Industrial pollution in Europe

Releases of pollutants to the environment from Europe's industrial sector – 2015

The European Pollutant Release and Transfer Register (E-PRTR) ensures public access to information on pollutant releases to the environment from Europe's largest industrial facilities. This briefing, based upon recently updated E-PRTR data, provides details of Europe's largest emitting facilities for selected key pollutants in 2015. A more detailed assessment of the large combustion plants (LCP) sector also highlights the ongoing shift away from certain fossil fuels in the sector over the past decade, as well as improvements made to the sector's environmental performance.

- Updated information for 2015 concerning pollutant releases to the environment is newly available from around 35 000 of Europe's largest industrial facilities and 3 400 LCPs.
- For selected key pollutants released to air and water, half of the facilities responsible for the largest releases are located in the United Kingdom (14 facilities), Germany (7), France (5) and Poland (5).
- Although good progress is being made by the EU towards its climate and energy policy objectives for 2020 and 2030, coal-fired power plants continue to be responsible for the largest amounts of key pollutants released to air. Bełchatów (Poland) is responsible for the highest amounts of carbon dioxide (CO_2), sulphur dioxide (SO_2) and nitrogen oxides (NO_x) released to air in 2015. In addition, Drax (United Kingdom), Jänschwalde (Germany) and Kozienice (Poland) are top polluters for each of these three pollutants.
- Wastewater treatment plants were responsible for the highest amounts of total nitrogen, phosphorus and organic carbon released to water. The most polluting of these facilities were located in the United Kingdom, France and Spain.
- Despite a decreasing amount of coal used over past years, it remains the most used fuel in large combustion plants. Biomass use in LCPs remains minor, comprising 4.7 % of fuel used by LCPs in 2015, although its use increased threefold between 2004 and 2015.
- Europe's LCPs have significantly improved their environmental performance over past years, releasing fewer emissions to air per energy unit consumed.

Countries recently reported official data for 2015 to the European Pollutant Release and Transfer Register (E-PRTR) and separately for LCPs under the European Union's (EU) LCP Directive. E-PRTR data covers 35 000 facilities over 65 economic activities and is available for the EU-28 Member States (data for Italy had not been reported at the time of writing), the EFTA countries (Iceland, Liechtenstein, Norway and Switzerland) and Serbia. For LCPs, data is available for the EU-28 countries and Kosovo (UNSCR 1244/99). Data for both Serbia and Kosovo are reported voluntarily and are not included in this briefing analysis.

The updated E-PRTR data show, for each facility, information concerning the amounts of pollutant released in 2015 to air, water and land as well as off-site transfers of waste and of pollutants in wastewater. The top polluters were identified as those sites having the top ten largest individual releases to air and water for each of nine key pollutants:

Air pollution	Water pollution
■ carbon dioxide (CO_2) ■ sulphur dioxide (SO_2) ■ nitrogen oxides (NO_x) ■ PM_{10} particulate matter ■ heavy metals (combined releases of cadmium (Cd), mercury (Hg) and lead (Pb)).	■ total nitrogen (N) ■ total phosphorous (P) ■ total organic carbon (TOC) ■ heavy metals (combined releases of cadmium (Cd), mercury (Hg), nickel (Ni) and lead (Pb)).

Note that since the reporting year of 2015, changes in E-PRTR operating facilities may have occurred. Official data for 2016 will be available in June 2018.

Top polluting industrial facilities in Europe

The top industrial polluting facilities are located throughout Europe and, not surprisingly, they are often clustered in areas with high industrial activity (**Figure 1**). Half of the identified facilities responsible for the largest releases of pollutants to the environment are located in the United Kingdom (14 facilities), Germany (7), Poland (5) and France (5). A number of facilities are responsible for large releases of more than one of the nine selected key pollutants — overall 59 individual facilities are included in the list of top polluters (**Table 1**).

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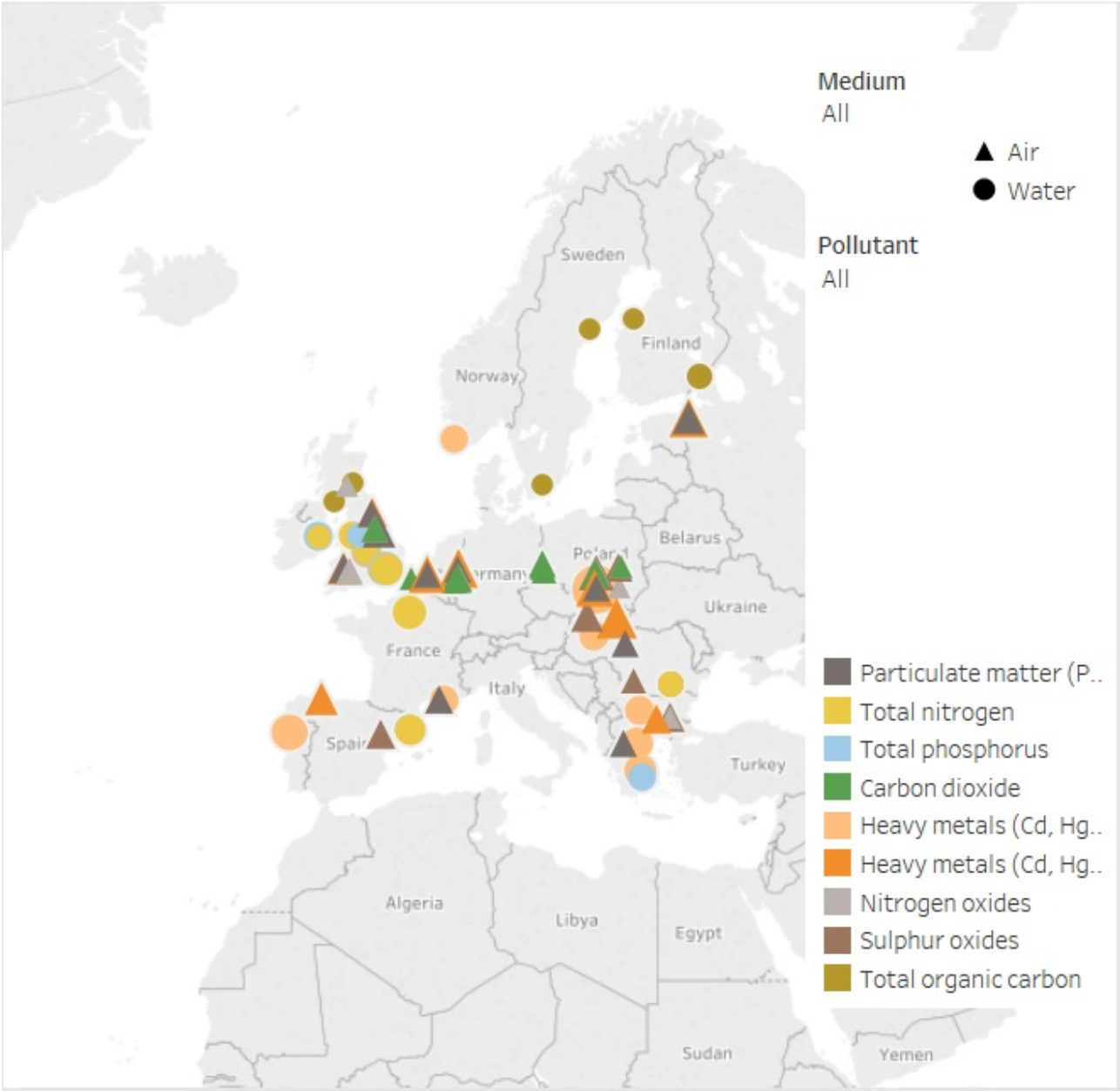
Figure 1. Location of Europe's top polluting industrial facilities to air and water



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Source: The European Pollutant Release and Transfer Register (E-PRTR), Member States reporting under Article 7 of Regulation (EC) No 166/2006

Note: The size of symbols reflects the magnitude of pollutants. Italy did not meet the deadline for submitting E-PRTR data for 2015 and is not included.

For air, four facilities — all of them coal fired power plants — appear as top polluters for three different pollutants (CO_2, SO_2 and NO_x):

- Bełchatów (Poland) — Europe's largest thermal power station firing lignite;
- Drax (UK) — powered by hard coal, and biomass mainly sourced from North America;
- Jänschwalde (Germany) — predominantly lignite-fired power station;
- Kozienice (Poland) — Poland's second largest coal-burning power station.

Of the 65 economic activities included in E-PRTR, power plants were responsible for Europe's largest individual facility releases of SO_x and NO_x, and comprised all but one of the facilities releasing the most CO_2 to air. All of these power plants are fuelled predominantly by coal except the Eesti plant in Estonia which is fuelled by oil shale. In contrast, the most polluting facilities for heavy metals were, with one exception, metal production and processing sites. These sites also comprised seven of the top ten facilities emitting PM_{10}.

For water, four wastewater treatment plants (WWTPs) reported the largest releases of three different pollutants:

- Seine Aval (France; releases of N, P and TOC)
- Beckton (United Kingdom; releases of N, P and TOC)
- Ringsend (Ireland; N, P and TOC)
- Minworth (United Kingdom, releases of Heavy metals, N and P)

It is important to note that wastewater treatment plants only release pollutants into water that they have received from other sources through transfers (receipts) of wastewater. Although featuring prominently in the list of most polluting facilities, they are not themselves the original source of the pollutants. Overall, 31 different wastewater treatment plants accounted for all of the highest N and P releasing facilities, as well as the majority of TOC and heavy metals releases to water.

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Table 1. Top industrial polluters in Europe

Medium
(•) Air
( ) Water

Pollutant
(•) Carbon dioxide
( ) Heavy metals (Cd, Hg, Pb)
( ) Nitrogen oxides
( ) Particulate matter (PM10)
( ) Sulphur oxides

Rank	Facility	Country	Sector	Total releases (kg)	E-PRTR share
1	Bełchatów	Poland	Power plant	37,000,000,000	2.2%
2	Neurath	Germany	Power plant	32,100,000,000	1.9%
3	Niederaußem	Germany	Power plant	27,300,000,000	1.7%
4	Jänschwalde	Germany	Power plant	23,700,000,000	1.4%
5	Drax	United Kingdom	Power plant	23,400,000,000	1.4%
6	Boxberg	Germany	Power plant	19,500,000,000	1.2%
7	Eschweiler	Germany	Power plant	18,300,000,000	1.1%
8	Schwarze Pumpe	Germany	Power plant	12,300,000,000	0.7%
9	Kozienice	Poland	Power plant	11,600,000,000	0.7%
10	ArcelorMittal Dunke..	France	Metal processing	11,400,000,000	0.7%

Source: The European Pollutant Release and Transfer Register (E-PRTR), Member States reporting under Article 7 of Regulation (EC) No 166/2006

A small number of facilities contribute a relatively high share of the total releases of pollutants from all E-PRTR facilities for several key pollutants. Particularly for heavy metals, several individual facilities contributed more than 5 % of all reported emissions from E-PRTR facilities in 2015, including:

- Bolesław metals mine (Poland; 10.5 % of heavy metals released to water);
- U.S. Steel Košice metal production and processing site (Slovakia; 7.5 % of heavy metals released to air);
- Eesti oil shale-fired power plant power plant (Estonia; 7.1 % of heavy metals released to air).

Information on releases to air and water from industrial facilities in the years prior to 2015 is also shown in the E-PRTR website. A comparison of the updated 2015 data with those for earlier years shows that, overall, the reported releases of key air pollutants from industry continued to decline in 2015. Releases of TOC and heavy metals to water also fell, while N and P releases remained stable for the third year in a row.

In the spotlight: large combustion plants

Large combustion plants that generate heat and/or electricity are defined in the LCP Directive as those facilities having an installed capacity greater than 50 megawatts thermal energy (MW_{th}). They are common in the electricity and heat supply sectors, oil refineries and in other sectors such as chemical industries and iron and steel production.

In the EU-28, the number of LCPs has decreased slightly over the last four years. In 2015, around 3 400 LCPs were in operation. The latest officially-reported data from national authorities show that the consumption of fossil fuels by LCPs has decreased by 23.4 % since 2006. These decreases occurred while EU-28 Member States reduced their electricity consumption only moderately, i.e. by 3.3 % since 2006 (Eurostat, 2017). This reflects factors such as improving energy efficiency within the sector and the shift of Europe's energy system away from coal, gas and oil to other energy sources such as renewables (EEA, 2017).

Despite the share of coal decreasing for the third year in a row, it nonetheless remains the dominant fuel used in LCPs, accounting for more than half (55 %) of the total fuel energy input. Combustion of coal typically generates more greenhouse gas and air pollutant emissions per energy unit than other fossil fuels. The use of natural gas increased slightly between 2014 and 2015 to 26.1 % of fuel input. The use of biomass fuels increased threefold between 2004 and 2015, but contributed a relatively minor share (4.7 %) of LCP fuel use in 2015.

LCPs have significantly improved their environmental performance over the past decade in terms of pollutant emissions per unit of energy consumed (**Figure 2**). While changes in the energy mix and the retrofitting of certain plants explain part of the changes, the sector also benefitted from a significant uptake of emission abatement techniques in existing plants. This has, at least in part, been driven by the requirements of the EU's LCP Directive and implementation of the more recent Industrial Emissions Directive, which includes emission standards for existing LCPs.

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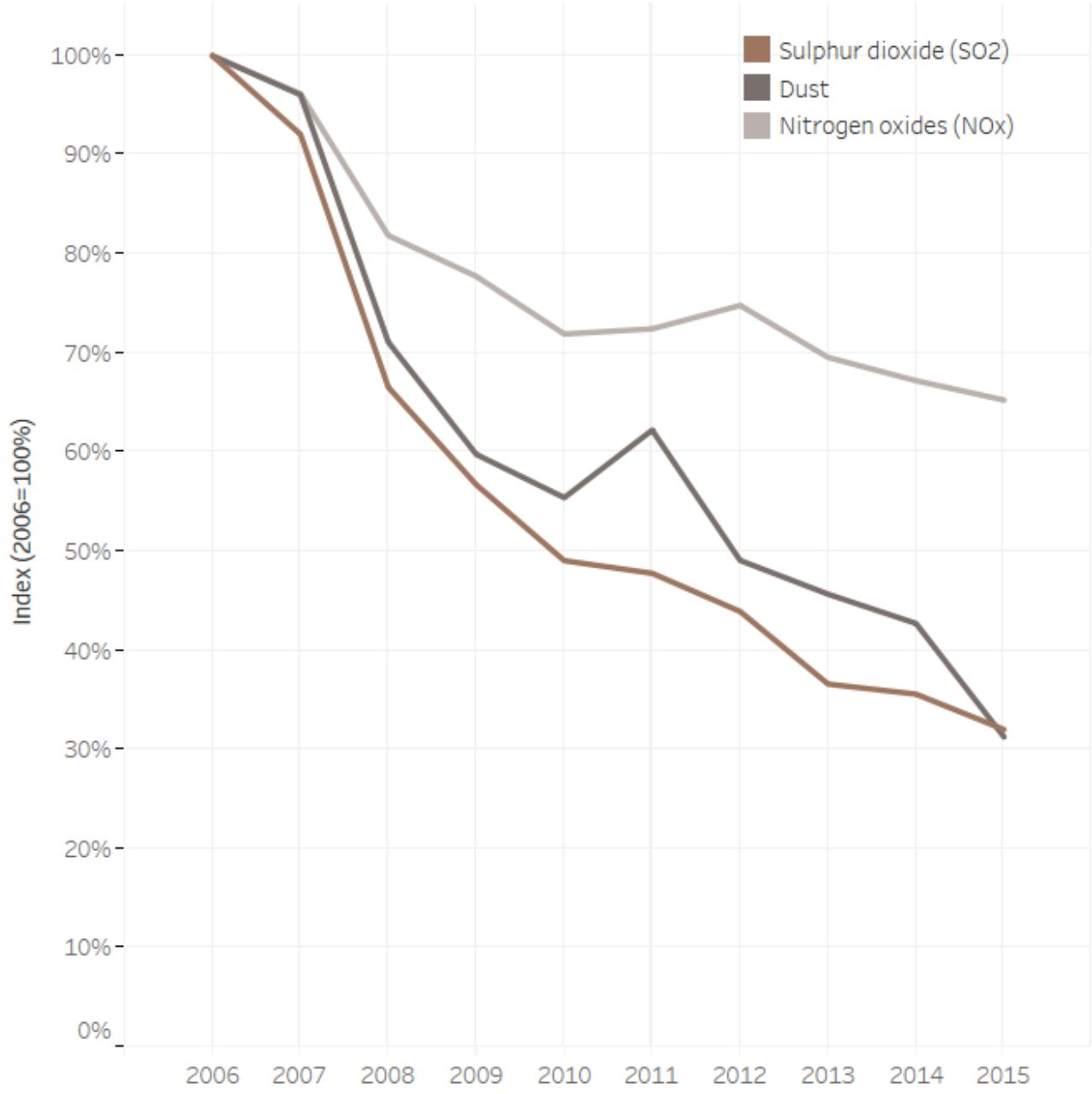
Figure 2. LCP emissions per unit of energy consumed for SO_2, NO_x and Dust (all fuels)



Source: Reported data on large combustion plants covered by Directive 2001/80/EC

Although the LCP sector is continuing to improve its environmental performance, it remains an important source of emissions, at levels that continue to contribute to poor air quality across Europe. It is evident that the LCP sector needs to shift more rapidly from fossil fuel combustion in order for the EU to achieve its climate and energy policy goals for 2030 and beyond. A recent EEA study (EEA, 2016) highlighted that the transition needed in the energy sector towards

alternative technologies is lagging and warns that a commitment to strengthen investment in clean technology and restructure the fossil fuel-based energy infrastructure is needed to ensure a secure and affordable future power supply in the EU.

References

EEA, 2016, 'Transforming the EU power sector: avoiding a carbon lock-in', EEA report No 22/2016, (accessed 15 June 2017).

EEA, 2017, 'Renewable energy in Europe 2017: recent growth and knock-on effects', EEA report No 3/2017, (accessed 15 June 2017).

Eurostat, 2017,'Supply, transformation and consumption of electricity - annual data', (accessed 15 June 2017).

Further information

- Access and explore data via the E-PRTR website
- Download datasets from the EEA data service: European Pollutant Release and Transfer Register (E-PRTR) and large combustion plants (LCPs)
- EEA industrial pollution indicators

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