no emissions to water data are reported for intensive rearing of poultry and pigs. Data completeness varies per year and pollutant. For the year 2015 no data are available for water emissions, thus data from 2014 are presented. Full details on the emissions reported by industrial sector and year are presented in tabular format in Appendix 3.

The available data of emissions to water for the year 2014 are shown in Figure 20. This plot presents, per pollutant, the proportion of emissions to water by industrial sector compared to the total data reported by Italy to the E-PRTR in 2014. Overall, industrial sectors, are responsible for less than half of the total pollutants emitted to water in 2014 and reported to E-PRTR with the exception of cyanides, AOX, As and Cr which appear to be more intensely emitted from industrial sectors compared to the rest of the emissions reported to E-PRTR (with AOX solely coming from industrial sectors). The contribution of each industrial sector varies considerably between pollutants. Considering cyanides emissions, iron and steel production emits the greatest contribution whereas As is mainly emitted by the energy – power industrial sector. In the case of AOX emissions, the energy- refining, gasification, liquefaction and coke industrial sector is responsible of most of the emissions to water. Furthermore, 'other activities' are the main emitter of Cr emissions to water. PCDD/F emissions are not reported. Full details on the emissions reported by industrial sector and year are presented in tabular format in Appendix 3.

Figure 20: Pollutant emissions to water from industrial sectors and rest of PRTR (2014)



Note: Rest of PRTR relates to the total for E-PRTR reporting minus the industrial sectors shown here. No water emission data were available for 2015. No data reported for diuron in 2014.

Source: EEA (2017b)

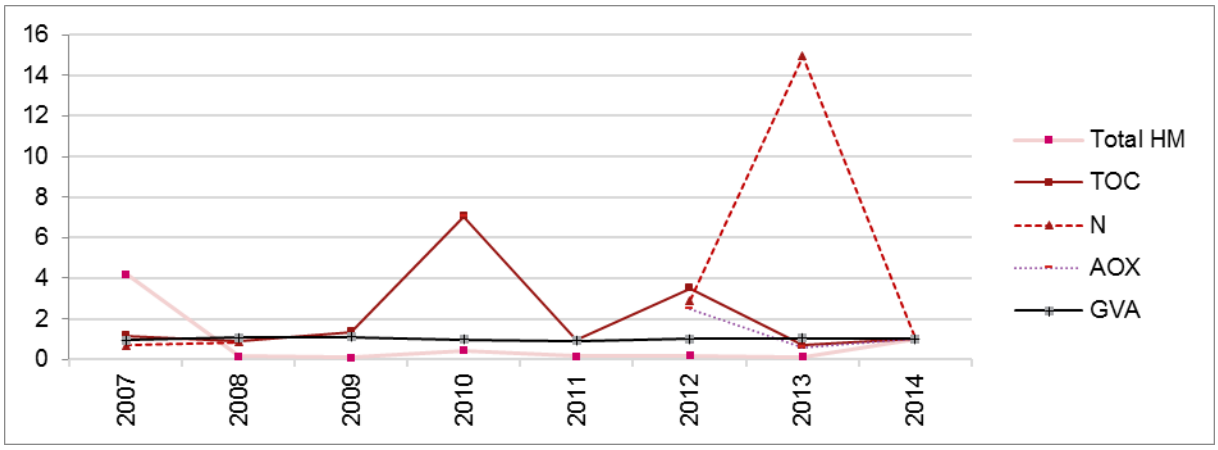
In the following subsections, emissions to water are shown in indexed charts by industrial sector, with the exception of the mineral industrial sectors for which no or limited data were reported. The emission data were indexed to compare the development of pollutant emissions with the GVA in specific industrial

sectors from 2007 to 2014. Full details on the emissions reported by industrial sector and year are presented in tabular format in Appendix 3.

Energy industry

Emissions to water from the energy - power industrial sector fluctuated significantly in the period 2007 to 2014. No real trend can be seen due to the high fluctuations and data gaps for various years (Figure 21). In 2014, data were reported for total heavy metals, TOC, total N and AOX.

Figure 21: Indexed emissions to water from the energy-power sector (indexed to 2014=1)

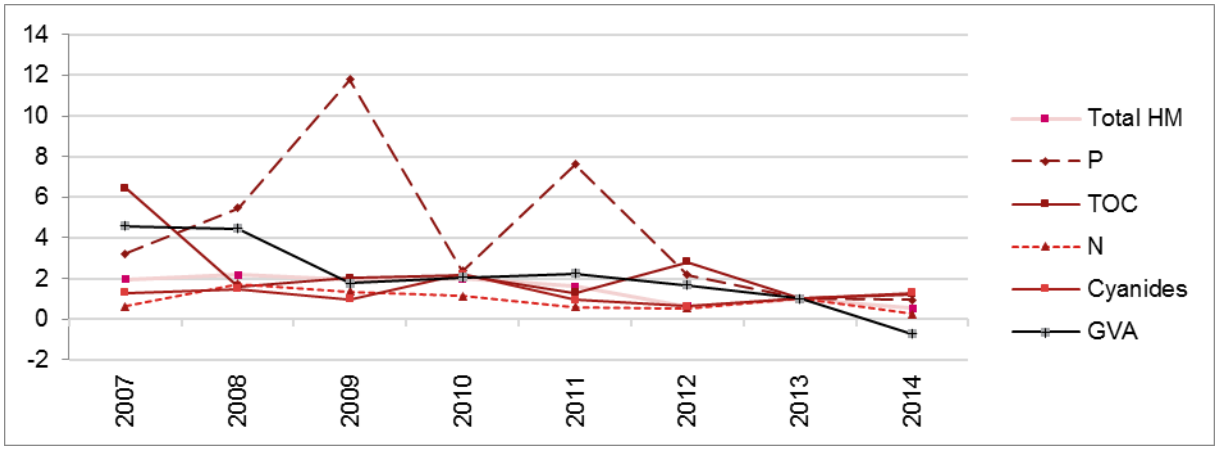


Note: No diuron, cyanides, total P, PCBs or PCDD/F reported. Zero emissions reported for total N between 2009 and 2011, and for AOX between 2007 and 2009 and in 2011. Values not plotted in the chart above to avoid misrepresenting the trend.

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

Within the energy - refining, gasification and liquefaction, coke industrial sector no data were reported for diuron, PCBs and PCDD/F and AOX in 2013. The year 2013 was used as basis for indexing in this sector, as for 2014 a negative GVA was reported. For the pollutants reported, most of the emissions to water decreased, with some fluctuations, from 2007 to 2014 in line with the GVA. Two spikes are seen for total P, it is not clear what caused them.

Figure 22: Indexed emissions to water from the energy- refining, gasification and liquefaction, coke (indexed to 2013=1)



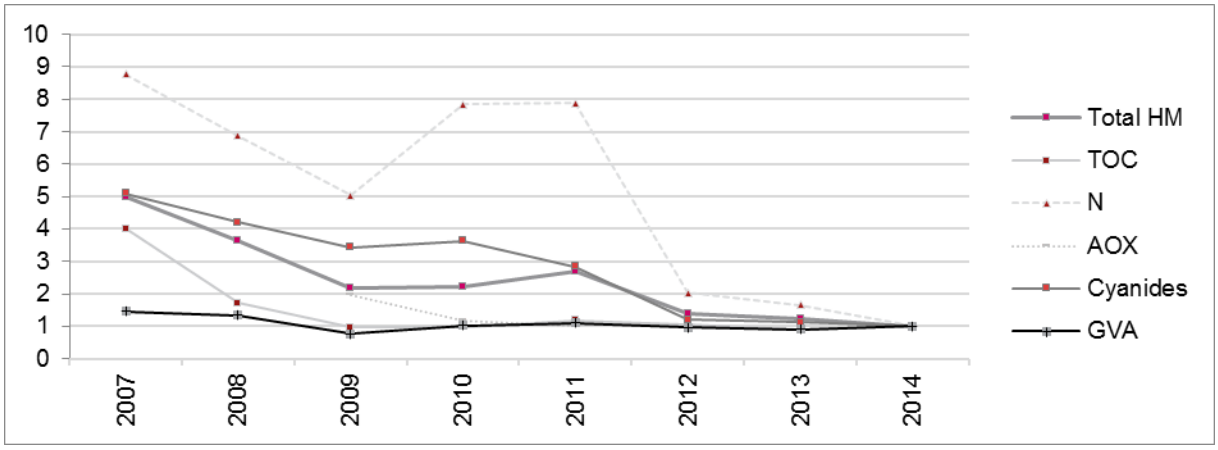
Note: No AOX, PCBs, PCDD/F or diuron reported. All values indexed to the year 2013 owing to the negative GVA reported for 2014 which distorts the trend line.

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

Metal industry

All reported pollutant emissions to water for the iron and steel metal industrial sector generally decreased from 2007 to 2014 together with the GVA (Figure 23). The main decrease can be observed for the period 2007 to 2012. Data on total P, PCB, PCDD/F and diuron emissions was not reported.

Figure 23: Indexed emissions to water from the iron and steel sector metal production (metal industrial sector) (indexed to 2014=1)

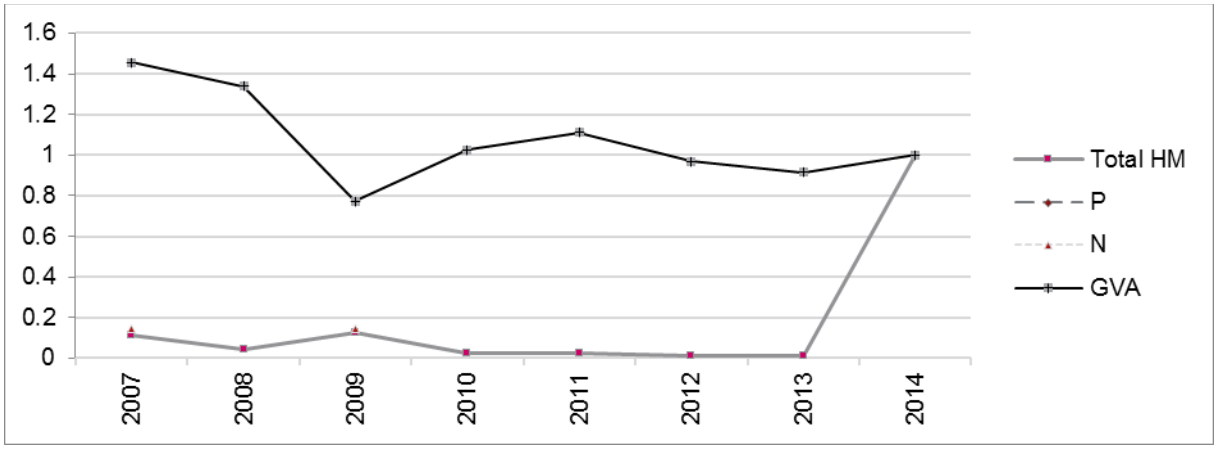


Note: No P, PCB, PCDD/F or diuron. Zero emissions reported for AOX in 2007, 2008, 2012 and 2013. Values not plotted in the chart above to avoid misrepresenting the trend.

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

Within the non-ferrous metal industrial sector only data on total heavy metals, total P and total N were reported. In the case of total P, data were only reported for 2014 and total N emissions were reported for 2007, 2009 and 2014.Total heavy metal emissions varied significantly with low emission values between 2010 and 2013 and high emissions reported for 2014 (Figure 24). This was due to overall high emission values reported for all heavy metals in this year.

Figure 24: Indexed emissions to water from the non-ferrous metal production (metal industrial sector) (indexed to 2014=1)



Note: Only total heavy metals, total P and total N reported. Zero emissions reported for total P between 2007 and 2013, and for total N in 2008 and between 2010 and 2013. Values not plotted in the chart above to avoid misrepresenting the trend.

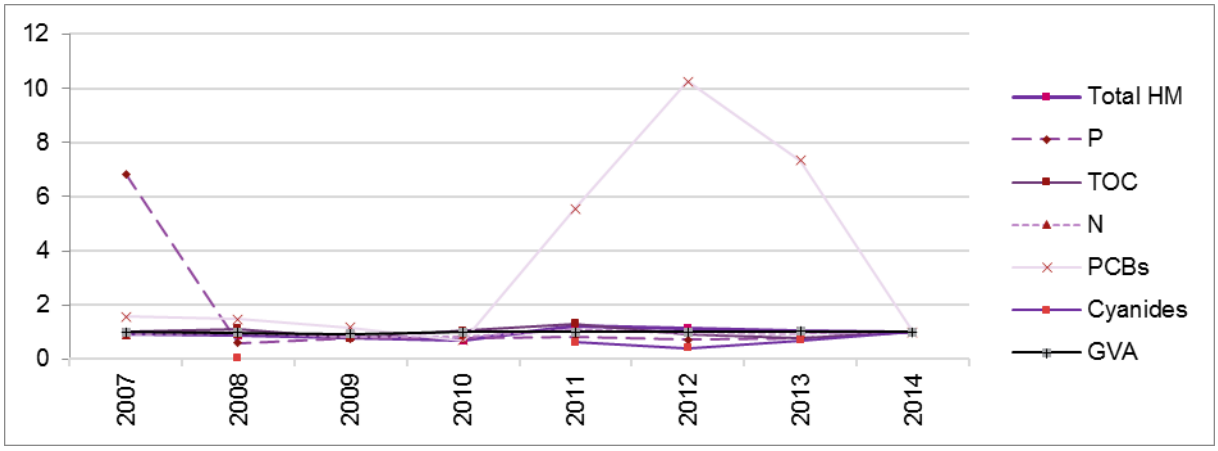
Source: EEA (2017b), Eurostat (2017a)

Chemical industry

Emissions to water from the chemical industrial sector mainly come from the production of organic chemicals, inorganic chemicals and pharmaceutical products including intermediates.

Emissions to water in the chemical industrial sector have remained fairly constant from 2007 to 2014 for all pollutants in line with the GVA (Figure 25). Spikes can be observed for total P in 2007 and for PCBs in 2012. No data were reported for PCDD/F, AOX and diuron in 2014, AOX emissions were only reported for 2010.

Figure 25: Indexed emissions to water from the chemical industrial sector (indexed to 2014=1)



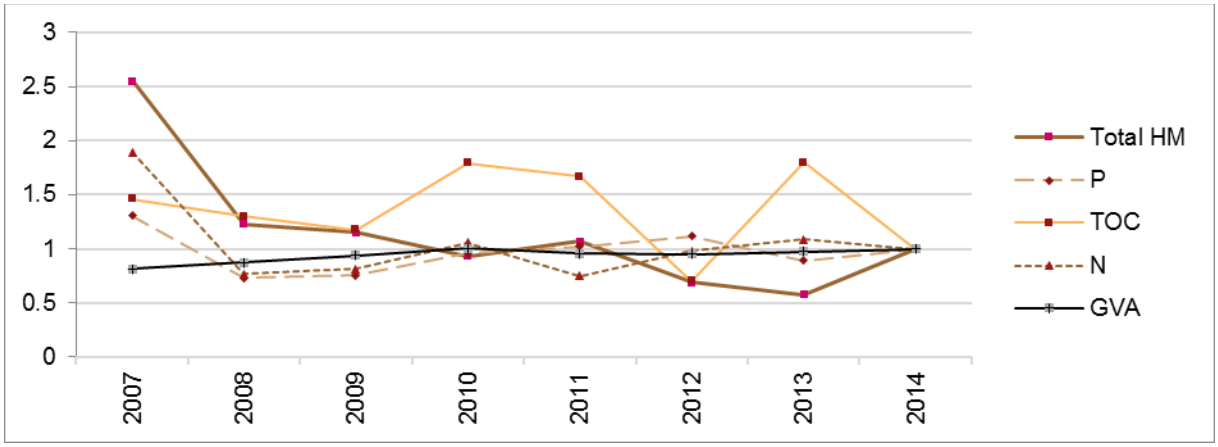
Note: All pollutants reported except PCDD/F. Zero emissions reported for cyanides in 2007 and between 2009 and 2010. Values not plotted in the chart above to avoid misrepresenting the trend.

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

Waste management industry

Emissions to water from the hazardous waste management industrial sector were only reported for total heavy metals, total P, total N and TOC. All pollutant emissions fluctuated significantly with no real trend, despite the slowly increasing GVA and growing number of installations between 2011 and 2015 (Figure 26).

Figure 26: Indexed emissions to water from the hazardous waste (waste management industrial sector) (indexed to 2014=1)



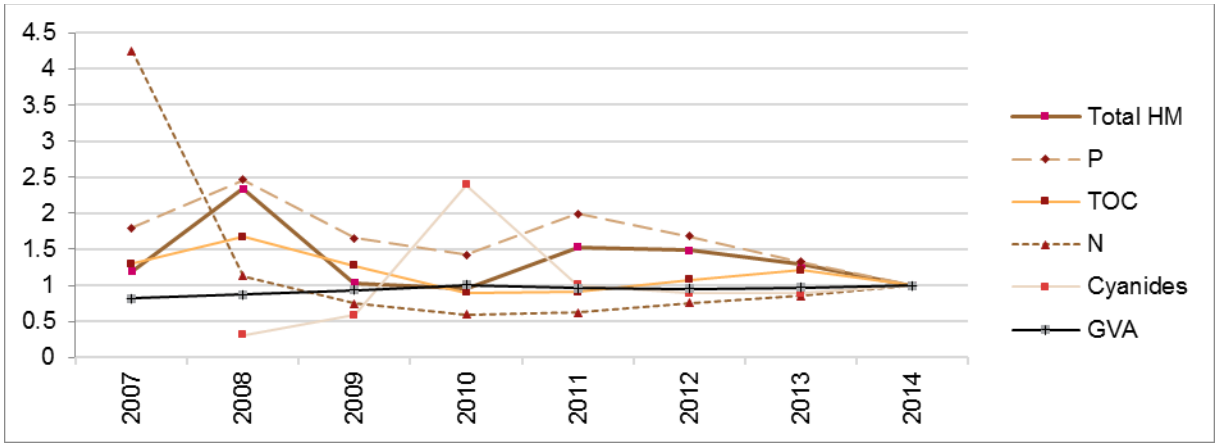
Note: Only total heavy metals, total P, TOC and total N reported.

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

Within the non-hazardous waste management industrial sector overall emissions to water decreased with significant fluctuations for all pollutants from 2007 to 2014, except for cyanide emissions, which

increased in this time period. Considering the time period 2011 to 2014, total P and total heavy metal emissions continuously decreased whereas total N emissions continuously increased and TOC and cyanide emissions remained fairly static (Figure 27).

Figure 27: Indexed emissions to water from the non-hazardous waste (waste management industrial sector) (indexed to 2014=1)



Note: Only total heavy metals, total P, TOC, total N, and cyanides reported. Zero emissions reported for cyanides in 2007. Value not plotted in the chart above to avoid misrepresenting the trend.

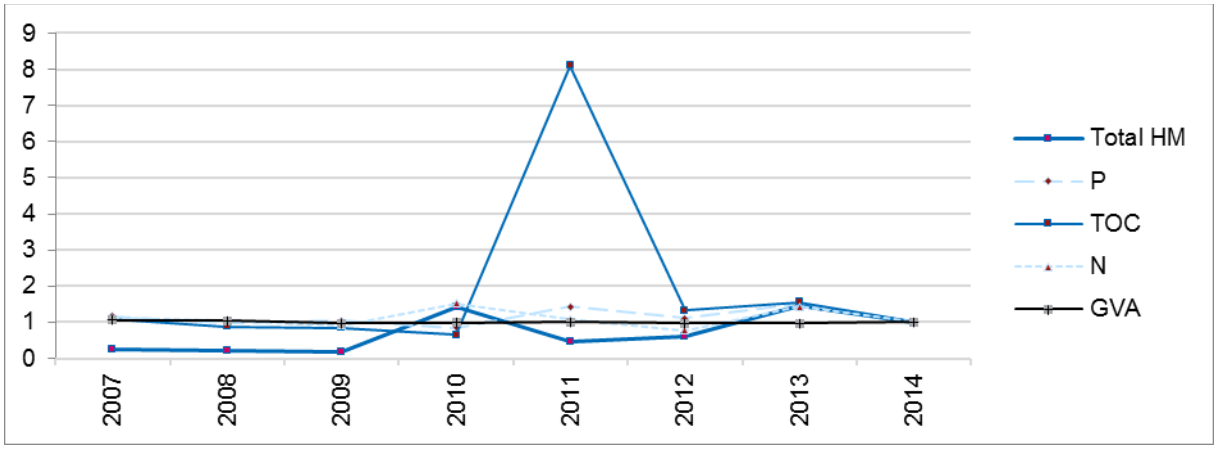
Source: EEA (2017b), Eurostat (2017a)

Other activities

Emissions to water from 'other activities' mainly come from surface treatment. For intensive rearing of poultry and pigs and production of carbon, pulp and paper, no data was reported.

For all pollutants reported in 2014 (total heavy metals, total P, TOC and total N) emissions to water remained fairly static with some fluctuations over time and a peak in total TOC in 2011 (Figure 28). Emissions of total heavy metals increased over time, with Cr being the main significant heavy metal. Emission of PCBs and cyanides were also reported in some years but not consistently so are not presented in the figure. The GVA follows the same decreasing trend as overall emissions to water over time.

Figure 28: Indexed emissions to water from other activities (indexed to 2014=1)



Note: Only total heavy metals, total P, TOC and total N reported. Zero emissions reported for cyanides between 2009 and 2013. Values for cyanides were only reported for 2007, 2008 and 2014. They were therefore not plotted in the chart above to avoid misrepresenting the trend.

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

Additional data for emissions to water

Additional data reported to E-PRTR for emissions to water are presented in Appendix 3 – including for pollutants with no time series.

Limitations

No limitations arise as a result of the mapping to IED activities as E-PRTR activities are well aligned in this respect. However, it is generally expected that emissions to water reported to E-PRTR will be underreporting against IED activities because of the reporting thresholds which apply (as well as inconsistencies between years). E-PRTR also has a limited timeseries.

Table 7: Gaps in emissions to water data for Italy

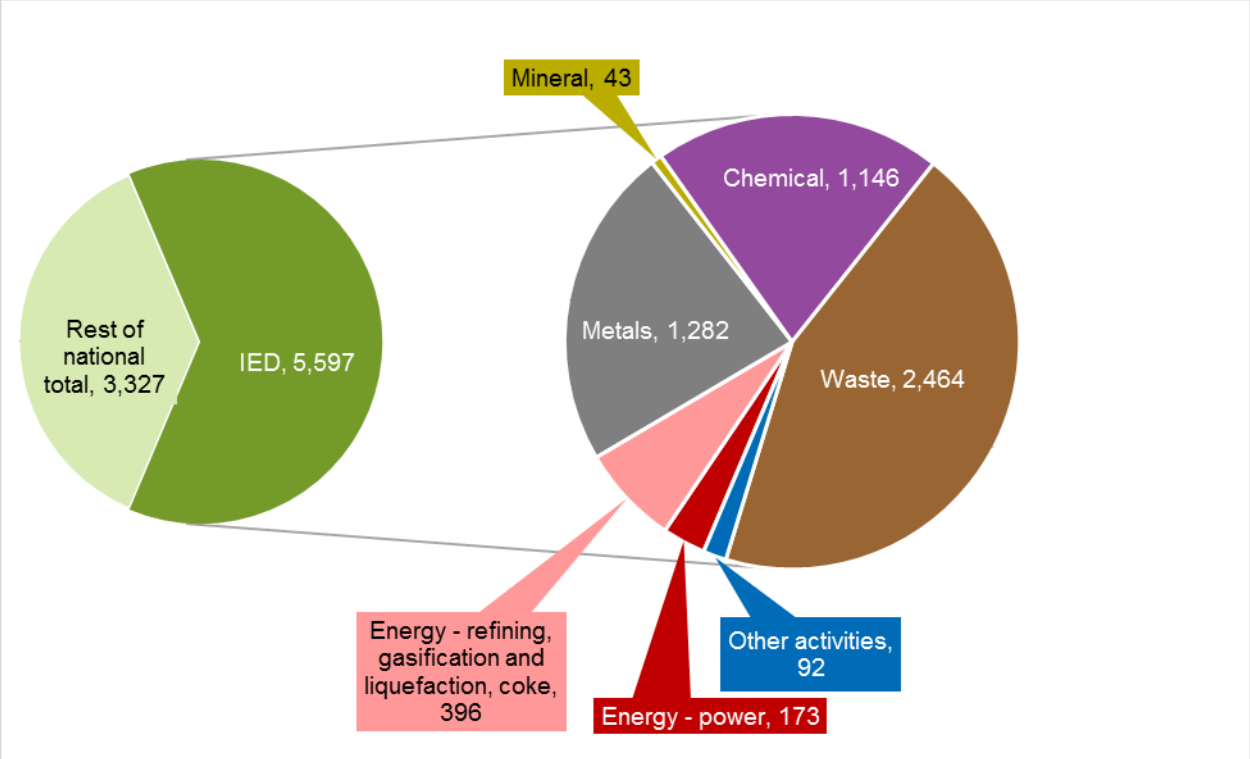
Missing data	Description	Conclusion and actions taken#
No data available for 2015	No data on water emissions available for any sector for the year 2015	Data for 2014 analysed
No data available for the mineral sector	No data on water emissions for the mineral sector	No action

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 a significant share of total hazardous waste generated in Italy in 2014 (more than half) (Figure 29). Of this, the waste management industrial sector generates the largest quantity (44% of total industrial hazardous waste generation), followed by the metals industrial sector (23%) and the chemical industrial sector (20%).

Figure 29: Hazardous waste generation by industrial sector in 2014 (kt)

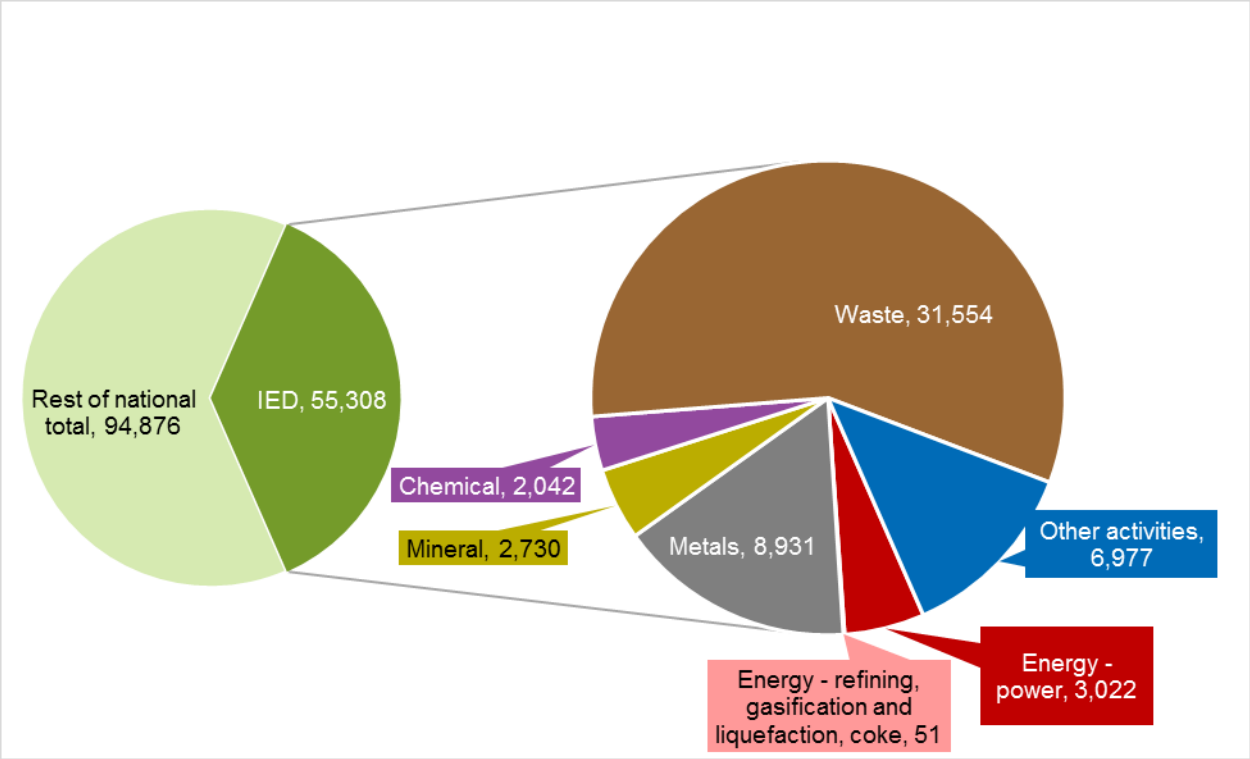


Note: Rest of national total relates to all NACE reporting minus the industrial sectors shown here.

Source: Eurostat (2017e)

The share of total non-hazardous waste generated in industrial sectors is slightly less contributing to 37% of total non-hazardous waste generated in 2014 (Figure 30) – with the waste management industrial sector again accounting for the majority of this (57%). It is again followed by the metals industrial sector (16%). However, 'other activities' is the third industrial sector generating non-hazardous waste (13%).

Figure 30: Non-hazardous waste generation by industrial sector in 2014 (kt)



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

Source: Eurostat (2017e)

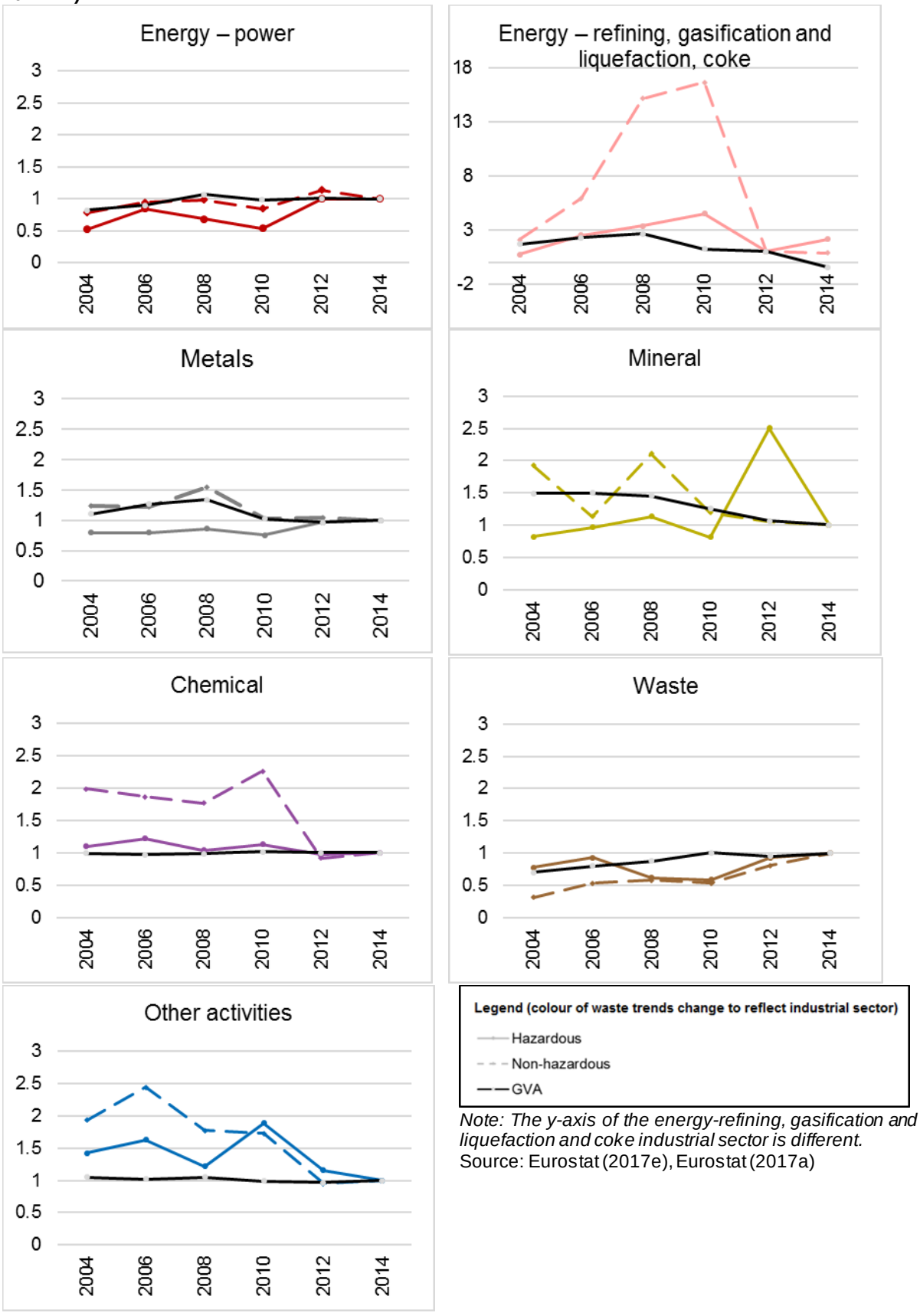
Hazardous waste generated by the chemical industrial sector and 'other activities' has decreased over time, while GVA remained quite stable (Figure 31). In the case of the energy – power and the waste industrial sectors, hazardous waste generation increased in line with GVA. Waste generation within the energy - refining, gasification and liquefaction, coke, metal and mineral industrial sectors increased despite decreasing GVA.

Non-hazardous waste generation has decreased between 2004 and 2014 in most of the industrial sectors, except in the case of energy – power and waste management, where it increased (Figure 31). Significant decreases can be observed for the chemical industrial sector and 'other activities'. In the energy - refining, gasification and liquefaction, coke industrial sector a peak can be observed between 2008 and 2010, the reasons for this are not known. The trends in non-hazardous waste generation are, for almost all sectors, in line with the trend in GVA.

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 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 31: Hazardous and non-hazardous waste generation by industrial sector relative to GVA (indexed; 2014 = 1)



Note: The y-axis of the energy-refining, gasification and liquefaction and coke industrial sector is different.
Source: Eurostat (2017e), Eurostat (2017a)

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 or political intervention or implementation of a specific national policy or which are evident from literature or analysis[2]

As shown in section 2, key industries in Italy in terms of the number of IED installations in 2015 is intensive rearing of poultry or pigs (30% of total in 2015), followed by the waste management sector (21%) and the surface treatment industrial sector (12%).

The industrial sectors identified in section 4 as contributing the largest burden to the environment for emissions to air were the energy – power, metals – iron and steel and 'other activities' industrial sectors (for the latter NMVOC and NH_3 emissions primarily). All sectors except for minerals, for which no data were reported, were identified as having environmental burdens for emissions to water whereas the waste management, metals and chemicals industrial sectors mainly contribute to 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 NH_3 emissions to air data from manure management resulting from intensive rearing of poultry or pigs.

The challenges are shown in Table 8. Within the metals - iron and steel industrial sector, which contributes significantly to emissions of a number of air pollutants in Italy, one challenge was identified with one specific plant in regard to air pollution. Another challenge was identified in regard to air pollution resulting from non-hazardous waste management although this sector only marginally contributes to overall emissions to air in 2015. The challenges were identified through desk-based research and confirmed by a representative of the Italian Ministry of Environment.

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

Table 8: Key challenges identified in Italy

Lack of information to inform installation permit requirements	IT-1
IED activities / sectors	2.2 Production of pig iron or steel
Medium and pollutants	Emissions to air (main pollutants concerned include dust, N_2O, SO_2, HCl, benzene, dioxin and CO_2)
Description	The ILVA steel mill is the biggest steel mill in Europe with an annual production capacity of 10 million tonnes (accounting for 40% of Italian steel production). The installation is considered to be economically critical at a national level, employing 12,000 people directly and a further 8,000 by contract. The installation is considered to have contributed to 75% of the city of Taranto's GDP in 2008. In 2012, a study was published which found that the installation was responsible for the emission of several pollutants with negative effects on human health and agriculture in the surrounding area, as well as contributing to greenhouse gas emissions. The study found that the following impacts on human health could be attributed to the emissions from the installation between 1998 and 2010 (Ecologic, 2015): • ~30 deaths a year • ~18 cases a year of hospitalisation from malignant tumours • ~19 cases a year of hospitalisation from coronary disease • ~74 cases a year of hospitalisation from respiratory illness The report findings revealed a need for more stringent environmental requirements to be set in the installation's permit. The permit was revised in 2012 with stricter requirements and in compliance with the adopted BAT conclusions for the sector. The lack of information concerning the environmental impact of the installation was a particular challenge for the authorities when reviewing the appropriateness of the permit (Italian Ministry of Environment, Personal Communication).
Years applicable / current	1990 - 2012
Related infringement cases	The first national infringement case was reported in 1990 with a total of 10 cases reported – resulting in fines, prison sentences and compulsory clean-up actions with government officials designated to oversee them carried out. As well as the protection of the environment the national infringement cases also related to the protection of workers jobs. The Commission launched an infringement case in 2011; and issued a reasoned opinion in 2014 (European Commission, 2014). The 2011 proceedings found that the Italian government had failed to review the installation permits appropriately. The 2014 reasoned opinion stated that the Italian government had failed to ensure that the ILVA installation was compliant with the IED.
Public complaints	Public complaints are made in relation to air pollution and the need to protect jobs.
Media Attention	The issue has received ample media attention at local, regional, national and global scales including reports for example by the BBC (2014) and ENDS Europe (2014).
Political interventions	At a European level, the European Parliament commissioned a briefing on the installation and recommendations made suggested that the European Parliament monitor the situation closely going forwards.

Lack of information to inform installation permit requirements	IT-1
Policies implemented to address challenge	National legislation was adopted in 2015 to place the installation under special administration and extraordinary administration – meaning that commissioners have been appointed to manage the business appropriately (ensuring job security and environmental protection).
Related policies	EU climate policies and the National Emissions Ceiling Directive Local air quality plan defined in 2012 by the Local Authority.

Environmental crime in waste disposal	IT-2
IED activities / sectors	5.2 Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants; 5.3 Disposal of non-hazardous waste; and 5.4 Landfills
Medium and pollutants	Emissions to air (main pollutant dioxins)
Description	In 2010, the region was notified by the European Commission that waste collection in Campania was inadequate and was required to construct an installation for waste disposal (CJEU, 2015). The planned construction was intended to support the disposal of: • 1,829,000 tonnes for landfill • 1,190,000 tonnes for thermal treatment recovery • 382,500 tonnes for organic waste treatment The region has a history of waste disposal problems. Problems were first reported in 1989 and by 1999, one company had a monopoly of waste management for the province. The company was sensitive to corruption and often failed to dispose of waste resulting numerous cases of civil unrests (Greyl et al., 2010). The need for new waste disposal installations arose primarily from the toxic emissions coming from the burning of untreated waste (as carried out by the one company responsible for waste disposal in the region) (Greyl et al., 2010). The reported environmental and human health impacts include (Greyl et al., 2010): • In 2010, 2,551 sites were classified as contaminated in the region; and of the 39 landfills, 27 are thought to contain toxic waste. • In 2007, the Campania Mortality Atlas reported that the first cause of mortality in young people in the region was tumours, directly linked to exposure to waste.
Years applicable / current	1989 – ongoing
Related infringement cases	The first court order by the Commission was made in 2010, and failure to comply led to further court action in 2015 when the European Commission ordered the region to pay a fine of €20 million, accompanied by a daily late-payment fee of €120,000 for every day that the requirements are not met (CJEU, 2015).
Public complaints	The issue has led to significant civil unrest as evidenced by the state of emergency declared in 1994 and subsequent emergencies within emergencies (Greyl et al., 2010). A protest was held by the public in response to the re-opening of a closed landfill site in 2008 and police intervention was needed. The protestors were concerned over health impacts from the landfill. A protest march was also organised in 2008 in relation to waste management in the region (Greyl et al., 2010).

Environmental crime in waste disposal	IT-2
Media Attention	The issue of waste disposal management in Campania has received considerable media attention at local, regional, national and global scales in the past although this attention has subsided in more recent years despite the problem being ongoing.
Political interventions	In 1993 a regional waste management plan was adopted but it was unable to overthrow the illegal network of waste disposal already established. In 1994, the first state of emergency was declared owing to the saturation of landfills in the region, and emergencies within the emergency have since been declared. In 2009, a decree was passed giving the local authorities responsibility for the management of waste disposal infrastructure (Greyl et al., 2010).
Policies implemented to address challenge	Landfill tax (based on Law 549/1995) – the upper and lower level of the tax is stipulated by legislation and distinguishes between hazardous and non-hazardous waste. The landfill tax is applied at regional level. (EEA, 2013)
Related policies	None identified.

7 References

AMEC (2016) Supporting the evaluation of Regulation (EC) No 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register and its triennial review.

BBC (2014) Italian government steps in to save ILVA plant. 24 December 2014. http://www.bbc.co.uk/news/business-30599821

CEPI (2016) Key statistics 2016 European Pulp and Paper Industry. http://digibook.digi-work.com/Digibooks.aspx/Get/cepi/1641/KeyStatistics2016_Finalpdf

CEPS et al. (2016) Composition and drivers of energy prices and costs: case studies in selected energy-intensive industries. Final Report;

CJEU (2015) Press release 86/15. Luxembourg, 16 July 2015. http://curia.europa.eu/jcms/upload/docs/application/pdf/2015-07/cp150086en.pdf

EC (2010) BREF: Cement, Lime and Magnesium Oxide Manufacturing Industries. European Commission.

EC (2013) Communication from the Commission (COM/2013/407) Action Plan for a competitive and sustainable steel industry in Europe http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52013DC0407

EC (2015) Statistical pocketbook 2015 EU Energy in figures. http://ec.europa.eu/energy/sites/ener/files/documents/PocketBook_ENERGY_2015%20PDF%20final.pdf

EC (2016) Supporting the evaluation of Regulation (EC) No 166/2006 concerning the establishment of a E-PRTR and its triennial review. European Commission.

Ecologic (2015) The ILVA Industrial Site in Taranto. In-depth analysis for the ENVI Committee. http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/563471/IPOL_IDA(2015)563471_EN.pdf

EEA (2013) Municipal waste management in Italy. https://www.eea.europa.eu/publications/managing-municipal-solid-waste/italy-municipal-waste-management

EEA (2016) EEA country factsheets on industrial emissions. http://www.eea.europa.eu/themes/industry/industrial-pollution

EEA (2016b) Mapping industry across datasets. https://forum.eionet.europa.eu/nrc-industrial-pollution/library/consultations/2016/draft-2016-country-profiles/methodology/mapping-industry-across-datasets/

EEA (2017a) Data on emissions of air pollutants submitted to the LRTAP Convention and copied to EEA https://www.eea.europa.eu/data-and-maps/data/national-emissions-reported-to-the-convention-on-long-range-transboundary-air-pollution-lrtap-convention-11 [last update: 12 July 2017]

EEA (2017b) European Pollutant Release and Transfer Register [last update: 17 July 2017]. http://prtr.ec.europa.eu/#/home

ENDS Europe (2014) Final warning for Italy over polluting steel mill. 16 October 2014. http://www.endseurope.com/article/37304/final-warning-for-italy-over-polluting-steel-mill

ETC/ACM (2016) Summary report on 2014 E-PRTR data. European Environment Agency.

European Commission (2014) Environment: European Commission urges Italy to address severe pollution issues at Europe's biggest steel plant http://europa.eu/rapid/press-release_IP-14-1151_en.htm

Eurostat (2017a) National accounts aggregates by industry [nama_10_a64] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_a64&lang=en

Eurostat (2017b) Employment by sex, age and detailed economic activity [lfsq_egan22d] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsq_egan22d&lang=en

Eurostat (2017c) Simplified energy balances - annual data [nrg_100a] http://appsso.eurostat.ec.europa.eu/nui/show.do?wai=true&dataset=nrg_100a

Eurostat (2017d) Water use in the manufacturing industry by activity and supply category [env_wat_ind] and Water use by supply category and economical sector [env_wat_cat] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wat_ind&lang=en and http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wat_cat&lang=en

Eurostat (2017e) Generation of waste by waste category, hazardousness and NACE Rev. 2 activity [env_wasgen] http://appsso.eurostat.ec.europa.eu/nui/show.do?lang=en&dataset=env_wasgen

Greyl et al. (2010) The waste crisis in Campania, Italy. http://www.ceecec.net/wp-content/uploads/2008/09/CAMPANIA_FINAL_19-05.pdf

Italian Ministry of Environment (2018) Personal Communication, January 2018

Poyry and VITO (2012) Preparatory Action - Development of Prevention Activities to halt desertification in Europe - Service Contract to contribute to the building of Water and Ecosystem accounts at EU level. Final Report 2: Uses & Supply http://ec.europa.eu/environment/water/blueprint/pdf/WaterEcosystemAccount2.pdf

Appendices

Appendix 1 Mapping industrial sectors across data sources for Italy

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

Appendix 3 Emissions to water by pollutant and industrial sector (detail)

Appendix 1: Mapping industrial sectors across data sources for Italy

Industrial sector †	**GVA**	**Employment**	**Energy consumption**	**Water consumption**	**Emissions to air**	**Emissions to water**	**Waste generated**
	Eurostat (2017a)	**Eurostat (2017b)**	**Eurostat (2017c)**	**Poyry and VITO (2012)**	**EEA (2017a)**	**EEA (2017b)**	**Eurostat (2017e)**
Sector classification	*NACE Rev 2*	*NACE Rev 2*	*Energy balance indicator*	*Own definitions*	*NFR14 sector classification*	*E-PRTR*	*NACE Rev 2*
Time series available	*2000-2015, annually*	*2008-2015, annually*	*2000-2015, annually*	*No time series*	*2000-2015, 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	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, gasification and liquefaction, coke	C19 (coke and refined petroleum products)	C19 (coke and refined petroleum products)	B_101307 - Petroleum Refineries; B_101312 - Coke Ovens; B_101320 - Non-specified (Energy); B_101314 - Gas Works; B_101316 - Coal Liquefaction Plants; B_101317 - Liquefaction (LNG) / regasification plants; B_101319 - Gas-to-liquids (GTL) plants (energy)	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; B_101315 - Blast Furnaces	Cooling processes in the iron and steel sector.	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	*Unavailable*	2C2-7 Non-ferrous metals	Non-ferrous metal production (2e)	
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	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	*Unavailable*	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*	*Unavailable*	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	*Unavailable*	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: Food and drink products	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)
Textiles and tanning	C13-C15 (textiles; wearing apparel; leather)	C13-C15 (textiles; wearing apparel; leather)	B_101835 - Textile and Leather	Processing in textiles and tanning		Pre-treatment or dyeing of textile fibres or textiles (9a); Tanning of hides and skins (9b)	C13-C15 (textiles; wearing apparel; leather)
Pulp, paper and wood-based products	C16 (wood products)	C16 (wood products);	B_101851 - Wood and Wood Products	Processing in pulp, paper and wood-based sector	2I Wood processing		C16 (wood products)
	C17 (paper and paper products)	C17 (paper and paper products)	B_101840 - Paper, Pulp and Print		2H1 Pulp and paper industry	Pulp, paper and wood production (6a-c)	C17-C18 (paper and paper products; printing)
Intensive rearing of poultry and pigs	*Insufficient granularity in reported data*	*Insufficient granularity in reported data*	*No indicators*	*Unavailable*	3B4gi Manure management - Laying hens; 3B4gii Manure management - Broilers	Intensive rearing of poultry and pigs (7a)	*Insufficient granularity in reported data*
Surface treatment	*Insufficient granularity in reported data*	*Insufficient granularity in reported data*	*No indicators*	*Unavailable*	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.

Appendix2: Emissions to air by pollutant and industrial sector (detail)

Notes: Emissions rounded to two decimal places unless data is less. Industrial sectors and pollutants with no data reported across the timeseries have been removed.

Source: EEA (2017a).

Pollutant	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Energy – power																	
SO_x	kt	465.09	419.52	371.40	288.74	253.74	187.57	183.27	149.53	117.88	88.78	78.90	71.42	70.03	57.30	51.00	44.36
NO_x	kt	281.54	275.11	265.90	266.90	251.18	237.12	229.16	220.12	191.40	156.04	154.09	148.70	132.46	115.34	107.22	101.16
$PM_{2.5}$	kt	22.07	20.29	18.17	16.11	14.12	11.79	11.51	9.92	9.32	6.94	7.12	6.73	5.64	5.80	5.84	6.21
NMVOC	kt	12.38	12.03	12.07	12.21	12.21	12.18	12.55	12.39	11.40	8.90	9.62	9.68	9.28	8.93	8.85	9.09
NH_3	kt	0.21	0.40	0.65	1.09	3.08	3.66	2.51	1.88	2.06	1.69	1.38	1.52	1.23	1.17	1.13	0.86
Cd (HM)	t	5.14	4.71	3.17	3.18	3.22	3.41	3.49	3.41	3.33	2.12	2.58	2.80	2.71	2.34	2.36	2.11
As (HM)	t	43.62	44.00	39.88	40.44	39.85	38.42	39.51	40.02	40.67	41.01	43.51	45.06	43.51	43.16	43.37	44.35
Cr (HM)	t	31.61	31.20	31.44	33.32	34.28	35.30	35.73	36.23	34.58	27.75	28.92	29.11	27.75	24.47	23.11	24.40
Cu (HM)	t	31.88	29.96	28.58	29.29	29.30	31.12	31.23	30.96	29.93	18.65	23.78	25.94	25.29	20.65	20.28	18.30
Pb (HM)	t	156.76	152.86	142.38	140.93	138.42	145.03	145.28	145.62	136.84	91.79	106.88	113.96	109.81	100.48	103.34	97.95
Hg (HM)	t	4.35	4.33	4.34	4.22	4.21	4.27	4.23	4.18	3.92	3.05	3.13	3.20	2.91	2.72	2.80	2.77
Ni (HM)	t	37.80	36.80	37.47	35.76	31.77	28.84	28.75	25.76	22.99	18.36	17.00	16.06	15.02	13.43	12.83	15.02
Zn (HM)	t	227.83	210.38	199.26	205.55	212.93	221.96	224.38	211.00	204.23	134.11	165.78	181.58	174.13	146.23	141.82	129.50
PCDD/F	g	128.80	125.54	120.59	119.31	114.67	125.56	124.79	128.38	119.98	68.40	65.86	65.76	55.27	55.64	59.86	59.37

Pollutant	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Energy - refining, gasification and liquefaction, coke																	
SO_x	kt	108.54	92.32	95.57	85.16	84.06	74.78	68.33	57.53	54.71	42.41	44.47	36.31	31.13	20.83	12.06	12.18
NO_x	kt	39.93	35.54	36.09	34.95	34.00	31.08	32.98	32.90	32.00	22.91	25.40	24.18	21.96	17.50	14.70	14.74
$PM_{2.5}$	kt	3.12	2.99	2.01	1.72	1.59	1.62	1.64	1.34	1.13	0.77	0.83	0.46	0.70	0.41	0.29	0.50
NMVOC	kt	2.04	1.47	1.40	1.26	1.36	1.44	1.41	1.40	1.57	1.43	1.61	1.57	1.41	1.24	1.18	1.18
Cd (HM)	t	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02
As (HM)	t	0.12	0.13	0.17	0.16	0.17	0.17	0.16	0.17	0.19	0.17	0.18	0.18	0.17	0.13	0.12	0.10
Cr (HM)	t	1.32	1.52	1.75	1.64	1.74	1.89	1.84	1.90	2.44	2.20	2.70	2.73	2.51	2.05	1.97	1.74
Cu (HM)	t	0.80	0.91	1.11	1.05	1.11	1.16	1.11	1.16	1.32	1.20	1.31	1.29	1.23	0.96	0.90	0.74
Pb (HM)	t	0.39	0.44	0.55	0.52	0.54	0.57	0.54	0.56	0.62	0.57	0.61	0.59	0.57	0.44	0.41	0.33
Hg (HM)	t	0.13	0.14	0.18	0.17	0.17	0.18	0.18	0.18	0.21	0.19	0.20	0.20	0.19	0.15	0.14	0.11
Ni (HM)	t	4.24	4.75	5.97	5.62	5.93	6.14	5.88	6.10	6.64	6.11	6.31	6.12	5.95	4.55	4.22	3.31
Zn (HM)	t	0.50	0.56	0.70	0.66	0.70	0.72	0.69	0.72	0.77	0.71	0.72	0.69	0.68	0.52	0.48	0.37
PCDD/F	g	3.72	4.09	5.12	4.80	5.09	5.30	5.06	5.24	5.60	5.18	5.26	5.09	4.96	3.77	3.49	2.81
Metals: iron and steel																	
SO_x	kt	1.39	1.40	1.39	1.42	1.48	1.51	1.64	1.65	1.61	1.07	1.38	1.53	1.46	1.33	1.31	1.25
NO_x	kt	2.09	2.16	2.21	2.23	2.34	2.32	2.58	2.61	2.56	1.81	2.23	2.45	2.33	2.22	2.21	2.20
$PM_{2.5}$	kt	4.76	4.65	4.60	4.82	5.13	5.32	5.74	5.72	5.50	3.52	4.60	5.15	4.92	4.23	4.15	3.80
NMVOC	kt	3.00	3.01	3.06	3.15	3.35	3.36	3.70	3.72	3.61	2.49	3.09	3.42	3.27	3.03	3.01	2.93
Cd (HM)	t	1.07	1.08	1.08	1.11	1.17	1.18	1.29	1.29	1.26	0.85	1.07	1.19	1.13	1.04	1.02	0.98
As (HM)	t	0.17	0.16	0.15	0.16	0.17	0.19	0.19	0.18	0.17	0.09	0.14	0.16	0.15	0.11	0.10	0.08
Cr (HM)	t	9.16	9.25	9.29	9.48	9.99	10.11	11.04	11.06	10.78	7.25	9.20	10.20	9.70	8.85	8.76	8.39
Cu (HM)	t	6.01	6.10	6.16	6.27	6.60	6.64	7.28	7.31	7.14	4.87	6.13	6.78	6.45	5.96	5.91	5.73
Pb (HM)	t	64.08	65.49	66.51	67.46	70.97	71.04	78.35	78.78	77.19	53.36	66.51	73.44	69.88	65.42	64.95	63.65
Hg (HM)	t	2.42	2.50	2.57	2.59	2.72	2.69	3.00	3.03	2.98	2.12	2.60	2.85	2.72	2.61	2.60	2.60
Ni (HM)	t	3.63	3.71	3.77	3.82	4.02	4.03	4.44	4.47	4.38	3.02	3.77	4.16	3.96	3.71	3.68	3.60
Zn (HM)	t	551.32	567.04	579.32	585.62	615.35	612.14	679.18	684.25	672.14	471.54	582.39	641.41	610.75	579.46	576.37	571.33
PCDD/F	g	70.66	73.22	75.32	75.84	79.58	78.59	87.80	88.65	87.34	62.31	76.16	83.64	79.71	76.76	76.50	76.79

Pollutant	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Metals: Non-ferrous																	
SO_x	kt	2.87	2.84	3.27	3.62	3.70	3.65	3.64	3.77	3.89	3.88	2.88	2.76	2.12	0.001	0.001	-
NO_x	kt	0.42	0.41	0.58	0.55	0.56	0.54	0.55	0.56	0.53	0.54	0.44	0.49	0.32	0.001	0.001	-
$PM_{2.5}$	kt	0.47	0.38	0.36	0.37	0.30	0.32	0.26	0.25	0.28	0.25	0.33	0.18	0.20	0.01	0.01	-
NMVOC	kt	0.34	0.09	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.08	0.06	0.07	0.05	-	-	-
Cd (HM)	t	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	-	-	-
Hg (HM)	t	0.10	0.08	0.04	0.04	0.05	0.05	0.04	0.05	0.05	0.02	0.03	0.04	0.02	0.02	-	-
Ni (HM)	t	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.09	0.07	0.07	0.05	-	-	-
Zn (HM)	t	0.38	0.38	0.38	0.38	0.39	0.39	0.39	0.37	0.37	0.33	0.26	0.28	0.20	-	-	-
Mineral: Cement, lime and magnesium oxide																	
SO_x	kt	12.34	12.58	13.05	13.62	14.14	14.19	14.40	14.17	12.76	10.85	10.28	9.84	7.87	6.92	6.46	6.25
$PM_{2.5}$	kt	5.67	5.80	6.01	6.27	6.51	6.54	6.65	6.52	5.88	4.96	4.75	4.57	3.73	3.30	3.08	2.94
Chemical																	
SO_x	kt	8.93	8.01	8.04	8.03	8.37	8.69	7.98	8.43	7.63	5.73	6.64	6.99	5.40	5.66	5.72	4.94
NO_x	kt	3.32	3.12	3.07	3.08	3.62	3.41	3.14	3.18	2.65	2.32	2.63	2.84	2.40	2.41	2.42	2.30
$PM_{2.5}$	kt	0.61	0.55	0.35	0.33	0.33	0.33	0.34	0.31	0.30	0.29	0.32	0.30	0.27	0.31	0.25	0.24
NMVOC	kt	6.22	5.66	5.40	4.41	4.02	3.87	3.78	3.94	3.69	3.72	3.69	3.66	3.99	3.69	3.06	2.88
NH_3	kt	0.35	0.28	0.27	0.77	0.42	0.53	0.63	0.47	0.45	0.27	0.48	0.36	0.53	0.37	0.42	0.45
Cd (HM)	t	0.11	0.10	0.10	0.09	0.11	0.10	0.09	0.09	0.07	0.06	0.06	0.07	0.06	0.04	0.05	0.06
Hg (HM)	t	0.94	0.82	0.65	0.43	0.56	0.48	0.46	0.34	0.22	0.14	0.12	0.16	0.05	0.04	0.03	0.04

Pollutant	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Waste: hazardous																	
SO_x	kt	0.16	0.19	0.17	0.20	0.19	0.23	0.26	0.23	0.21	0.19	0.14	0.15	0.20	0.22	0.10	0.10
NO_x	kt	0.27	0.32	0.28	0.34	0.31	0.37	0.43	0.37	0.35	0.34	0.23	0.26	0.34	0.37	0.19	0.18
$PM_{2.5}$	kt	0.03	0.03	0.03	0.04	0.03	0.04	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.04	0.02	0.02
NMVOC	kt	0.97	1.12	0.90	1.12	1.03	1.31	1.45	1.24	1.21	1.46	0.91	0.95	1.22	1.36	0.70	0.69
Cd (HM)	t	0.10	0.12	0.11	0.13	0.12	0.14	0.17	0.14	0.13	0.12	0.09	0.10	0.12	0.14	0.06	0.06
As (HM)	t	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02
Cr (HM)	t	0.21	0.26	0.23	0.27	0.25	0.30	0.35	0.30	0.28	0.25	0.18	0.20	0.27	0.29	0.14	0.14
Cu (HM)	t	0.32	0.38	0.36	0.39	0.37	0.35	0.48	0.44	0.41	0.26	0.19	0.30	0.43	0.45	0.33	0.33
Pb (HM)	t	2.38	2.94	2.43	3.13	2.87	3.78	4.12	3.43	3.18	3.44	2.42	2.35	2.85	3.28	1.01	1.00
Hg (HM)	t	0.10	0.12	0.11	0.13	0.12	0.14	0.17	0.14	0.13	0.12	0.09	0.10	0.13	0.14	0.06	0.06
Ni (HM)	t	0.13	0.16	0.15	0.17	0.16	0.17	0.21	0.19	0.18	0.13	0.10	0.13	0.17	0.19	0.11	0.11
Zn (HM)	t	1.40	1.73	1.47	1.84	1.69	2.12	2.38	2.02	1.87	1.86	1.32	1.37	1.72	1.94	0.74	0.74
PCDD/F	g	15.69	0.13	0.11	0.13	0.12	0.15	0.17	0.15	0.14	0.15	0.07	0.07	0.10	0.10	0.06	0.06
Waste: non-hazardous																	
SO_x	kt	0.08	0.08	0.06	0.05	0.05	0.05	0.04	0.05	0.05	0.06	0.07	0.06	0.07	0.08	0.08	0.09
NO_x	kt	0.20	0.19	0.13	0.09	0.08	0.08	0.05	0.05	0.05	0.06	0.09	0.06	0.04	0.04	0.05	0.05
$PM_{2.5}$	kt	0.01	0.01	0.01	0.0036	0.0032	0.0032	0.0020	0.0023	0.0023	0.0026	0.0017	0.0019	0.0019	0.0020	0.0022	0.0025
NMVOC	kt	10.44	11.30	11.03	10.92	10.55	10.67	10.38	10.13	9.87	9.62	9.61	9.31	9.32	8.44	8.32	7.81
NH_3	kt	8.35	9.04	8.83	8.74	8.45	8.54	8.30	8.10	7.89	7.69	7.65	7.41	7.43	6.71	6.60	6.20
Cd (HM)	t	0.04	0.04	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.0005	0.0004	0.00	0.00	0.00	0.00
As (HM)	t	0.01	0.01	0.0049	0.0031	0.0027	0.0026	0.0011	0.0014	0.0012	0.0015	0.0011	0.0008	0.00	0.00	0.00	0.00
Cr (HM)	t	0.07	0.07	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.0001	0.0001	0.00	0.00	0.00	0.00
Cu (HM)	t	0.16	0.15	0.10	0.06	0.05	0.05	0.02	0.03	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Pb (HM)	t	0.22	0.20	0.13	0.08	0.07	0.07	0.03	0.04	0.03	0.04	0.06	0.04	0.0016	0.00	0.00	0.0000
Hg (HM)	t	0.02	0.02	0.01	0.01	0.01	0.01	0.0035	0.0043	0.0037	0.0045	0.0018	0.0014	0.0002	0.0001	0.0001	0.0002
Ni (HM)	t	2.67	2.47	1.61	1.02	0.88	0.85	0.37	0.46	0.40	0.48	0.0001	0.0000	0.00	0.00	0.00	0.00
Zn (HM)	t	0.0028	0.0026	0.0017	0.0011	0.0009	0.0009	0.0004	0.0005	0.0004	0.0005	0.0009	0.0006	0.00	-	-	-
PCDD/F	g	5.76	0.08	0.05	0.03	0.03	0.03	0.01	0.02	0.01	0.02	0.01	0.01	0.0030	0.0024	0.0025	0.0029

Pollutant	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Other activities																	
SO_x	kt	0.24	0.24	0.27	0.25	0.23	0.17	0.16	0.16	0.09	0.03	-	-	-	-	-	-
NO_x	kt	0.45	0.51	0.56	0.59	0.55	0.51	0.50	0.52	0.50	0.44	0.40	0.40	0.37	0.35	0.35	0.36
$PM_{2.5}$	kt	1.74	1.93	1.91	1.88	1.81	1.58	1.29	1.14	0.94	0.70	0.46	0.47	0.46	0.45	0.45	0.46
NMVOC	kt	435.96	432.10	422.59	405.48	400.20	394.32	398.26	393.38	372.05	353.12	318.91	333.17	310.91	319.37	299.62	308.22
NH_3	kt	56.34	60.73	60.12	59.28	57.95	56.98	56.27	57.40	58.37	58.68	58.83	59.35	57.78	56.30	56.68	57.16

Appendix 3 - Emissions to water by pollutant and industrial sector (detail) (kg)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Energy - power									
Total HM	4,401	178	110	461	160	196	129	1,044	-
Total P	22,710	20,900	23,920	16,530	19,030	-	-	-	-
Total TOC	300,000	231,300	349,300	1,803,800	239,000	901,100	179,700	256,300	-
Total N	54,500	68,600	-	-	-	231,000	1,190,000	79,500	-
AOX	-	-	-	12,910	-	4,550	1,110	1,820	-
Cyanides	90.4	76.1	-	-	-	87.6	53.0	-	-
Energy - refining, gasification and liquefaction, coke									
Total HM	629	703	635	638	516	200	323	170	-
Total P	33,490	57,000	122,750	24,600	79,200	22,700	10,400	9,890	-
Total TOC	2,580,900	639,800	811,400	856,300	516,000	1,125,200	400,000	486,300	-
Total N	191,000	542,000	420,000	356,700	184,600	169,900	310,600	81,500	-
AOX	-	-	-	2,430	1,790	1,200	-	3,860	-
Cyanides	463	522	346	785	338	224	354	456	-
Metals: iron and steel									
Total HM	2,353	1,717	1,026	1,048	1,266	651	581	472	-
Total P	16,100	12,400	10,700	11,700	17,600	-	-	-	-
Total TOC	1,586,600	677,500	384,100	386,000	465,000	417,000	356,000	395,200	-
Total N	2,506,100	1,966,000	1,441,200	2,241,900	2,253,200	581,400	471,800	286,100	-
AOX	-	-	2,090	1,260	1,060	-	-	1,060	-
Cyanides	49,454	40,950	33,400	35,295	27,713	11,637	10,934	9,725	-
Metals: Non-ferrous									
Total HM	104.2	41.9	115.7	22.7	20.6	9.9	13.9	929.9	-
Total P	-	-	-	-	-	-	-	6,050	-
Total N	55,000	-	55,000	-	-	-	-	375,000	-
Mineral: Glass									
Total HM	0.17	0.98	0.27	-	-	-	-	-	-
Total N	-	-	126,000	-	-	-	-	-	-
Chemical									
Total HM	1,545	1,416	1,286	1,122	1,986	1,850	1,697	1,596	-
Total P	760,790	66,190	85,810	84,520	93,900	80,550	85,370	111,400	-
Total TOC	1,791,600	1,986,900	1,391,500	1,866,500	2,336,300	1,682,000	1,372,900	1,782,700	-
Total N	1,377,300	1,438,300	1,277,500	1,271,300	1,699,900	1,464,500	1,431,000	1,505,100	-
PCBs	0.36	0.34	0.27	0.16	1.28	2.36	1.69	0.23	-
AOX	-	-	-	4,890	-	-	-	-	-
Cyanides	-	79	-	-	1,210	827	1,350	1,960	-
Waste: hazardous									
Total HM	157,4	75,8	71,1	57,4	66,0	42,7	35,5	61,7	-
Total P	25,630	14,340	14,860	18,820	20,070	21,910	17,510	19,620	-
Total TOC	669,200	595,600	538,000	820,900	764,800	321,000	825,000	458,000	-
Total N	191,200	77,800	82,000	107,000	76,000	99,200	110,000	101,000	-
PCBs	-	27,6	-	-	-	-	-	-	-
Diuron	-	55,2	-	-	-	-	-	-	-
Cyanides	210	160	-	876	-	-	-	-	-

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Waste: non-hazardous									
Total HM	720	1,407	623	579	924	897	777	602	-
Total P	169,390	232,190	155,900	134,170	187,360	158,510	124,730	94,220	-
Total TOC	1,098,200	1,417,300	1,078,200	761,900	767,100	908,900	1,021,300	845,300	-
Total N	8,008,400	2,127,500	1,409,000	1,122,200	1,175,000	1,429,500	1,605,600	1,885,700	-
PCBs	-	-	-	-	-	0.70	1.30	-	-
AOX	-	-	-	1,010	-	-	-	-	-
Cyanides	-	146	274	1,122	470	418	418	469	-
Other activities									
Total HM	736	638	551	4,503	1,440	1,859	4,637	3,156	-
Total P	80,680	66,950	71,930	58,880	98,710	77,110	104,780	68,960	-
Total TOC	3,397,100	2,763,000	2,691,100	2,055,100	25,498,100	4,183,000	4,902,900	3,150,200	-
Total N	600,600	559,700	490,300	821,400	579,100	412,600	776,500	538,600	-
PCBs	0.10	0.11	-	-	-	-	-	-	-
Cyanides	1,086	704	-	-	-	-	-	112	-

Source: EEA (2017b)

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com