Ricardo Energy & Environment

Industrial emissions policy country profile – Slovenia

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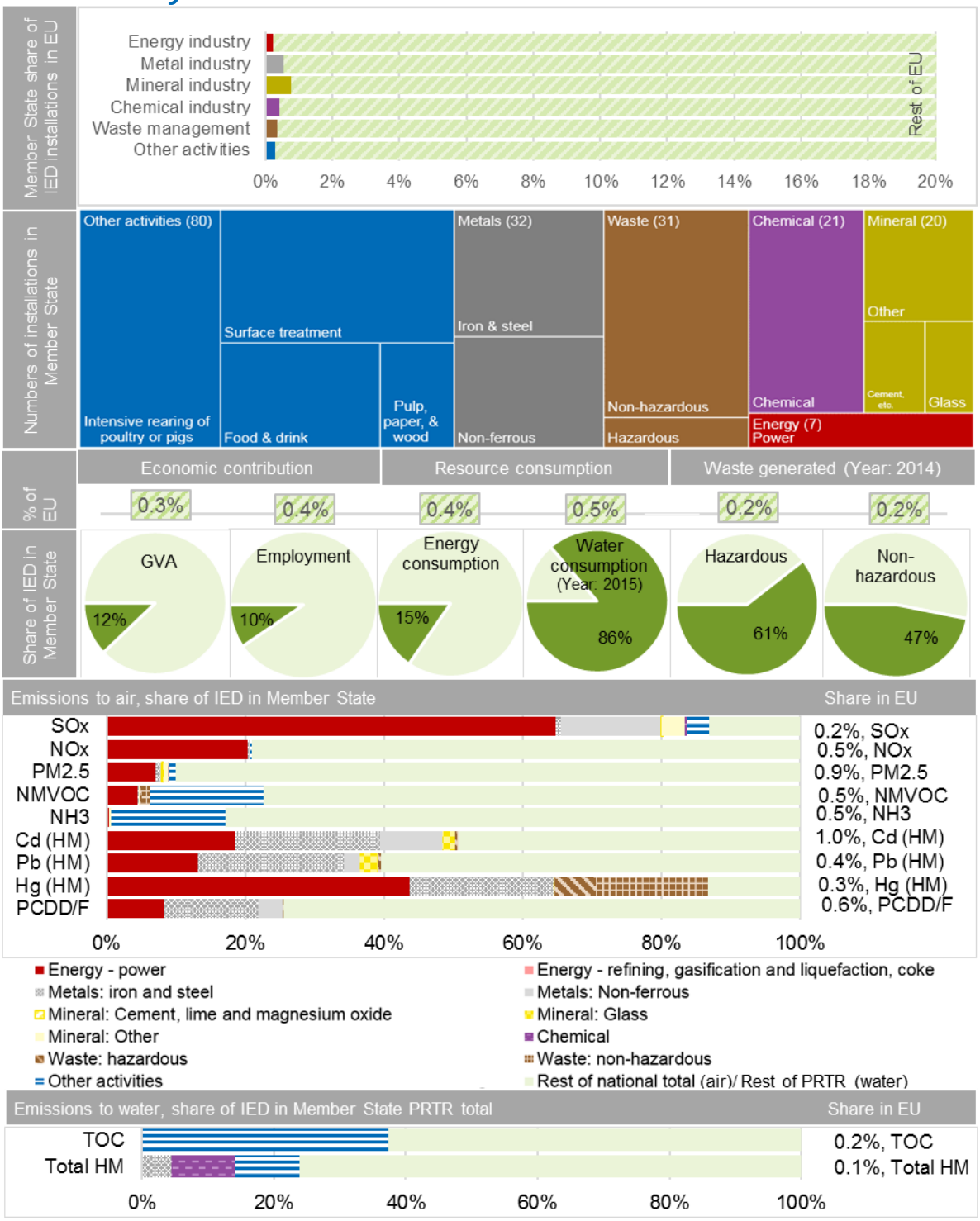
Abbreviations and units

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
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
SI	Slovenia
SO_x	Oxides of Sulphur
TOC	Total Organic Carbon
Zn	Zinc

Summary of industrial statistics for Slovenia



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 Slovenia.

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 Slovenia and how they have been addressed.

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

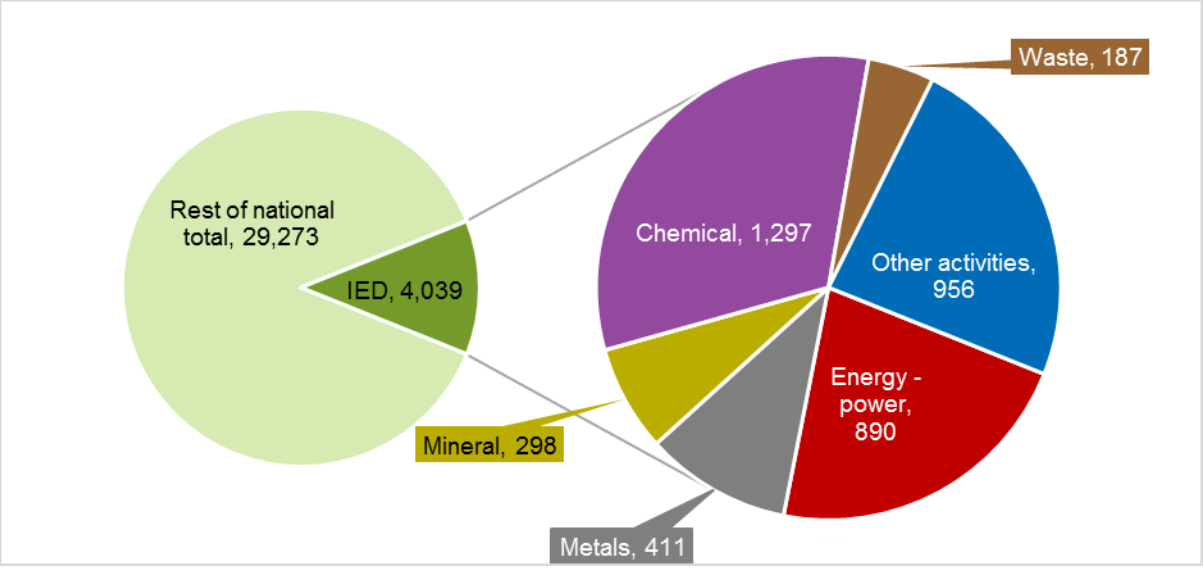
2.1 Economic contribution

Gross value added (GVA) and employment are the indicators used to denote the economic contribution of IED activities.

Industrial sectors contribute a relatively small share (12%) of the total GVA across all economic activities in Slovenia; in 2015 they contributed €4.0 billion to Slovenia's economy (Figure 1). Of this share, the chemical sector accounts for the largest contribution (32% of all industrial sectors' GVA), followed by 'other activities' (24%) and the energy - power sector (22%). The reported GVA for 'other activities' consists of food and drinks production (~12.6% of total GVA of industrial sectors), followed by wood production (6.6% of total GVA of industrial sectors) and pulp and paper production (~4.6% of total GVA of industrial sectors).

The economic significance of industrial sectors shows a similar snapshot for employment (Figure 2). In 2015, a little less than 10% of Slovenian employees were employed by the industrial sector. However, for employment, the 'other activities' sector is more significant compared to the chemicals sector. Taken together, the GVA and employment indicate that the chemicals, 'other activities' (mainly food and drink production), and energy - power sectors are the most economically significant industrial sectors in Slovenia. However, it is necessary to take into account that GVA and employment data available from Eurostat do not include data on intensive rearing of poultry and pigs, which is an important economic sector in Slovenia.

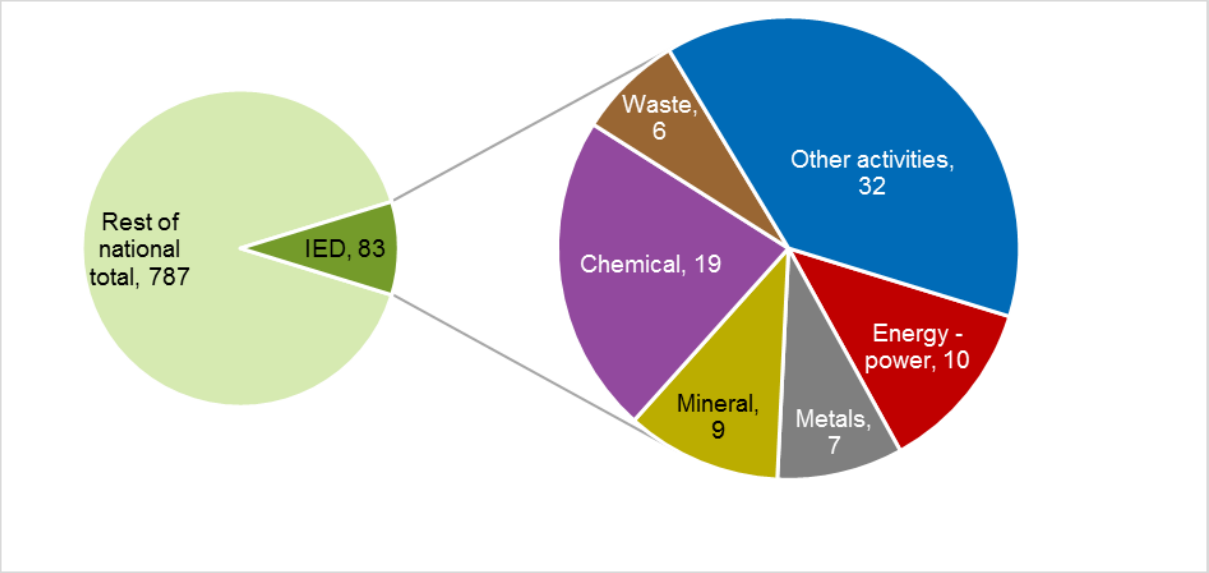
Figure 1: Gross value added of industrial sectors in 2015 (Current prices, million EUR)



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

Source: Eurostat (2017a)

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



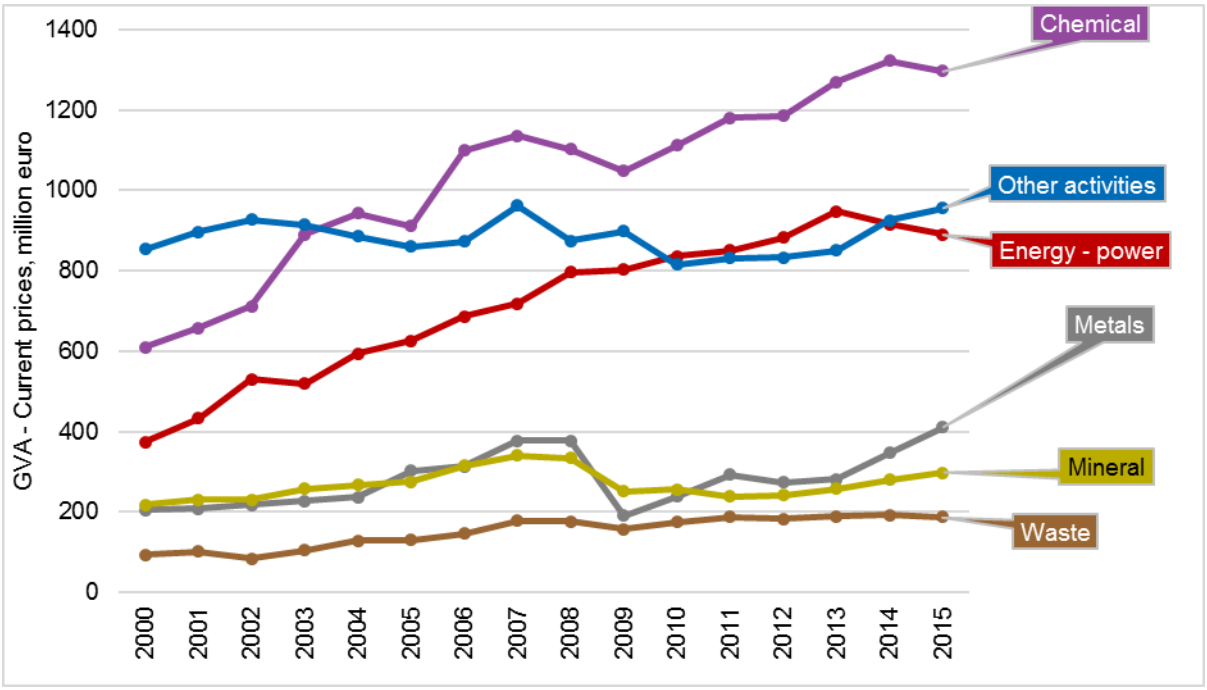
Note: Rest of national total relates to all NACE activities minus the industrial sectors in the chart.

Source: Eurostat (2017b)

Since 2000, the main areas of economic growth in Slovenia, as measured by growth in GVA, are the chemicals sector and the energy - power sector (Figure 3). The largest industrial sector contributing to GVA, the chemical sector, has doubled from about €600 million in 2000 to more than €1.2 billion in 2015, albeit with some fluctuations over this period; from 2014 to 2015, the GVA of this sector decreased slightly. The energy - power sector has grown continuously in the time from 2000 to 2013, and contracted since then. The GVA of 'other activities' varied over the last 15 years, with an upward trend from 2013 onwards. The GVA of the metals sector has doubled over the considered time period, showing only one significant downwards peak in 2009. This downwards peak, which can also slightly be seen for other sectors, could be due to the economic crisis in 2009 in Europe. A similar trend as for the metals sector can be observed for the mineral sector, although less pronounced. The GVA of the waste management sector has slightly increased in the time period 2000 to 2015.

In general, it seems that the Slovenian industrial sector economy recovered well after the economic crisis and an overall growth in industrial sector's GVA can be seen from then onwards, though the declines of the chemicals and energy - power industrial sectors over the last one and two years respectively have to be mentioned.

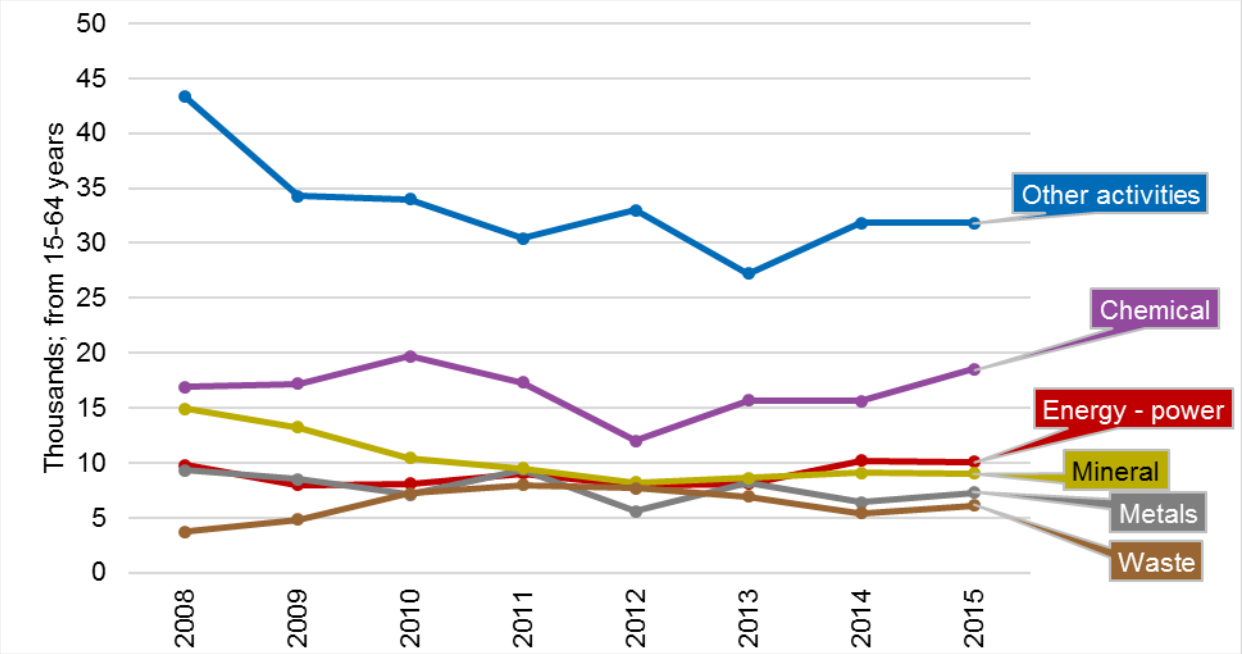
Figure 3: Gross value added of industrial sectors (2000-2015)



Source: Eurostat (2017a)

Although the chemical sector reported the highest GVA, the 'other activities' sector provides for the highest employment in Slovenia in 2015 amongst the industrial sectors with about 32,000 employees, which is almost twice as much compared to 18,500 employees in the chemical sector (Figure 4). However, employment in the 'other activities' sector decreased significantly between 2008 and 2015 (by ~10,000 employees). The major decrease is due to the reduction of employment in pulp and paper production (decrease of 45%) and the wood production (39%). The employment in the chemical sector decreased from 2010 to 2012, but has been growing in the following years. Severe losses in employment numbers were reported for the mineral sector (down by ~40% when comparing 2015 with 2008), while approximately stable employment numbers were reported for the energy – power and the metals sectors, though the latter had some fluctuations. The number of people employed in the waste management sector more than doubled from 2008 to 2011, but decreased from then on until 2014 and has been in a slight upward trend in 2015.

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's 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 Slovenia

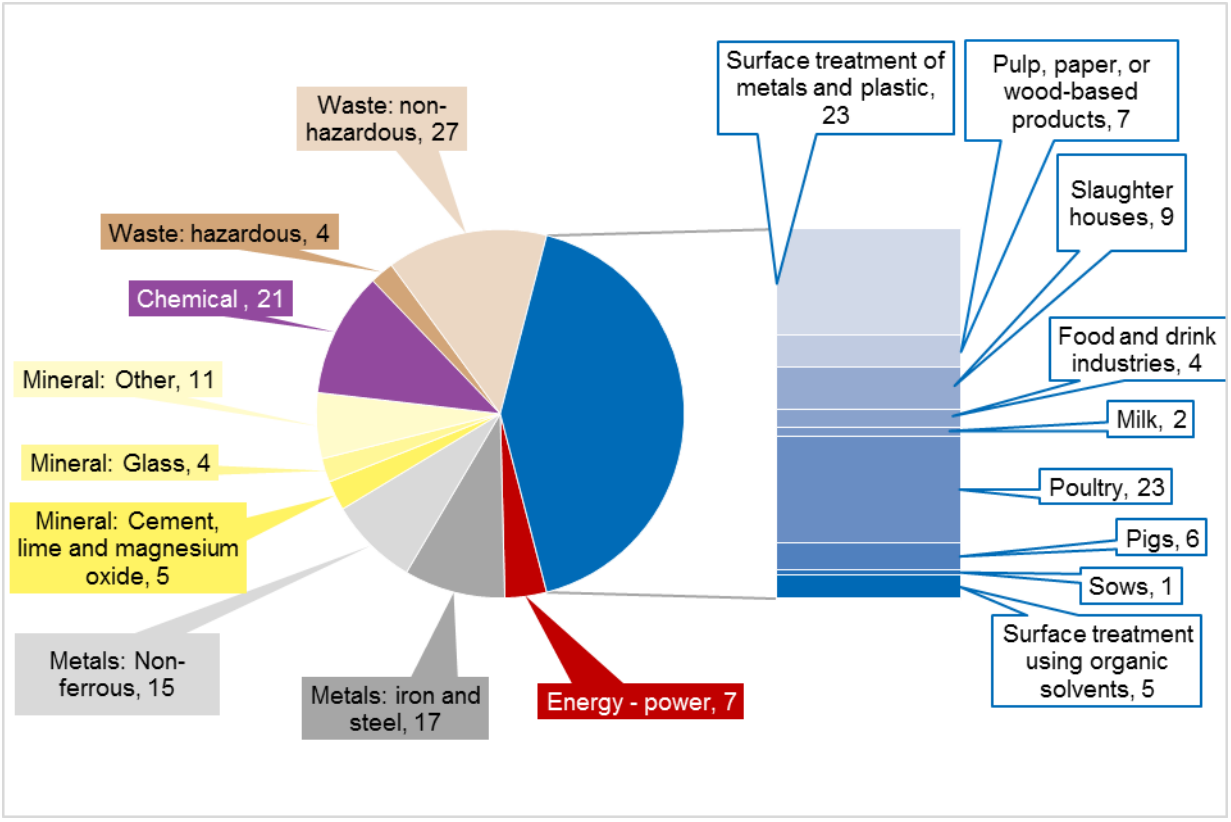
Missing data	Description	Conclusion and actions taken
No IED installations reported for some sectors	No IED installations reported for textiles, tanning [of leather] and the energy - refining, gasification and liquefaction and coke sector.	Removed NACE codes c13 (textiles), c15 (tanning [of leather]), and c19 (coke and refined petroleum products)

2.2 Number of IED installations

In 2015, Slovenia has a reported total of 191 IED installations. The main industrial sector in 2015, according to the reported number of permitted IED installations, is 'other activities' and more specifically the intensive rearing of poultry and pigs (16% of total IED installations) (Figure 5, Table 3). This sector is followed in size by the non-hazardous waste management sector (14% of total IED installations), the surface treatment of metals and plastic (12% of total IED installations) and the chemical sector (11% of total IED installations).

Permits are reported for all IED activities except for refining (IED activity 1.2), production of coke (IED activity 1.3), gasification or liquefaction (IED activity 1.4), metal ore (IED activity 2.1), phosphorus-, nitrogen- or potassium-based fertilisers (IED activity 4.3), plant protection products (IED activity 4.4), explosives (IED activity 4.6), disposal of non-hazardous waste (IED activity 5.3), textiles (IED activity 6.2), tanning (IED activity 6.3) and the production of carbon (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 2011 and 2015 by industrial sector, with IED activity detail

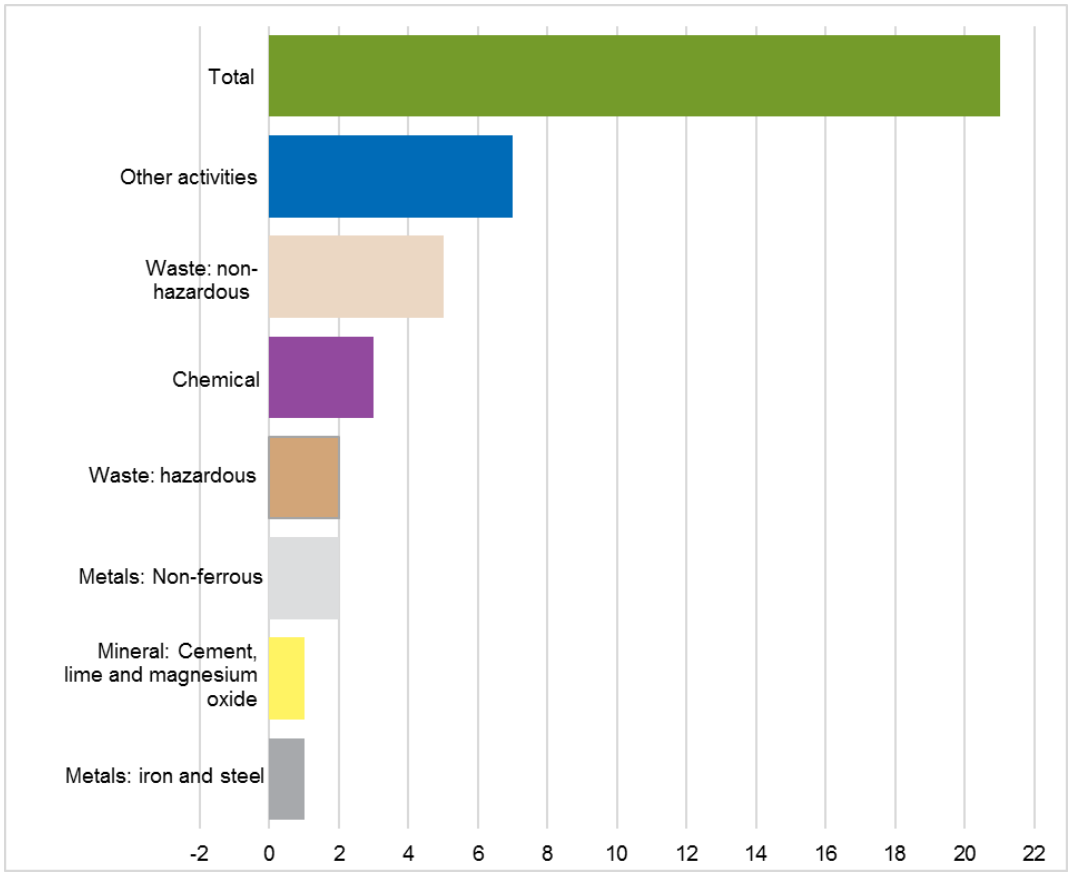
Industrial sector, with IED activity detail		2011	2015	Change in number of IED installations 2011 to 2015
Energy: power	*1.1 Combustion*	**7**	**7**	**0**
Metals: iron and steel		**16**	**17**	**1**
	2.2 Pig iron or steel	*3*	*3*	*0*
	2.3 Processing of ferrous metals	*1*	*1*	*0*
	2.4 ferrous metal foundries	*12*	*13*	*1*
Metal: non-ferrous	*2.5 Processing of non-ferrous metals*	**13**	**15**	**2**
Mineral: Cement, lime and magnesium oxide	*3.1 Cement, lime and magnesium oxide*	**4**	**5**	**1**
Mineral: glass	*3.3 Glass*	**4**	**4**	**0**
Mineral: Other		**11**	**11**	**0**
	3.4 Mineral fibres	*2*	*2*	*0*
	3.5 Ceramic	*9*	*9*	*0*
Chemical		**18**	**21**	**3**
	4.1 Organic	*11*	*13*	*2*
	4.2 Inorganic	*4*	*4*	*0*
	4.5 Pharmaceutical products	*3*	*4*	*1*
Waste: hazardous	*5.1 Disposal / recovery*	**2**	**4**	**2**
Waste: non-hazardous		**22**	**27**	**5**
	5.2 co-/ incineration of hazardous and non-hazardous waste	*1*	*1*	*0*
	5.4 Landfills	*15*	*15*	*0*
	6.5 Disposal of animal carcases	*6*	*11*	*5*
Other activities		**73**	**80**	**7**
	6.1 Pulp, paper, or wood-based products	*7*	*7*	*0*
	6.7 Surface treatment using organic solvents	*4*	*5*	*1*
	2.6 Surface treatment of metals and plastic	*23*	*23*	*0*
	6.4 (a) Slaughterhouse	*8*	*9*	*1*
	6.4 (b) Food and drink	*4*	*4*	*0*
	6.4 (c) Milk	*2*	*2*	*0*
	6.6 (a) Poultry	*18*	*23*	*5*
	6.6 (b)/(b)1 Pigs	*6*	*6*	*0*
	6.6 (c)/(b)2 Sows	*1*	*1*	*0*
Total		**170**	**191**	**21**

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 reported number of IED installations permitted in Slovenia (Figure 6). This increase is largely due to the increases in the intensive rearing of poultry and pigs (from 25 installations in 2011 to 30 in 2015), the non-hazardous waste management sector (from 22 installations in 2011 to 27 in 2015) and the chemical sector (from 18 to 21 installations). There were no industrial sectors with reductions reported.

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



Note: The energy - power, glass and mineral - other sectors are removed from the chart as no change was reported.

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.

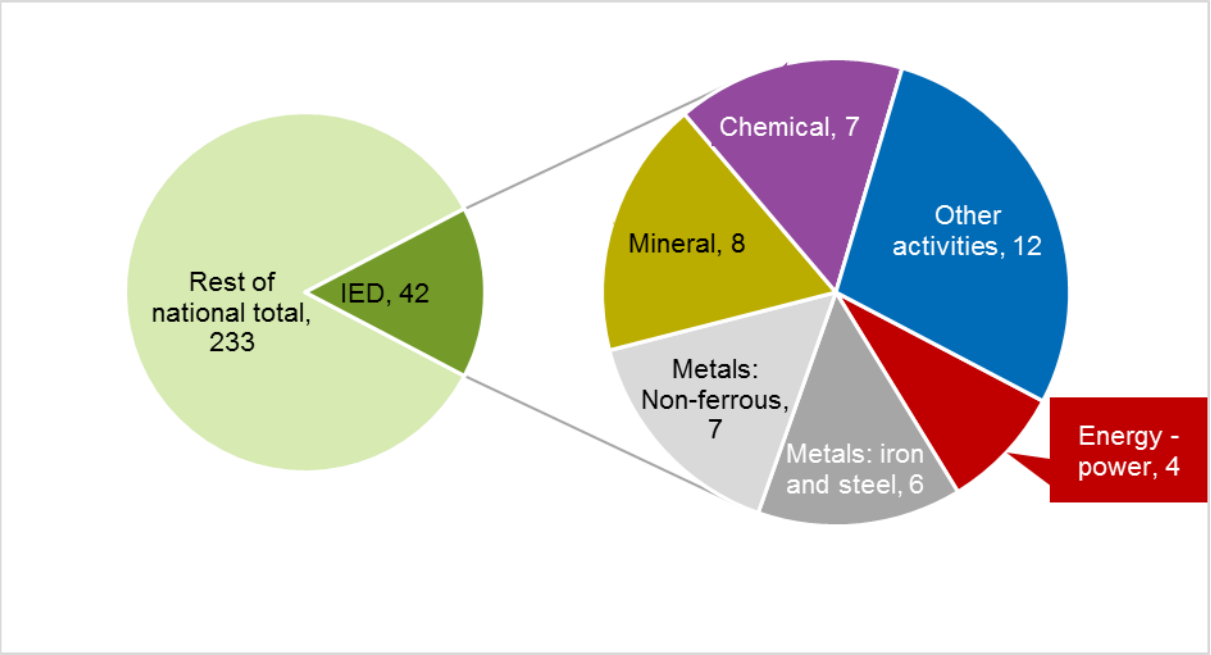
3 Resource use in industrial sectors

3.1 Energy consumption

In 2015, the industrial sectors accounted for 15% of the total energy consumption in Slovenia (42 PJ) (Figure 7). Among industrial sectors, the 'other activities' sector consumed the most energy in 2015 (12 PJ), accounting for 29% of the industrial sector energy consumption. It is followed by the minerals (8 PJ, 19%), the chemical (7 PJ, 17%) and the non-ferrous metals industrial sectors (7 PJ, 17%).

Note that no data was reported for the waste management sector (as mentioned in Table 4).

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

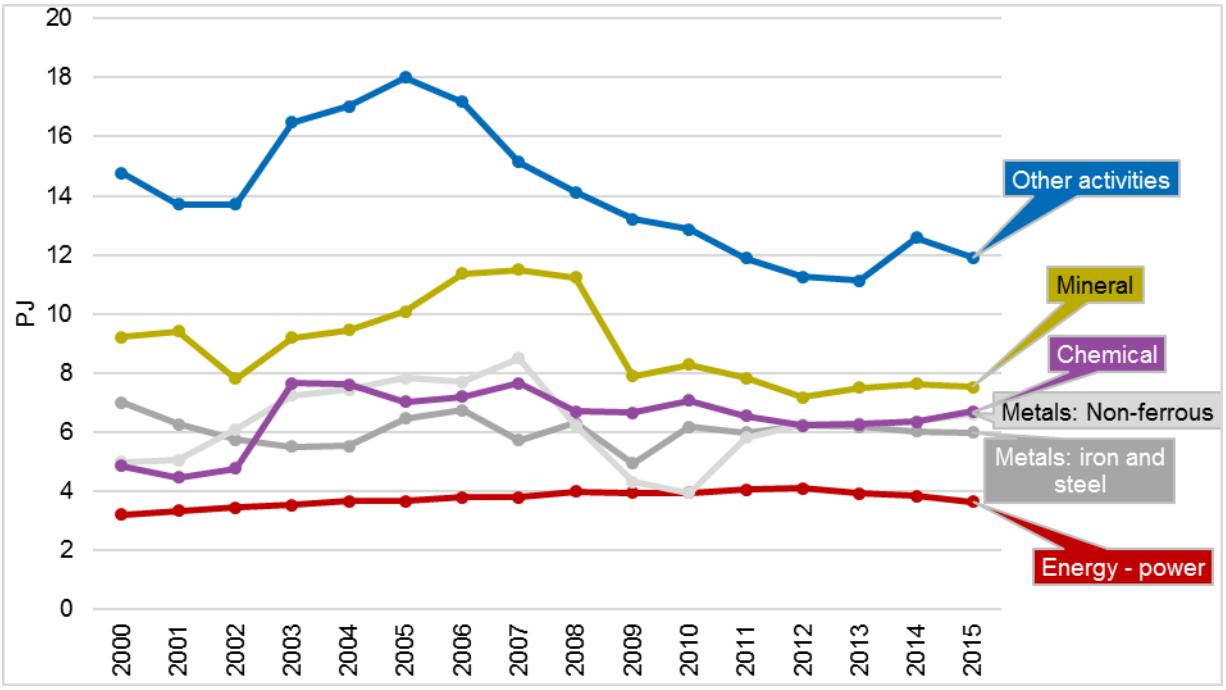


Note: Rest of national total relates to gross inland consumption minus the industrial sectors shown here. No data reported for the waste management sector.

Source: Eurostat (2017c)

The 'other activities' sector increased its energy consumption between the years 2002 to 2005 (Figure 8). From then on, for the next eight years the consumption decreased continuously before in 2014 where an increase was reported. The second largest energy consumer in Slovenia among the industrial sectors is the mineral sector where consumption increased until 2008 before decreasing significantly in 2009; from then on consumption has remained on a level of around 8 PJ. Slovenia had in 2009 also a decrease in economic contribution and employment in the mineral sector (as can be seen in Figure 3 and Figure 4). The energy consumption of the chemical sector is almost stable between 6 to 8 PJ since 2003. The declines in energy consumption of the metals sectors around 2009 are consistent with the GVA decline shown in Figure 3.

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



Note: No data were 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.

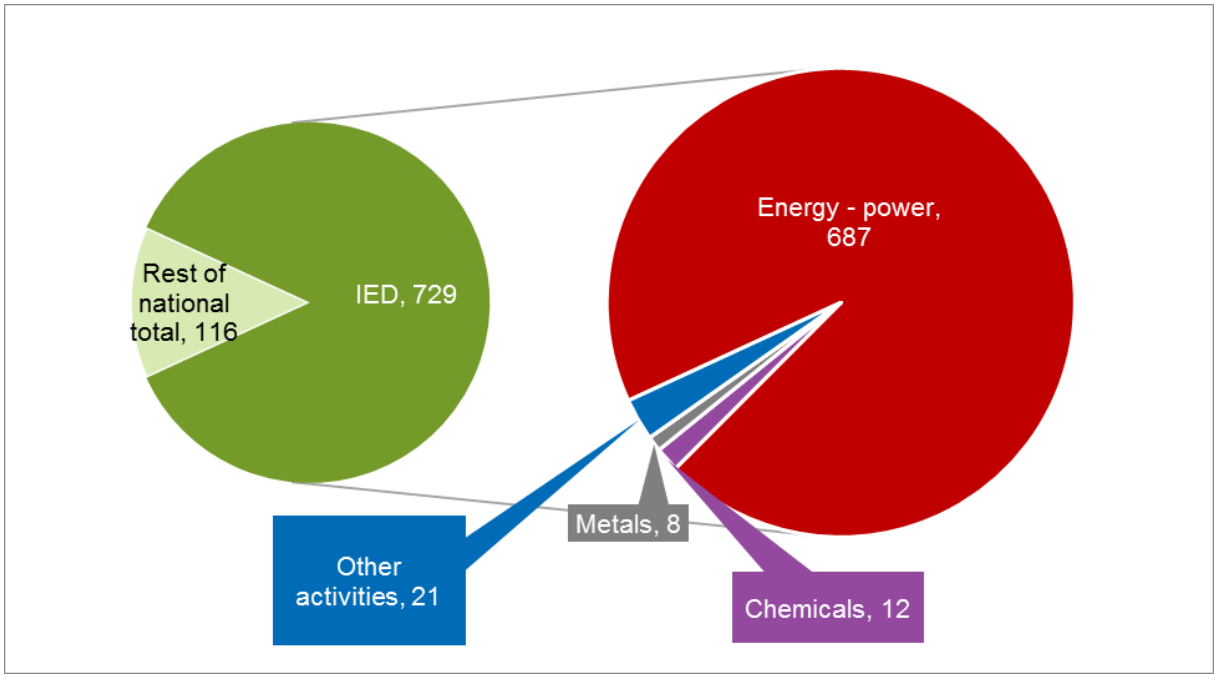
Table 4: Gaps in energy consumption data for Slovenia

Missing data	Description	Conclusion and actions
Data gap	No data reported for waste management sector	No action
No IED installations reported for some sectors	No IED installations reported for textiles, tanning and the energy - refining, gasification and liquefaction and coke sector.	Respective energy balance indicators removed from energy consumption for energy - refining, etc. to avoid overreporting.

3.2 Water consumption

The data availability for water consumption by industrial sector in Slovenia is limited. Data showing consumption by industrial sector for 2015 is only available for a limited number of sectors (Figure 9). The largest share of water is consumed by the energy – power sector (94% of the water consumption of all industrial sectors). The 'other activities' sector consumed 21 million m³ of water (making 3% of the water consumption of all industrial sectors) and the chemical sector consumed 12 million m³ (1.5%). Although this number relates to the combination of the chemical and the energy - refining industrial sectors, one can assume that only the chemicals industrial sector is responsible for the amount given the fact no IED installations of the energy - refining industrial sector were reported.

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

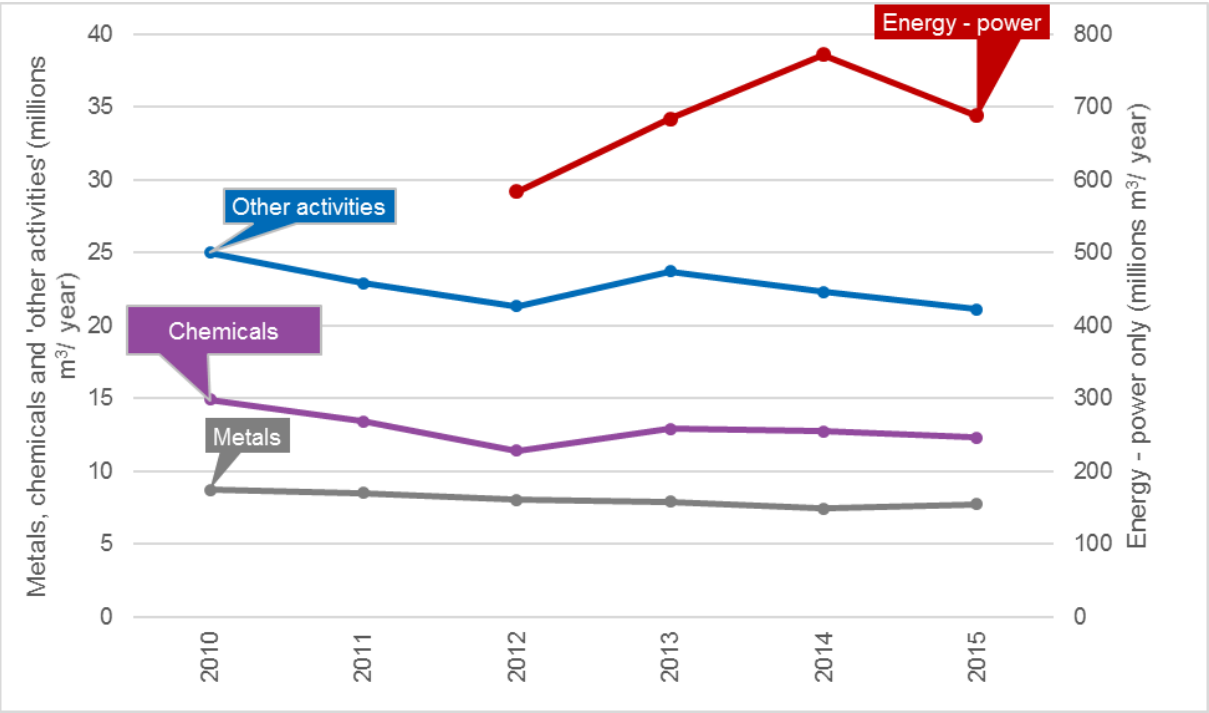


Note: Rest of national total relates to gross inland consumption minus the industrial sectors shown here. No data reported for the waste management and the minerals industrial sectors.

Sources: Eurostat (2017d)

Water consumed by the energy - power sector increased by 32% between 2012 and 2014. However, in 2015, water consumption decreased. For the 'other activities', metals and chemicals sectors water consumption decreased over the years, but not significantly (Figure 10).

Figure 10: Water consumption (million m3) by selected industrial sectors (2010-2015)



Note: Data available from 2010 to 2015. Due to the significant differences in the consumed amount of water among sectors, the energy - power data are plotted on a different scale (right hand y-axis). Data reported for energy – power for the years 2012 to 2015. No data for the waste management and the minerals industrial sectors.

Source: Eurostat (2017d)

Limitations

Limitations have arisen from the mapping owing to combined reporting of NACE classifications for energy (refining, gasification and liquefaction, coke) 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: Gaps in water consumption data for Slovenia

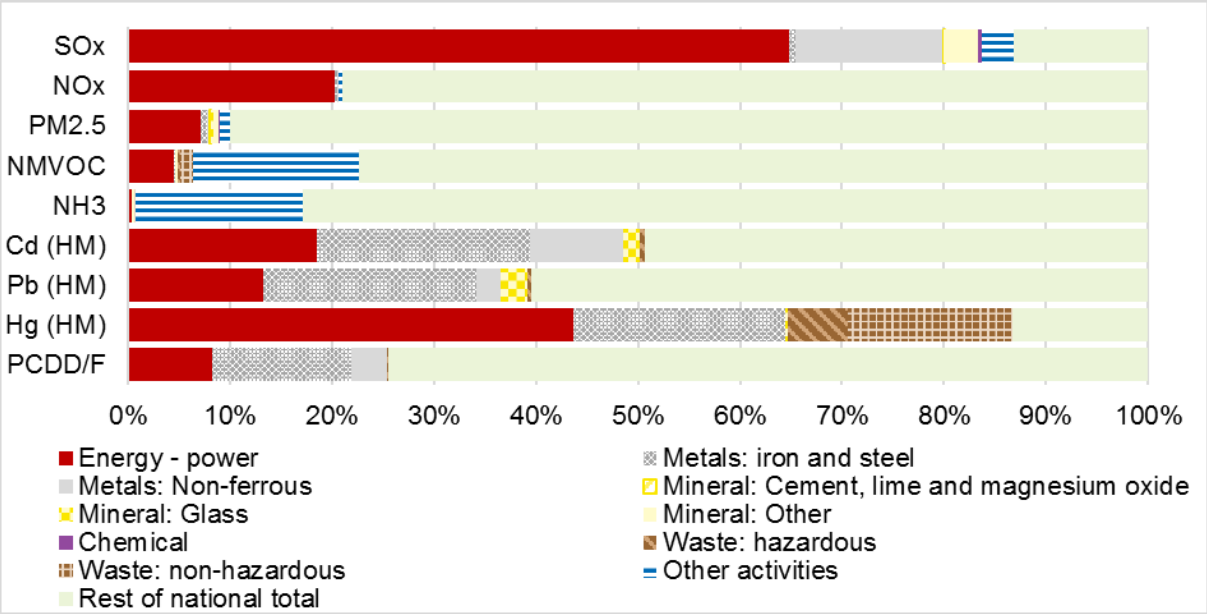
Missing data	Description	Conclusion and actions taken
Limited time series	Data reported to Eurostat (2017d) is only available for 2010 to 2015 Data for energy – power is only available from 2012 onwards	No action
Data gaps	No data for waste management and mineral sectors	No action
No IED installations reported for some sectors	No IED installations reported for textiles, tanning and the energy - refining, gasification and liquefaction and coke sector.	As the energy - refining, gasification and liquefaction and coke sector is grouped with the chemical sector respective indicators were not removed. Risk of overreporting but generally, chemicals is the dominant sector. Chart relabelled to show just chemicals. Respective indicators for textiles and tanning were removed.

4 Emissions from industrial sectors

4.1 Emissions to air

Data were taken from inventories submitted by Slovenia under the CLRTAP (EEA, 2017a). Overall in 2015, industrial sectors are responsible for most of the national total Hg and SO_x emissions to air (more than 80%) but also for significant amounts of Cd and Pb emissions, 50% and 40% respectively (Figure 11). Emissions of NO_X, $PM_{2.5}$, NMVOC, NH_3 and PCDD/F are emitted primarily by sectors other than the industrial sectors, with the industrial sector contributions for these pollutants between 10% and 25% of national totals in 2015.

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

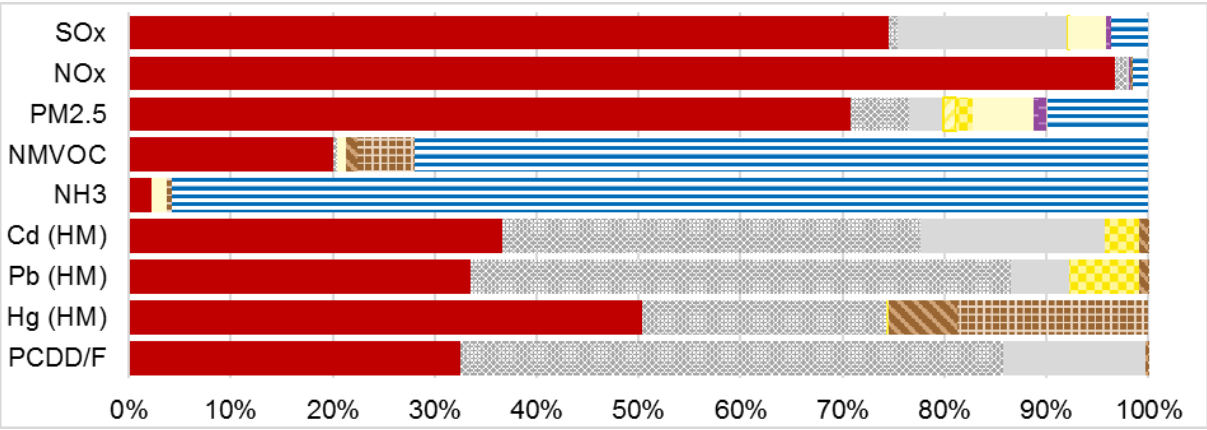


Note: Rest of national total relates to the national total for the entire territory (based on fuel sold) minus the industrial sector emissions shown here. No data reported for As, Cr, Cu, Ni and Zn and so are not shown.

Source: EEA (2017a)

Among the industrial sectors, the energy-power sector emitted significant shares of SO_x, NO_x, $PM_{2.5}$, Cd, Pb, Hg and PCDD/F emissions (Figure 12). The iron and steel sector significantly contributes to Cd, Pb, Hg and PCDD/F emissions and 'other activities' are responsible for the largest share of NMVOC and NH_3 emissions. The chemicals and mineral sectors contribute only small proportions of emissions.

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



Note: The key for this chart is in Figure 11. *No data reported for As, Cr, Cu, Ni and Zn and so are not shown.*

Emission to air trends are shown in indexed charts in the following subsections 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. Appendix 2 includes full details on the emissions reported by industrial sector and year.

Energy industry

Within the energy - power sector, SO_x, NOx and Cd emissions have notably decreased from 2000 to 2015 as illustrated in Figure 13. Emissions of NMVOC and NH_3 increased within the same period. The Slovenian authorities report that emissions reported to LRTAP from the energy-power sector from 2009 onwards reflect plant-specific values; prior to this time the emission estimates are based on emission factors (Ministry of the Environment and Spatial Planning, 2016). Furthermore, the reduction in SO_x emissions is attributed to the introduction of flue gas desulphurisation on coal plants, and switching to gas turbines in power cogeneration plants (add citation). The reductions of emissions of most pollutants is attributed to improvement in technologies, implementation of abatement techniques and fuel switching to cleaner fuels.

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

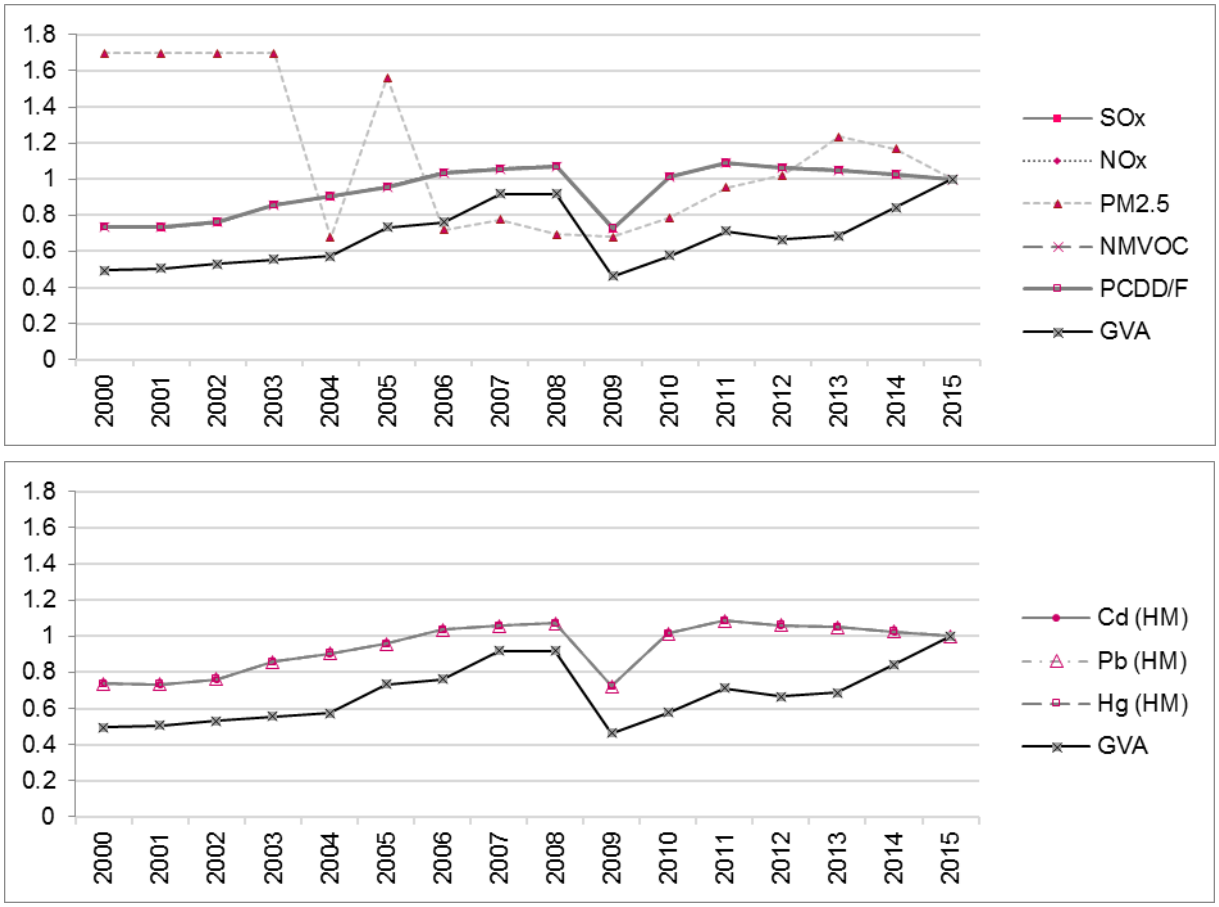
Note: No data reported for As, Cr, Cu, Ni and Zn. SOx removed in the second chart as an outlier to make detail visible for the other pollutants.
Source: EEA (2017a), Eurostat (2017a)

Metal industry

Air emissions reported for **iron and steel production** show a varied picture depending on the pollutant (Figure 14). Emissions of PCDD/F, SOx, NOx, NMVOC and reported heavy metals have almost followed the trend in GVA for the sector between 2000 and 2012, including a sharp reduction in 2009. From 2012 onwards decoupling from GVA appears to occur, with slight decreases in emissions of these pollutants compared to strong growth in GVA to 2015. The fact that the trend lines for PCDD/F, SOx, NOx and NMVOC and for Cd, Pb and Hg are the same from 2000 to 2015 indicates that the emission factors used for these pollutants in this national emission inventory are static over time, with changes in all pollutants' emissions driven by changes in activity levels. This is consistent with the information in Ministry of the Environment and Spatial Planning (2016).

The emissions of $PM_{2.5}$ follow a different trend. The $PM_{2.5}$ emissions to air halved from 2003 to 2004, but rose in 2005 before decreasing in the following years until 2009. Since 2009 the emissions increased in line with GVA until 2013 after which emissions decreased whilst GVA continued to rise. The $PM_{2.5}$ emissions are based on direct measurements of emissions into air and reflect plant specific emissions values (Ministry of the Environment and Spatial Planning, 2016).

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



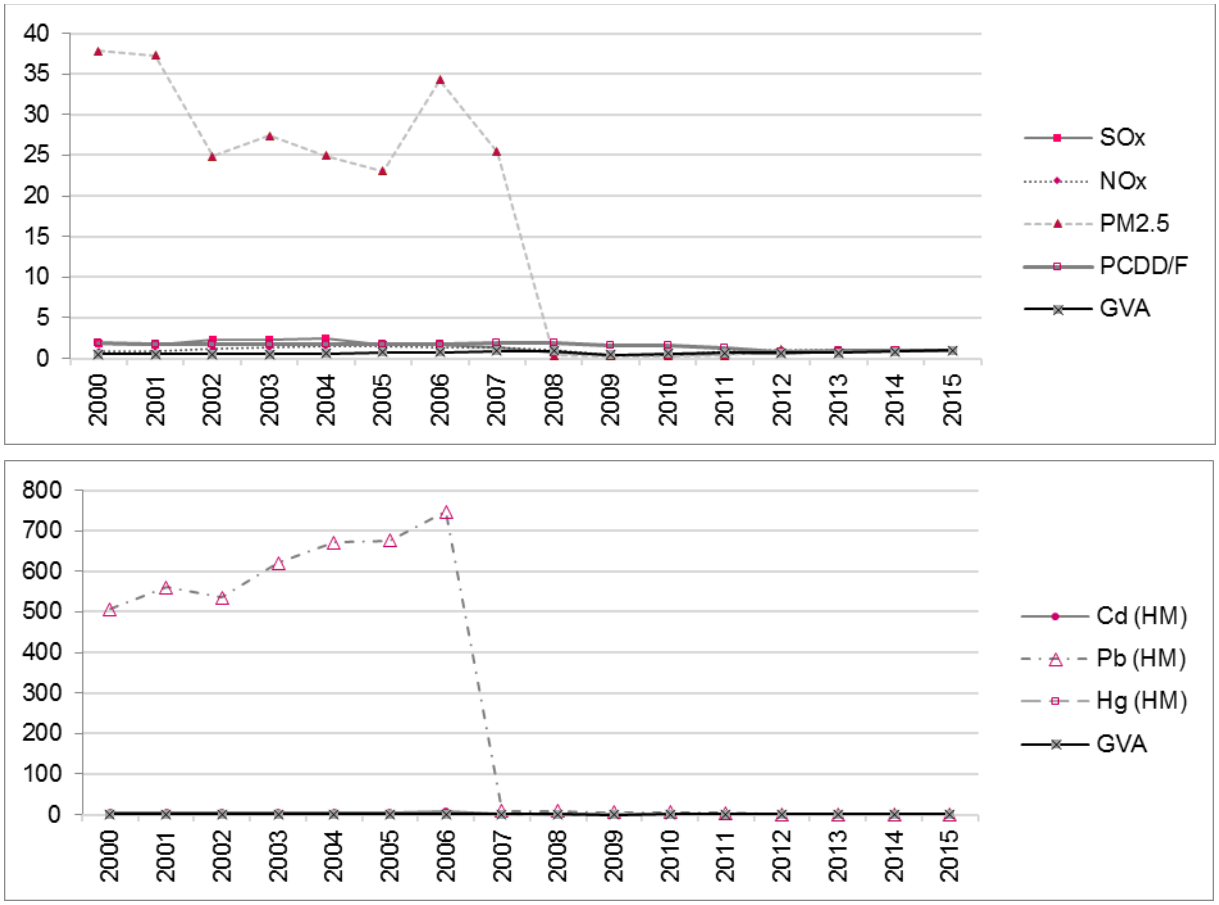
Note: No data reported for NH_3, As, Cr, Cu, Ni and Zn.

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

The largest reductions of emissions to air from **non-ferrous metal production** are of $PM_{2.5}$, Pb and Cd between 2006 and 2008 (Figure 15, Figure 17). The sharp reductions may be due to cessation of ferroalloy production in 2007, partial reduction in aluminium production from 2007 (closure of the least efficient unit), and/or a change in the emission factors for lead and zinc production from 2007 onwards due to the implementation of BAT (Ministry of the Environment and Spatial Planning, 2016). Until 2006, emissions of Pb and Cd from this sector made up a significant proportion (90% and 40% respectively) of national total emissions.

Emissions of PCDD/F and SO_x have decreased to a lesser extent, and NOx and Hg emissions remained fairly static over time, showing some slight fluctuations. Note that the trend lines for Cd and Pb generally are the same from 2000 to 2015. This may indicate that the emission factors used for these pollutants in this national emission inventory are static over time, with changes in all pollutants driven by changes in activity levels.

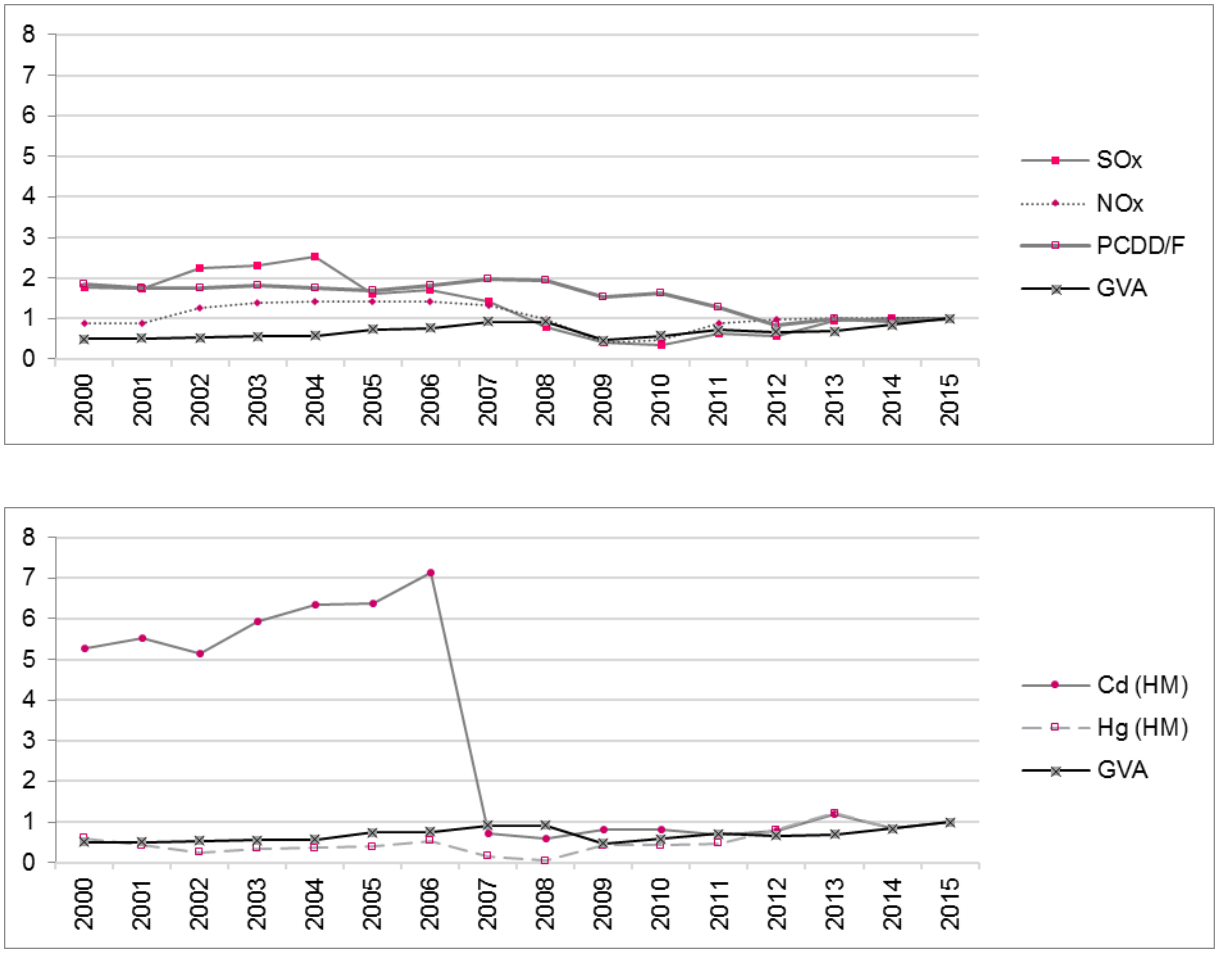
Figure 15: Indexed emissions to air from non-ferrous metal production (metal industrial sector) (indexed to 2015=1)



Note: No data reported for NMVOC, NH_3, As, Cr, Cu, Ni and Zn.

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

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



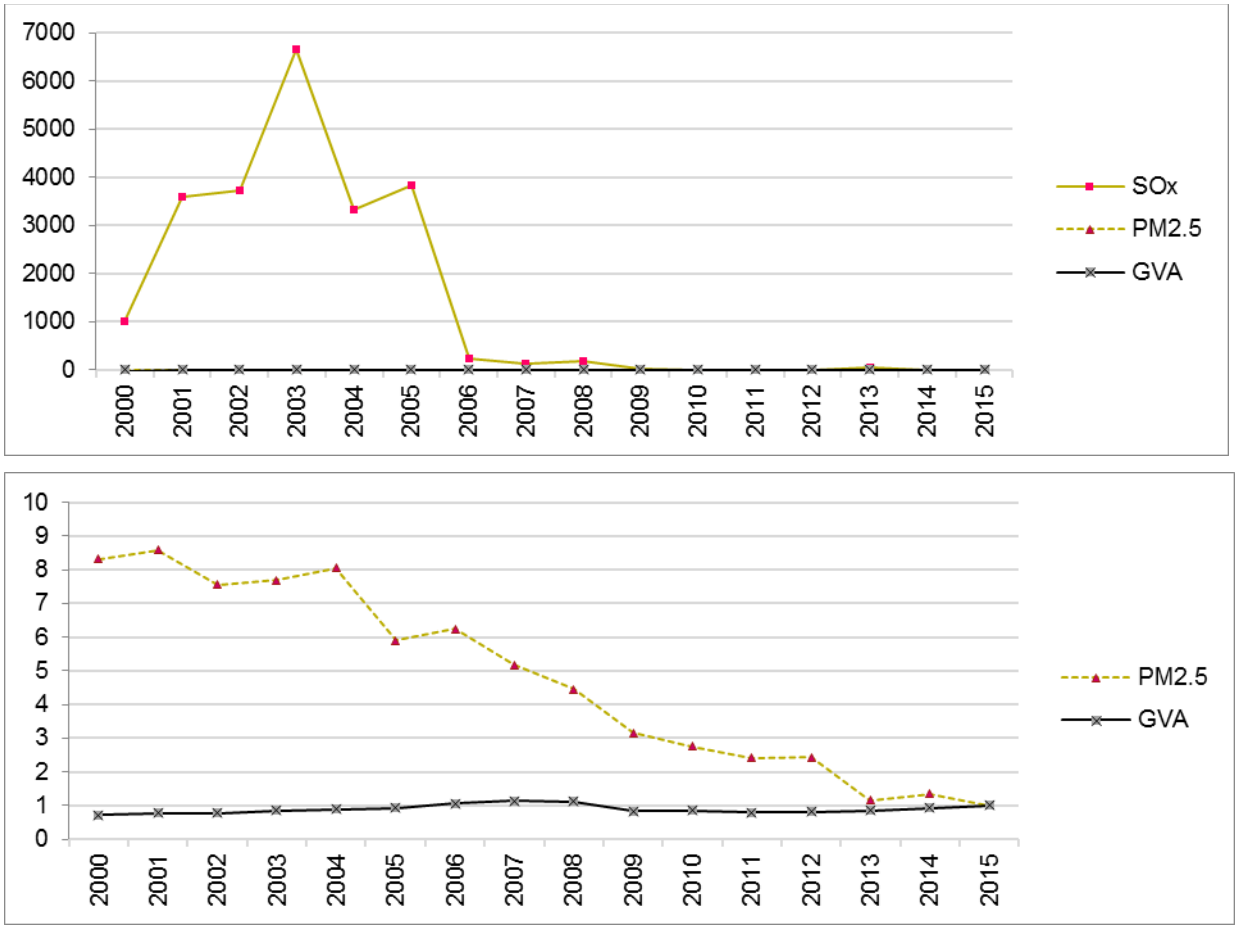
Note: No data reported for NMVOC, NH_3, As, Cr, Cu, Ni and Zn. $PM_{2.5}$ removed in the first chart and Pb removed in the second chart as outliers to make detail for other pollutants visible.

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

Mineral industry

The only pollutants reported as air emissions from **mineral-cement, lime and magnesium oxide production** are SOx and $PM_{2.5}$, which both decreased between 2000 and 2015 (Figure 17). The SO_x emissions varied heavily between 2000 and 2006, peaking in 2003 at several times the emissions reported for year 2015. However, the emissions of SO_x and $PM_{2.5}$ were insignificant at national level in 2015 (<0.1%), but at their peak in 2003 were 3% and 1% of national total emissions respectively.

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



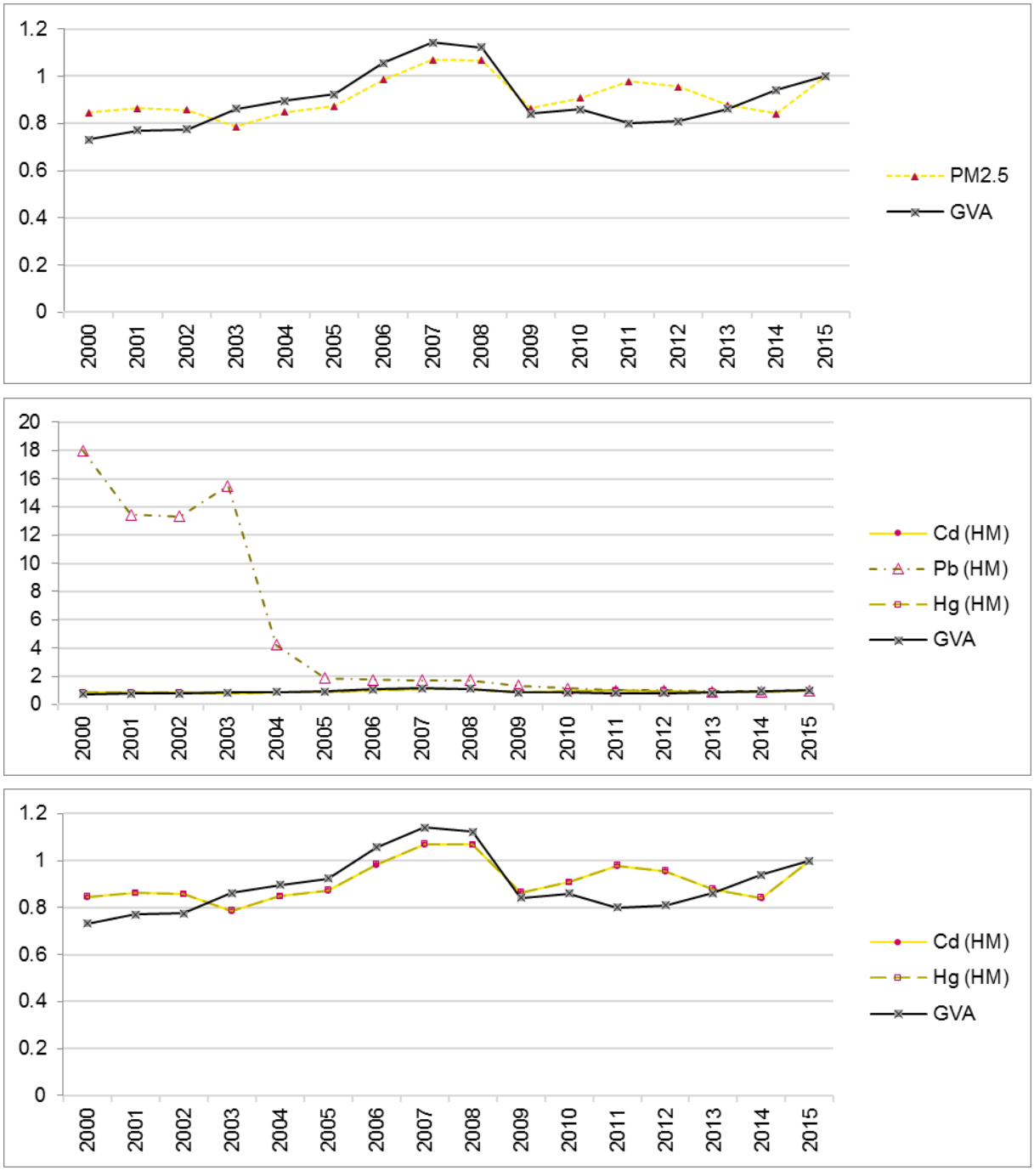
Note: Only data reported for SOx and PM2.5. SOx removed in the second chart as an outlier to make detail for other pollutant visible.

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

Similarly for the mineral **glass sector** only few pollutants are reported: $PM_{2.5}$, Cd, Pb, and Hg. The pollutants with significant emissions in 2015 are Cd and Pb (2% and 3% of national totals, respectively). Emissions of Pb from glass production decreased by a factor of ten between 2000 and 2005, and then continued to decline by a further factor of two by 2015 (Figure 18). Emissions of Pb reflect actual measured emission data from plants (Ministry of the Environment and Spatial Planning, 2016).

$PM_{2.5}$, Hg and Cd emissions have increased over time, following quite closely the trend in GVA increase in the same timeframe (Figure 18). Note that the trend lines for $PM_{2.5}$, Cd and Hg are the same from 2000 to 2015. This indicates that the emission factors used for these pollutants in this national emission inventory are static over time, with changes in all pollutants driven by changes in activity levels.

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

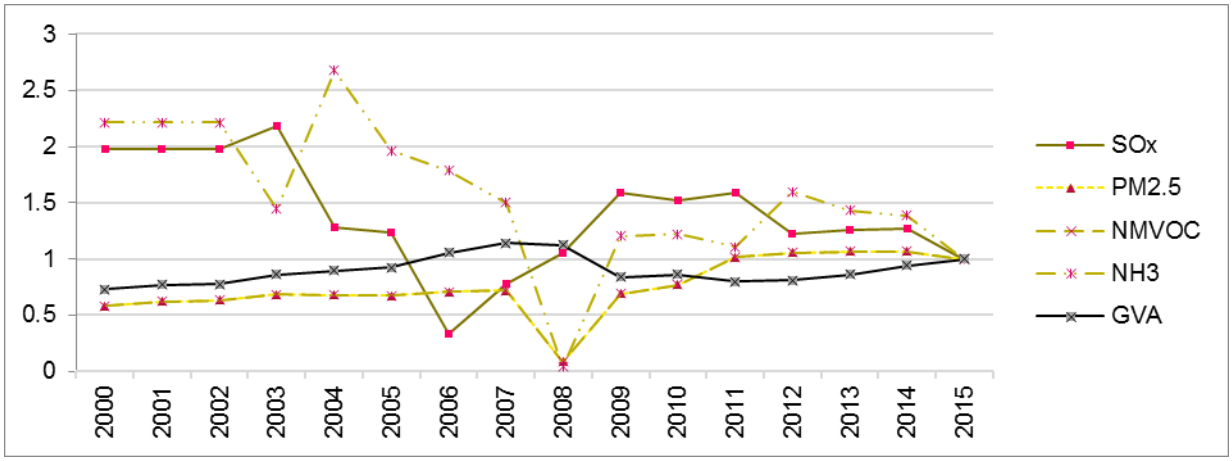


Note: Only data reported for PM2.5, Pb, Cd and Hg. Pb removed from third chart as an outlier to make detail visible for other non-heavy metal pollutants.

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

In the **other mineral production sector** (predominantly ceramic manufacturing), air emissions fluctuate between 2000 and 2015. Emissions of SO_X from this sector make up ~3% of national total in 2015; emissions of $PM_{2.5}$, NMVOC and NH_3 are less than 1% of national totals throughout 2000 to 2015. A notable drop in emissions of $PM_{2.5}$, NMVOC and NH3 is reported in 2008, and for SO_x in 2006 (Figure 19), the reasons for which are unclear. Overall, SO_X and NMVOC emissions approximately halved between 2000 and 2015, whilst NMVOC and $PM_{2.5}$ emissions on the other hand side have almost doubled in the same period. No correlation can be made with GVA for any of the pollutants. Note that the trend lines for NMVOC and $PM_{2.5}$ generally are the same from 2000 to 2015. This may indicate that the emission factors used for these pollutants in this national emission inventory are static over time, with changes in all pollutants driven by changes in activity levels.

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



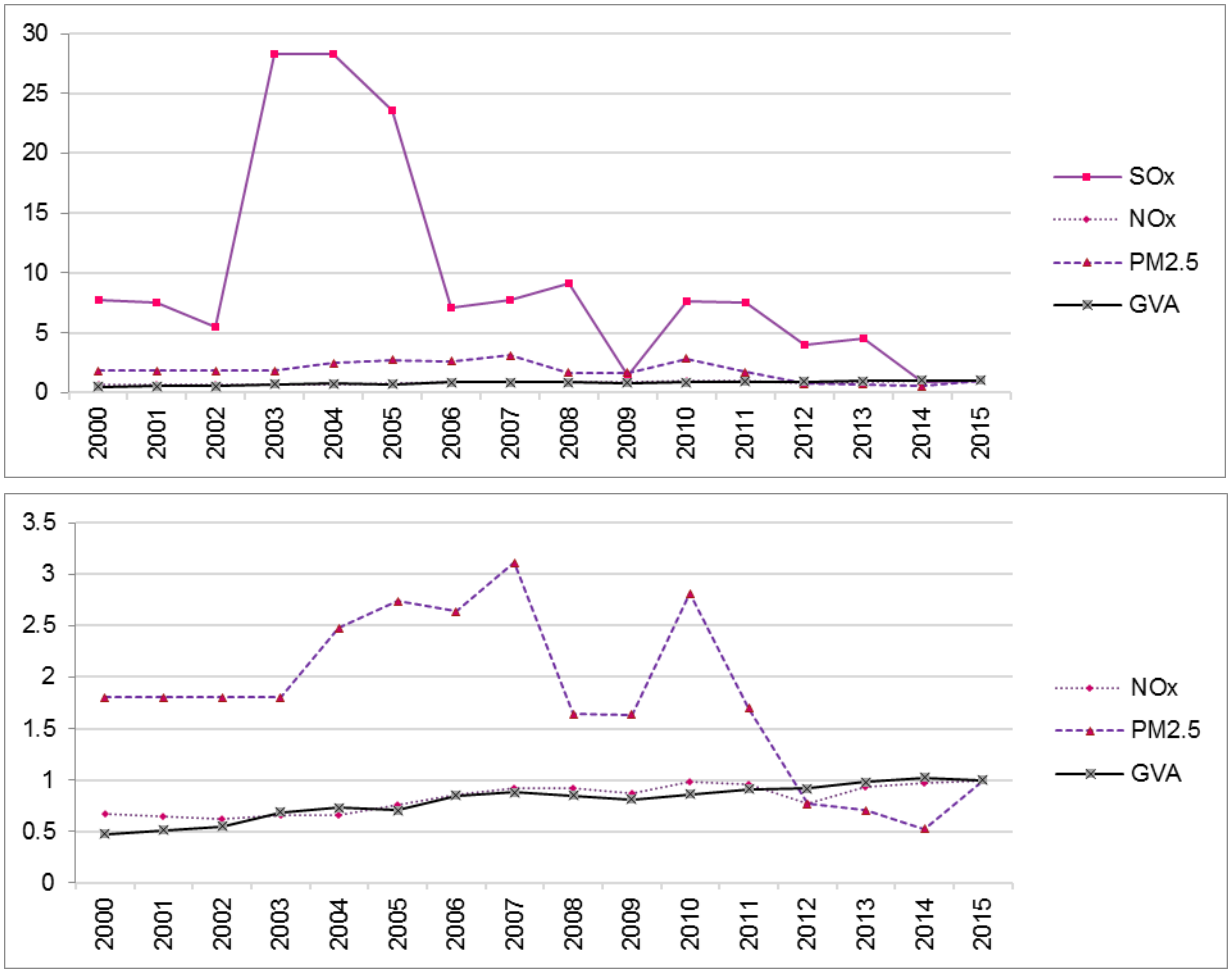
Note: No data reported for NOx, PCDD/F and heavy metals.

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

Chemical industry

For the chemical sector, SO_X, NO_X and $PM_{2.5}$ emissions are reported, all of which made up less than 0.5% of national emissions in 2015. SO_x emissions have fluctuated significantly between 2000 and 2015, peaking between 2003 and 2005, dropping sharply temporarily in 2009 before a drop by a factor of 7 from 2010 levels to 2015 (Figure 20). The reduction from 2005 to 2006 most likely correlates with cessation of nitric acid production in Slovenia, and between 2008 and 2009 due to cessation of production of calcium carbide (Ministry of the Environment and Spatial Planning, 2016). $PM_{2.5}$ emissions almost halved between 2000 and 2015 whereas the GVA slightly decreased in this time frame. The emissions of SO_2 and $PM_{2.5}$ from titanium dioxide production reflect actual measured emissions (Ministry of the Environment and Spatial Planning, 2016). Emissions of NO_X have been closely linked to GVA.

Figure 20: Indexed emissions to air from the chemical industrial sector (indexed to 2015=1)



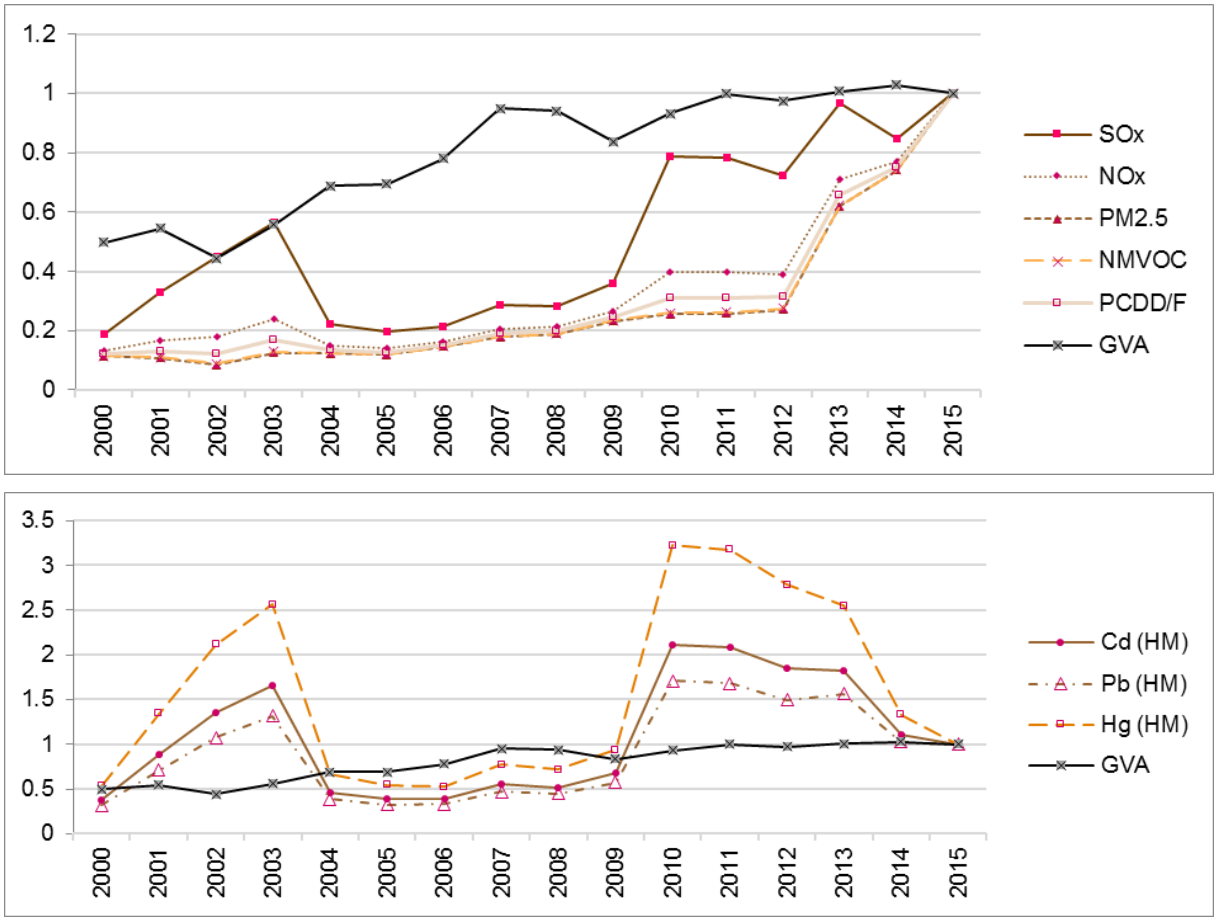
Note: No data reported for PCDD/F, NH_3, NMVOC and heavy metals. SOx removed in the second chart as an outlier to make detail for the other pollutants visible.

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

Waste management industry

GVA in the **hazardous waste management sector** has doubled between 2000 and 2015, and similarly pollutant air emissions have increased too (Figure 21). The most important pollutant for this sector is Hg, making up 6% of national total emissions in 2015. Similar trends in emissions were reported for SOx, Cd, Pb and Hg, with rapid increases in the early 2000s before dropping to follow slow growth in GVA, before further elevated emissions between 2010 to 2013. SOx emissions are five times higher in 2015 compared to 2000. Similar emissions increases, especially between 2012 and 2015 were reported for NOx, NMVOC and PCDD/F.

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



Note: No data reported for NH_3, As, Cu, Ni, Zn

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

In the **non-hazardous waste management sector**, the most important pollutant is Hg in terms of contribution to national total emissions (16%), followed by NMVOC (1%). NMVOC emissions to air reduced significantly from 2009 to 2013. For all other pollutants, a continuous upward trend is reported which follows the GVA trend (Figure 22).

Figure 22: Indexed emissions to air from non-hazardous waste (waste management industrial sector) (indexed to 2015=1)

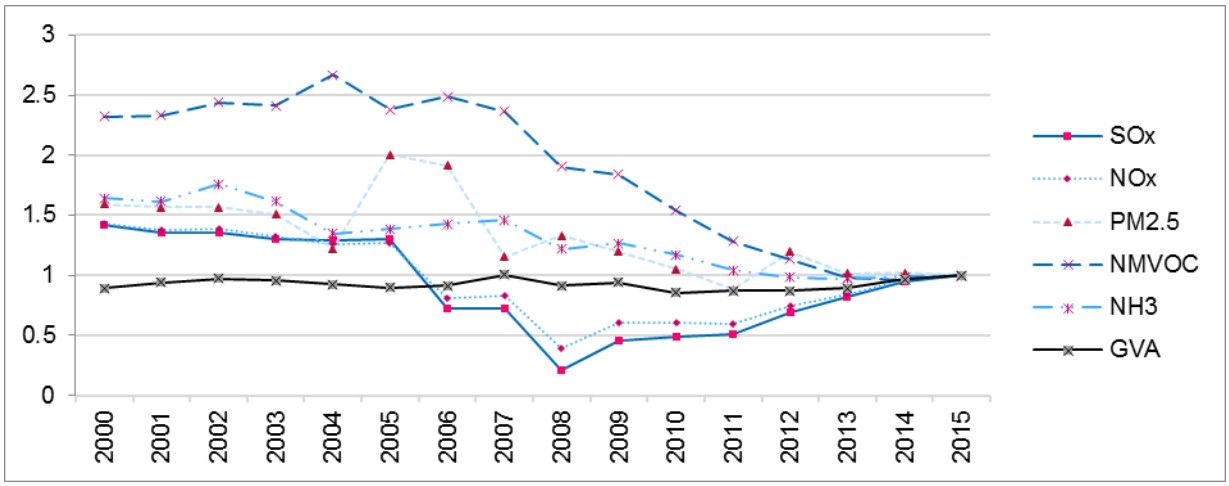
Note: No data reported for As, Cr, Cu, Ni and Zn.

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

'Other activities'

Within the 'other activities', the most significant pollutants contributing to national total emissions are NMVOC (16% of emissions in 2015), and NH_3 (16%). NMVOC emissions were approximately level from 2000 to 2007, and then approximately halved from 2007 to 2013 (Figure 23). NH_3 emissions appear to correlate with the GVA trend, even though the GVA trend excludes the intensive rearing of poultry and pigs; NH3 decreases by around 40% between 2003 and 2012. NO_x and SO_x emissions decrease until 2008 but more than double again by 2015.

Figure 23: Indexed emissions to air from other activities (indexed to 2015=1)



Note: No data reported for PCDD/F and heavy metals.

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.

Table 6: Gaps in emissions to air data for Slovenia

Missing data	Description	Conclusion and actions taken
Data gaps	No data reported for As, Cr, Cu, Ni and Zn	No action
No IED installations reported for some sectors	No IED installations reported for textiles, tanning and the energy - refining, gasification and liquefaction and coke sector.	Respective indicators were removed.

4.2 Emissions to water

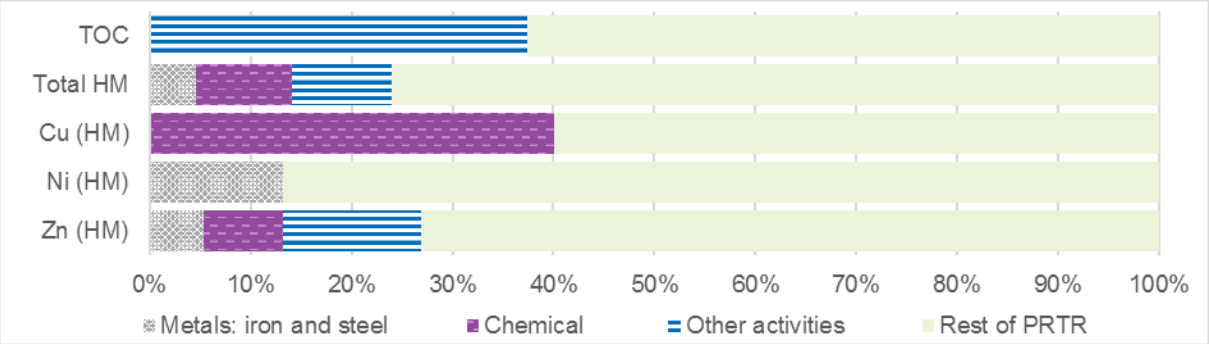
Emissions to water data were obtained from the E-PRTR (EEA, 2017b), which has a broader industrial scope than the IED but is not a national total. The figures in this section, apart from Figure 24, aggregate the separate heavy metals into a single total heavy metals metric based on their relative toxicity (reciprocal predicted no effect concentrations) and expressed in Hg equivalent. Overall there is limited data available for Slovenian emissions to water from industrial sectors.

The available data of emissions to water for the year 2015 are shown in Figure 24. This plot presents, per pollutant, the proportion of emissions to water by the industrial sector compared to the data reported by Slovenia to the E-PRTR in 2015. Pollutants reported by the industrial sectors are TOC, Cu, Ni, and Zn. Industrial sectors reporting water pollutants in 2015 are the chemical, iron and steel and 'other activities' sectors. Additional sectors reporting water pollutants in other years are the non-ferrous metals sector and non-hazardous waste management. Full details of these emissions are included in Table 7.

The industrial sectors contribute approximately 40% of the TOC and Cu emissions to water reported to E-PRTR in Slovenia in 2015. The proportions for Zn and Ni are ~25% and ~12% respectively.

The chemical sector accounts for 40% of all Cu emissions reported to E-PRTR in 2015, as well as for smaller shares of Zn emissions. 40 % of the TOC emissions to water reported to PRTR stem from 'other activities'. This sector also reported Zn emissions to water. The iron and steel sector reported ~10% of all Ni emissions to water in 2015 and a smaller share of Zn emissions compared to the total emissions of these pollutants in E-PRTR in Slovenia. No emissions to water were reported in E-PRTR for diuron, PCBs, Cd and Pb. No emissions from industrial sectors were reported for cyanides, AOX, total N, total P, As, Cr and Hg.

Figure 24: Pollutant emissions to water from industrial sectors and rest of PRTR total (2015)



Note: Rest of PRTR total relates to the total for E-PRTR reporting minus the industrial sectors shown here. No emissions reported to water for energy – power, non-ferrous metals, minerals and waste management sectors.

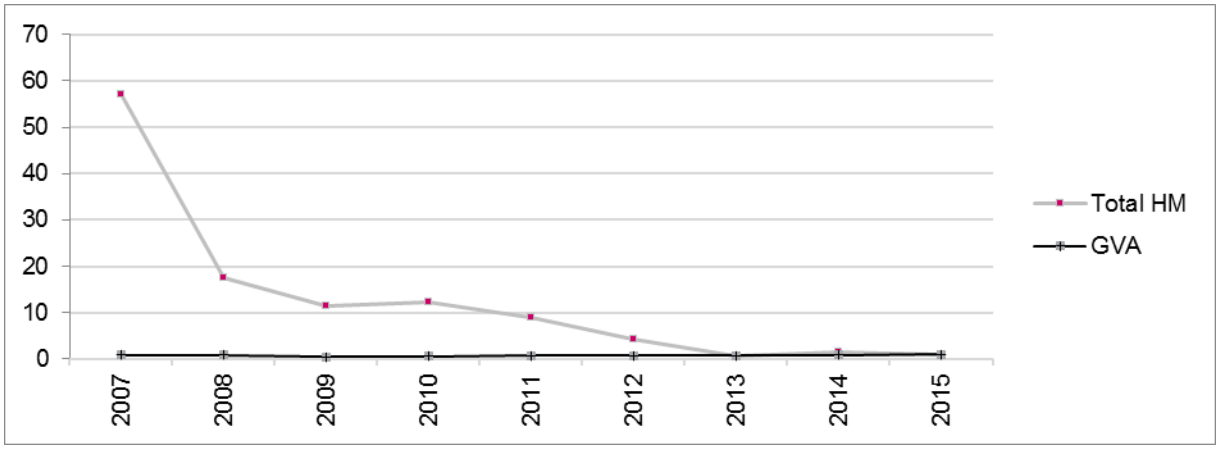
Source: EEA (2017b)

In the following subsections, emissions to water are shown in indexed charts by industrial sector. The emission data were indexed to compare the development of pollutant emissions with the GVA in specific industrial sectors from 2007 to 2015. Data was only reported for the chemical, metal - iron and steel and 'other activities' sectors for 2015. The graphs show the relative development of pollutant emissions and GVA over time; the absolute quantity of emissions is not presented. For some other sectors limited other emission data was also reported, however, not for 2015. Full details on the emissions reported by industrial sector and year are presented in Table 7.

Metal industry

The heavy metal emissions to water in the iron and steel sector decreased significantly between 2007 and 2009, and kept decreasing until 2015 (Figure 25). The reported value for 2007 is only that high, because for this year, all heavy metal emissions were reported. Values for 2013 and 2014 are very low because only few heavy metal emissions were reported for these years. The predominant heavy metal is Cr, which has decreased over the time period 2007 to 2012. As shown in section 2.1, the GVA has increased over the time period 2007 to 2015 with a downwards peak in 2009. No correlation is made with the GVA as only some heavy metals were reported for some years.

Figure 25: Indexed emissions to water from iron and steel production (metal industrial sector) (indexed to 2015=1)



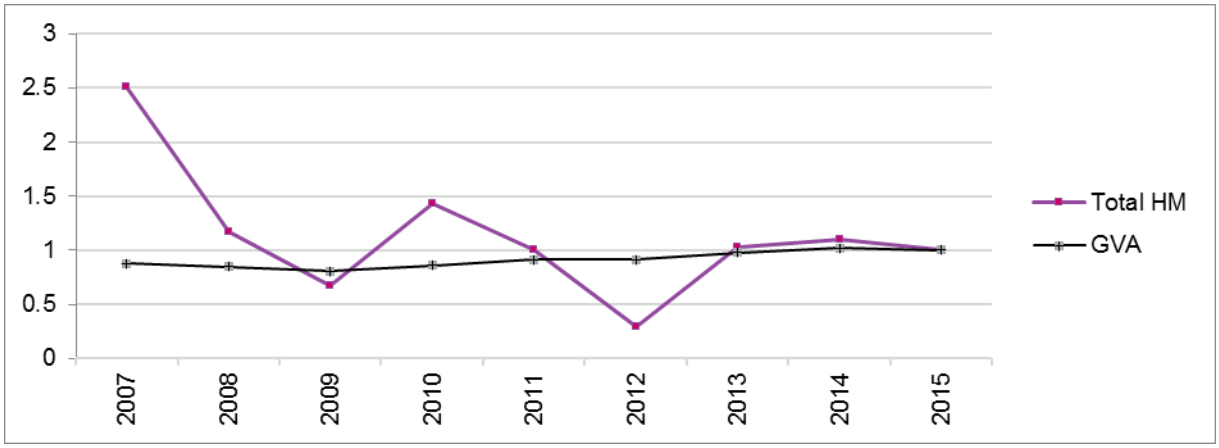
Note: Only heavy metals reported (not all heavy metals were reported for all years).

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

Chemical industry

Only heavy metal emissions to water were reported for the chemical sector. Overall heavy metal emissions have decreased between 2007 and 2015 but with fluctuations, without correlation with GVA. This results from different heavy metals being reported for different years (Cr in 2007, Zn in 2007 to 2015 except 2012, and Cu since 2010). For the last three years, the total heavy metals emissions level was almost stable (Figure 26).

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



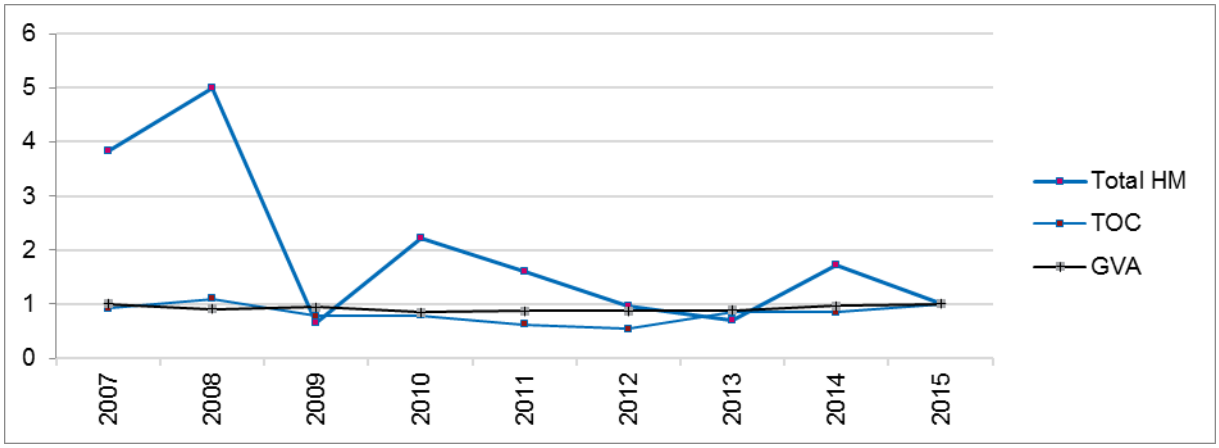
Note: Only heavy metals reported (not all heavy metals were reported for all years).

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

'Other activities'

'Other activities' sector emissions to water comprise total heavy metals (mainly Zn, reported for every year) and TOC (Figure 27). TOC emission levels have remained almost constant between 2007 and 2015, they have decreased between 2010 and 2013 but rose again afterwards. Heavy metals emissions increased in 2008 and were significantly reduced in 2009. Since then, heavy metal emissions fluctuated significantly showing no obvious trend.

Figure 27: Indexed emissions to water from 'other activities' (indexed to 2015=1)



Note: only TOC and heavy metals reported (not all heavy metals were reported for all years).

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

Additional data for emissions to water

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Metals: iron and steel									
Total HM	121.07	37.38	24.36	26.12	18.97	9.09	1.60	3.30	2.12
Metals: Non-ferrous									
Total HM	3.52	0.97	-	-	1.16	1.13	1.13	-	-
Mineral: Glass									
Total HM	5.52	7.95	1.58	-	-	-	-	-	-
Chemical									
Total HM	5	3	6	4	1	5	5	4	5
Total TOC	-	-	-	65,500	65,500	-	-	-	-
Waste: non-hazardous									
Total HM	4.29	2.24	-	-	-	-	-	-	-
Total N	-	70,400	-	-	-	-	-	-	-
PCBS	4.60	-	-	-	-	-	-	-	-
Other activities									
Total HM	18	23	3	10	7	4	3	8	5
Total TOC	325,000	386,400	274,800	278,000	220,100	192,400	301,000	298,000	352,000
Total N	115,000	-	-	-	-	-	-	-	-

Source: EEA (2017b)

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 activity thresholds which apply (as well as inconsistencies between years). E-PRTR also has a limited timeseries.

Table 8: Gaps in emissions to water data for Slovenia

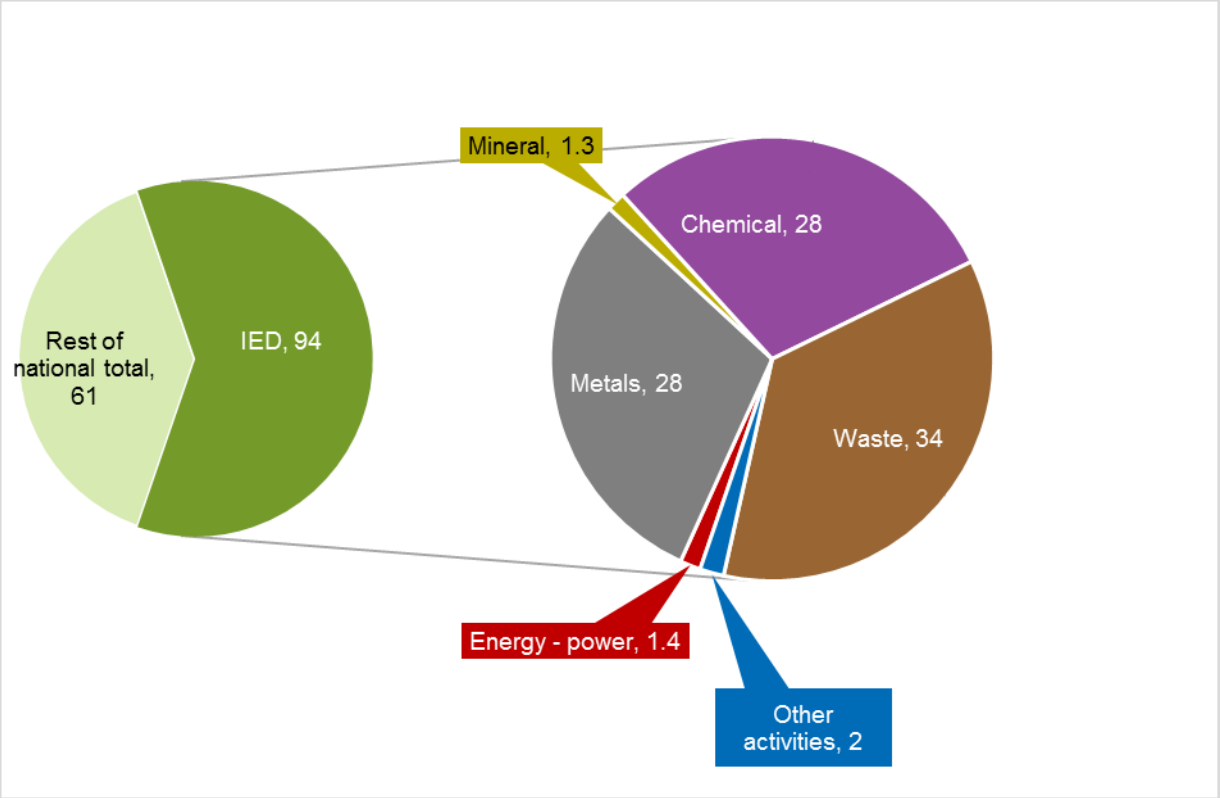
Missing data	Description	Conclusion and actions taken
Time-series	Time series from 2007 to 2015	No action
Data gaps	No data reported for several pollutants	No action
Data gaps	No data reported for several industrial sectors	No action
No IED installations reported for some sectors	No IED installations reported for textiles, tanning and the energy - refining, gasification and liquefaction and coke sector.	Respective indicators were removed.

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 61% of total hazardous waste generated in Slovenia in 2014 (Figure 28). Of this share, the waste management sector accounts for the major share (36%), followed by the metals and the chemicals sector (30% each) (Figure 28).

Figure 28: Hazardous waste generation by industrial sector in 2014 (kt)

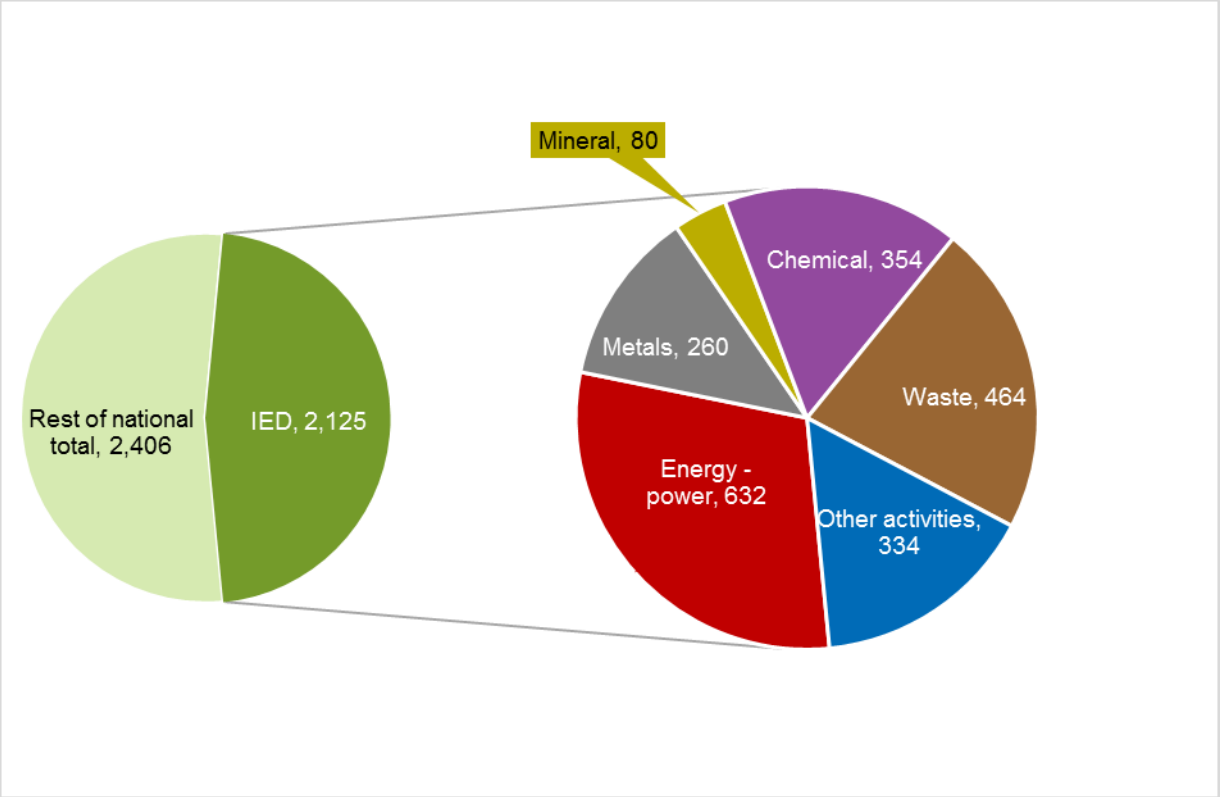


Note: Rest of national total relates to all NACE activities minus industrial sectors shown here.

Source: Eurostat (2017e)

Industrial sectors also account for a large share of total non-hazardous waste generated, namely 47% of the national total (Figure 29) – with the energy-power sector accounting for the largest share of this (30%). The second largest sector generating non-hazardous waste is the waste management sector itself (22%), followed by the chemicals sector, which is the third largest (17%).

Figure 29: Non-hazardous waste generation by industrial sector in 2014 (kt)



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

Source: Eurostat (2017e)

Hazardous and non-hazardous waste generation varied significantly within most sectors showing no obvious trend or correlation with the GVA (Figure 30).

Within the mineral sector, hazardous as well as non-hazardous waste generation decreased from 2008 to 2012, slightly increasing afterwards, in line with the GVA. Within the waste management sector itself, the amount of hazardous and non-hazardous waste generated waste was almost stable from 2004 to 2010, increasing afterwards until 2014. The GVA continuously slightly increased over the whole considered time period. The hazardous waste generated by the 'other activities' sector significantly decreased between 2004 and 2006, whilst non-hazardous waste almost doubled in the same period and decreased again, even more significantly, since then.

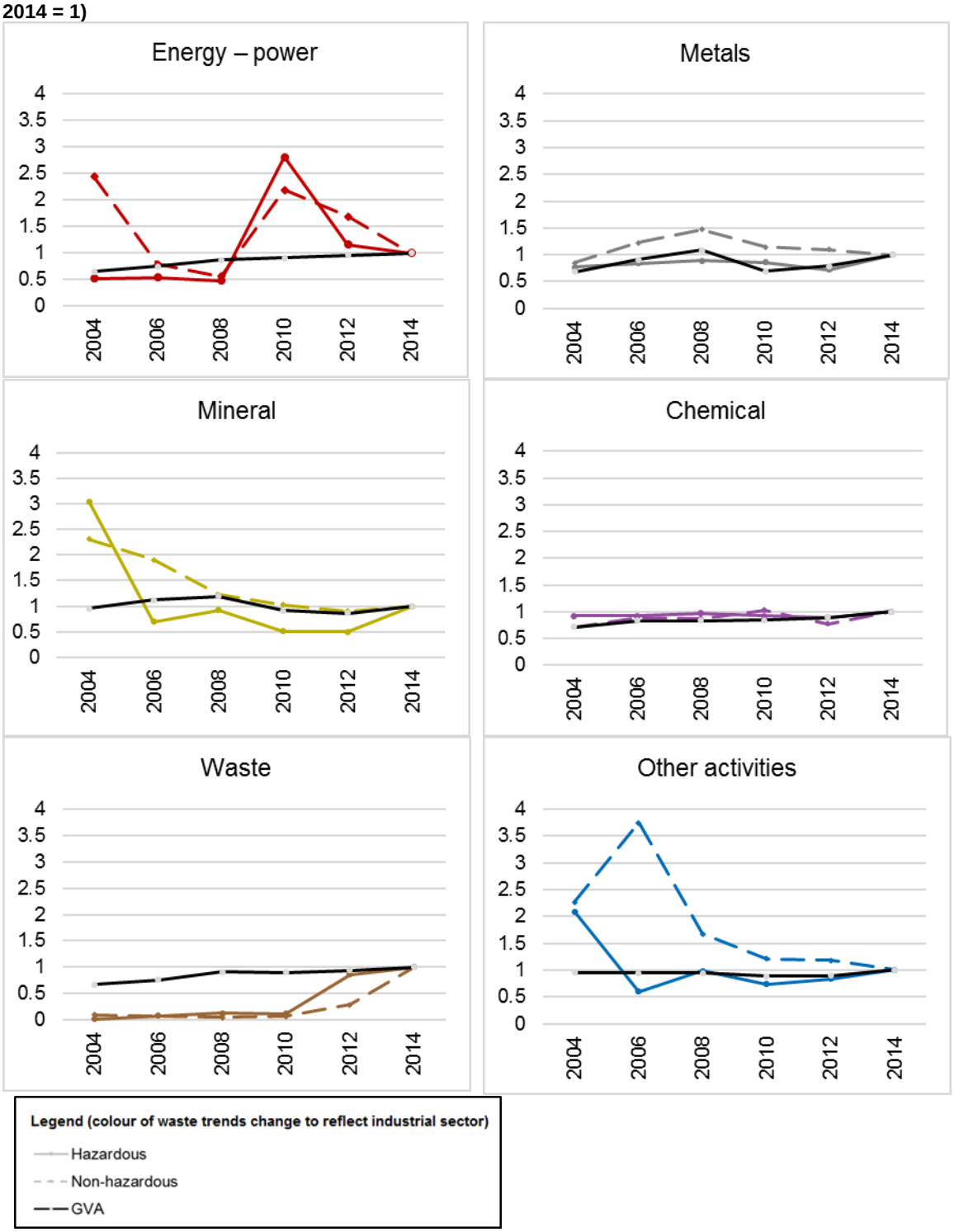
Limitations

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.

Table 9: Gaps in waste generation data for Slovenia

Missing data	Description	Conclusion and actions taken
No IED installations reported for some sectors	No IED installations reported for textiles, tanning and the energy - refining, gasification and liquefaction and coke sector.	Respective indicators removed from waste generation to avoid overreporting.

Figure 30: Hazardous and non-hazardous waste generation by industrial sector relative to GVA (indexed; 2014 = 1)



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, political intervention, implementation of a specific national policy and/or which are evident from literature or analysis[1].

As shown in section 2, key industries in Slovenia in terms of the reported number of IED installations are intensive rearing of poultry or pigs (16% of total in 2015), followed by non-hazardous waste management (14%) and the surface treatment of metals and plastic (12%). The sectors identified as making the largest contribution to the Slovenian economy as measured by GVA are chemicals (chemicals and pharmaceutical products, 32% of total industrial sector GVA) and energy – power (22%).

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, NO_x, $PM_{2.5}$ and Hg, 'other activities' mainly for NMVOC and NH_3, iron and steel production for most of the reported heavy metals and non-ferrous metal production for SO_X and Cd. The chemicals industry (contributing the main share of Cu), iron and steel manufacturing for Ni and other activities (sole emitter of TOC while contributing a significant share to Zn emissions to water) were identified as having significant environmental burdens for emissions to water whereas there were no data reported for the waste management, energy – power and the minerals industrial sectors.

No significant up-to-date challenges/pressures related to the IED sector were identified for Slovenia or reported by the Competent Authorities. According to the responsible authorities in Slovenia currently there are no political or environmental challenges and pressures related to the IED sectors.

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

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Appendices

Appendix 1 Mapping industrial sectors across data sources for Slovenia

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

Appendix 1: Mapping industrial sectors across data sources for Slovenia

Industrial sector	**GVA†**	**Employment**	**Energy consumption‡**	**Water consumption**	**Emissions to air**	**Emissions to water^**	**Waste generated**
	Eurostat (2017a)	**Eurostat (2017b)**	**Eurostat (2017c)**	**Eurostat (2017d)**	**EEA (2016c)**	**EEA (2017)**	**Eurostat (2017e)**
Sector classification	**NACE Rev 2**	**NACE Rev 2**	**Energy balance indicator**	**NACE Rev 2**	**NFR14 sector classification**	**E-PRTR**	**NACE Rev 2**
Time series available	*2000-2015, annually*	*2008-2015, annually*	*2000-2015, annually*	*2000-2015, annually*	*2000-2014, annually*	*2007-2015, annually*	*2004-2014, biennially*
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)	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)
Metals: iron and steel	C24 (basic metals)	C24 (basic metals)	B_101805 - Iron and Steel	C24 (basic metals)	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)	
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	2A1 Cement; 2A2 Lime; 2A3 Glass; 2A6 Other	Glass (3e)	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)	2B6 Titanium dioxide; 2B2 Nitric acid; 2B7 Soda ash; 2B10a Other; 2B5 Carbide	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	5C1bii Hazardous waste incineration 5C1biii Clinical waste incineration	Hazardous waste (5a)	E37-E39 (water supply; sewerage, waste management and remediation)
Waste: non-hazardous			No data available	Insufficient granularity in reported data	5A Solid waste disposal on land; 5C1a Municipal waste incineration; 5B1 Composting; 5C1bv Cremation; 5D2 Industrial wastewater handling	Non-hazardous waste (5b-e; g)	
Other activities* (food and drink products,	C10-C12 (food and drinks and tobacco)	C10 (food products); C11 (drink products)	B_101830 - Food and Tobacco	**DATASETS COMBINED:** C10-12 (food and drinks and tobacco); C13-15 (textiles; wearing apparel; leather); C16-17 (paper and wood products)	2H2 Food and beverages industry	Food and drink (8a-c)	C10-C12 (food products; drink products; tobacco)
	C16 (wood products)	C16 (wood products);	B_101851 - Wood and Wood Products		2I Wood processing	No data available	C16 (wood products)
paper and board, pulp,	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 pigs and poultry,	Insufficient granularity in reported data	Insufficient granularity in reported data	No indicators	Insufficient granularity in reported data	3B4gi Manure management - Laying hens; 3B4gii Manure management - Broilers	No data available	Insufficient granularity in reported data
surface treatment		Insufficient granularity in reported data	No indicators	Insufficient granularity in reported data	2D3d Coating applications; 2D3e Degreasing; 2D3f Dry cleaning; 2D3g Chemical products; 2D3h Printing; 2D3i Other solvent use; 2H3 Other industrial processes	Surface treatment (2f; 9c)	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 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 Slovenia (excluded indicators are: B_101315 - Consumption in Blast Furnaces)
^ Additional E-PRTR activities are applicable to the industrial sector categories but not included here as no data reported for Slovenia (excluded activities include: [Cement, lime and magnesium oxide (3c); Other (3f-g); Production of carbon (9d) Production of carbon (9d)]
* Sector mappings not shown for energy - refining, gasification and liquefaction, coke (IED activities 2.2, 1.3, 1.4), textiles (6.2), and tanning (6.3) as there are no IED installations for these sectors reported in Slovenia – see section 2.1.

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

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	83.54	53.47	55.16	52.51	43.39	34.83	12.14	11.20	10.44	8.77	8.01	9.75	9.00	9.44	6.85	3.54
NO_x	kt	19.15	19.72	21.22	19.18	17.25	17.71	17.78	15.75	15.75	14.03	14.00	13.47	12.73	12.03	9.66	7.14
$PM_{2.5}$	kt	0.80	1.11	1.22	1.12	1.21	1.30	1.00	0.81	1.13	0.84	0.78	0.85	0.82	0.82	0.80	0.83
NMVOC	kt	1.09	1.68	1.77	1.73	1.90	2.06	1.67	1.25	1.38	1.29	1.34	1.29	1.24	1.31	1.41	1.46
NH_3	kt	0.02	0.10	0.10	0.10	0.12	0.13	0.08	0.03	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.07
Cd (HM)	tonne	0.11	0.14	0.15	0.14	0.15	0.16	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.11	0.11
Pb (HM)	tonne	1.15	1.33	1.47	1.41	1.46	1.48	1.47	1.47	1.51	1.29	1.30	1.32	1.25	1.22	1.04	1.04
Hg (HM)	tonne	0.14	0.12	0.13	0.12	0.11	0.12	0.10	0.10	0.10	0.08	0.08	0.08	0.08	0.08	0.07	0.07
PCDD+PCDF	g	1.13	1.46	1.63	1.57	1.65	1.72	1.61	1.52	1.65	1.34	1.32	1.36	1.28	1.27	1.16	1.16
Metals: iron and steel																	
SO_x	kt	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.04
NO_x	kt	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09	0.06	0.08	0.09	0.09	0.09	0.08	0.08
$PM_{2.5}$	kt	0.11	0.11	0.11	0.11	0.05	0.10	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.08	0.08	0.07
NMVOC	kt	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Cd (HM)	tonne	0.09	0.09	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.09	0.13	0.14	0.13	0.13	0.13	0.13
Pb (HM)	tonne	1.21	1.20	1.25	1.41	1.48	1.57	1.70	1.74	1.76	1.19	1.67	1.79	1.75	1.72	1.69	1.64
Hg (HM)	tonne	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03
PCDD+PCDF	g	1.39	1.39	1.44	1.62	1.71	1.82	1.96	2.01	2.03	1.37	1.92	2.06	2.01	1.99	1.95	1.90
Metals: Non-ferrous																	
SO_x	kt	1.40	1.38	1.78	1.83	2.00	1.28	1.35	1.12	0.62	0.33	0.29	0.50	0.46	0.74	0.80	0.79
NO_x	kt	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.0052	0.0060	0.01	0.01	0.01	0.01	0.01
$PM_{2.5}$	kt	1.48	1.46	0.98	1.08	0.98	0.91	1.34	1.00	0.01	0.01	0.01	0.02	0.04	0.04	0.04	0.04
Cd (HM)	tonne	0.29	0.31	0.29	0.33	0.35	0.35	0.40	0.04	0.03	0.04	0.05	0.04	0.04	0.07	0.05	0.06
Pb (HM)	tonne	90.25	99.76	95.12	110.42	119.37	120.29	133.02	1.59	1.50	1.08	1.11	0.70	0.12	0.16	0.15	0.18
Hg (HM)	tonne	0.0001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0001	0.0001	0.0001	0.0001
PCDD+PCDF	g	0.91	0.87	0.88	0.90	0.87	0.84	0.91	0.99	0.96	0.76	0.81	0.64	0.41	0.50	0.46	0.50

Pollutant	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mineral: Cement, lime and magnesium oxide																	
SO_x	kt	0.28	0.99	1.03	1.83	0.92	1.05	0.07	0.04	0.05	0.0060	0.0025	0.0006	0.0011	0.01	0.0012	0.0003
$PM_{2.5}$	kt	0.12	0.13	0.11	0.11	0.12	0.09	0.09	0.08	0.07	0.05	0.04	0.04	0.04	0.02	0.02	0.01
Mineral: Glass																	
$PM_{2.5}$	kt	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cd (HM)	tonne	0.0087	0.0089	0.0089	0.0081	0.0088	0.0090	0.01	0.01	0.01	0.0089	0.0094	0.01	0.0099	0.0091	0.0087	0.01
Pb (HM)	tonne	3.80	2.84	2.82	3.28	0.89	0.40	0.37	0.37	0.36	0.29	0.24	0.21	0.21	0.20	0.19	0.21
Hg (HM)	tonne	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mineral: Other																	
SO_x	kt	0.36	0.36	0.36	0.40	0.23	0.23	0.06	0.14	0.19	0.29	0.28	0.29	0.22	0.23	0.23	0.18
$PM_{2.5}$	kt	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.0061	0.05	0.05	0.07	0.07	0.08	0.08	0.07
NMVOC	kt	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.0058	0.05	0.05	0.07	0.07	0.07	0.07	0.07
NH_3	kt	0.10	0.10	0.10	0.07	0.13	0.09	0.08	0.07	0.0017	0.06	0.06	0.05	0.08	0.07	0.07	0.05
Chemical																	
SO_x	kt	0.16	0.15	0.11	0.58	0.58	0.48	0.15	0.16	0.19	0.03	0.16	0.15	0.08	0.09	0.02	0.02
NO_x	kt	0.0045	0.0044	0.0042	0.0045	0.0044	0.0051	0.0058	0.0062	0.0062	0.0059	0.0067	0.0064	0.0052	0.0063	0.0066	0.0068
$PM_{2.5}$	kt	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.02	0.02	0.04	0.02	0.01	0.01	0.0075	0.01
Waste: hazardous																	
SO_x	kt	0.0001	0.0002	0.0003	0.0004	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0006	0.0005	0.0006
NO_x	kt	0.0013	0.0017	0.0018	0.0024	0.0015	0.0014	0.0017	0.0021	0.0022	0.0027	0.0040	0.0040	0.0039	0.0072	0.0078	0.01
$PM_{2.5}$	kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMVOC	kt	0.0094	0.0090	0.0073	0.01	0.01	0.0099	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.05	0.06	0.08
Cd (HM)	tonne	0.0010	0.0024	0.0036	0.0044	0.0012	0.0010	0.0010	0.0015	0.0014	0.0018	0.0056	0.0056	0.0049	0.0049	0.0030	0.0027
Pb (HM)	tonne	0.0084	0.02	0.03	0.03	0.01	0.0087	0.0088	0.01	0.01	0.02	0.05	0.04	0.04	0.04	0.03	0.03
Hg (HM)	tonne	0.0048	0.01	0.02	0.02	0.0060	0.0049	0.0047	0.0070	0.0065	0.0084	0.03	0.03	0.03	0.02	0.01	0.0090
PCDD+PCDF	g	0.0014	0.0015	0.0014	0.0019	0.0015	0.0014	0.0017	0.0021	0.0022	0.0028	0.0035	0.0035	0.0036	0.0074	0.0085	0.01

Pollutant	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Waste: non-hazardous																	
SO_x	kt	0.0011	0.0011	0.0012	0.0014	0.0014	0.0015	0.0014	0.0015	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0019
NO_x	kt	0.0079	0.0082	0.0091	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$PM_{2.5}$	kt	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006
NMVOC	kt	1.25	1.28	1.28	1.28	1.14	1.17	1.31	1.27	1.28	1.17	0.97	0.79	0.60	0.43	0.40	0.41
NH_3	kt	0.0076	0.0076	0.0076	0.0076	0.0056	0.0036	0.0028	0.0036	0.0044	0.0055	0.0064	0.01	0.01	0.02	0.02	0.02
Cd (HM)	tonne	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Pb (HM)	tonne	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005
Hg (HM)	tonne	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PCDD+PCDF	g	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005
Other activities																	
SO_x	kt	0.24	0.23	0.23	0.22	0.22	0.22	0.12	0.12	0.04	0.08	0.08	0.09	0.12	0.14	0.16	0.17
NO_x	kt	0.16	0.15	0.15	0.15	0.14	0.14	0.09	0.09	0.04	0.07	0.07	0.07	0.08	0.09	0.11	0.11
$PM_{2.5}$	kt	0.18	0.18	0.18	0.17	0.14	0.23	0.22	0.13	0.15	0.14	0.12	0.10	0.14	0.12	0.12	0.12
NMVOC	kt	12.14	12.21	12.75	12.61	13.97	12.45	12.99	12.36	9.96	9.61	8.06	6.72	5.92	5.10	5.04	5.23
NH_3	kt	5.19	5.10	5.56	5.10	4.27	4.38	4.52	4.62	3.85	4.00	3.71	3.30	3.10	3.07	3.12	3.16

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