

Environment and health

Air pollutant emissions



Indicator	Indicator past trend		Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Emissions of the main air pollutants in Europe (sulphur oxides: SO ₂ ; nitrogen oxides: NO _x ; ammonia: NH ₃ ; non-methane volatile organic compounds: NMVOCs; fine particulate matter: PM _{2.5})	EU 28 SO ₂ , NO _x , NMVOCs, NH ₃ , PM _{2.5} 	EEA 33 SO ₂ , NO _x , NMVOCs, PM _{2.5} , NH ₃  	Reduce air pollutant emissions in accordance with the requirements of the amended Gothenburg Protocol by the following percentages by 2005: SO ₂ 59 %, NO _x 42 %, NH ₃ 6 %, NMVOCs 28 %, PM _{2.5} 22 % compared to 2005 levels	
Air pollutant emissions have declined and current projections suggest that the EU is on target to meet the 2020 Gothenburg Protocol emission reduction commitments				

The Seventh Environment Action Programme (7th EAP) sets out commitments to improve the implementation of existing legislation on emissions to air and to secure further reductions in air pollution. Ceilings for 2010 were set for emissions of key air pollutants under the Gothenburg Protocol of the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (LRTAP) and under the EU National Emission Ceilings Directive (NECD). The Gothenburg Protocol further specifies emission reduction commitments for 2020 for selected pollutants.

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Emissions of these pollutants have generally decreased significantly over the past two decades. While the EU as a whole is on course to meet its 2020 emission reduction commitments, a number of EU Member States continue to report emissions above their respective Gothenburg Protocol and NECD ceilings for 2010. In 2013, the European Commission proposed a revised NECD that includes new national emission reduction commitments for 2020 and beyond. The proposal is currently under negotiation.

For further information on the scoreboard methodology please see Box I.1 in the [EEA Environmental indicator report 2016](#)

Setting the Scene

Air pollution is responsible for more than 400 000 premature deaths in Europe each year. It also harms crop growth and ecosystems, and damages the built environment (EEA, 2016a). In Europe, the most problematic pollutants in terms of harm to human health are particulate matter (PM), ground-level ozone (O₃) and nitrogen dioxide (NO₂). PM is emitted directly from emission sources but also can form in the atmosphere from various precursor pollutants including sulphur dioxide (SO₂), nitrogen oxides (NO_x) and ammonia (NH₃). Ground-level O₃ is similarly formed in the atmosphere from various precursor species including NO_x and non-methane volatile organic compounds (NMVOCs). Each of these pollutants can contribute to premature mortality and morbidity including respiratory illness and cardiovascular disease. SO₂, NO_x and NH₃ also cause ecosystem acidification and eutrophication, as well as damage to buildings and vegetation. When absorbed by plants, O₃ damages plant cells, impairing their ability to grow and reproduce, and leading to reduced agricultural crop yields, decreased forest growth and reduced biodiversity. The 7th EAP (EU, 2013) sets out commitments to improve the implementation of existing legislation and to secure additional reductions in air pollution. Air quality state and impacts are discussed in the briefing on outdoor air quality in urban areas (AIRS_PO3.1, 2016)(2) and the Eutrophication of terrestrial ecosystems due to air pollution briefing (AIRS_PO1.1, 2016)(3)

Policy targets and progress

The NECD (EU, 2001) and the Gothenburg Protocol (UNECE, 1979) set emission ceilings for 2010 for European countries for SO_x (SO₂ in the NECD), NO_x, NMVOCs and NH₃. The 2012 amended Gothenburg Protocol (UNECE, 2012) also sets 2020 emission reduction commitments for these same four pollutants, as well as for PM_{2.5}.

Anthropogenic emissions of certain air pollutants have decreased in both the EU-28 (Figure 1, left panel) and the EEA-33 (the 33 member countries of the European Environment Agency, which includes the 28 EU Member States) between 2005 and 2014 (Figure 1, right panel).

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However, for both NH₃ and PM_{2.5}, little progress has been made in reducing emissions.

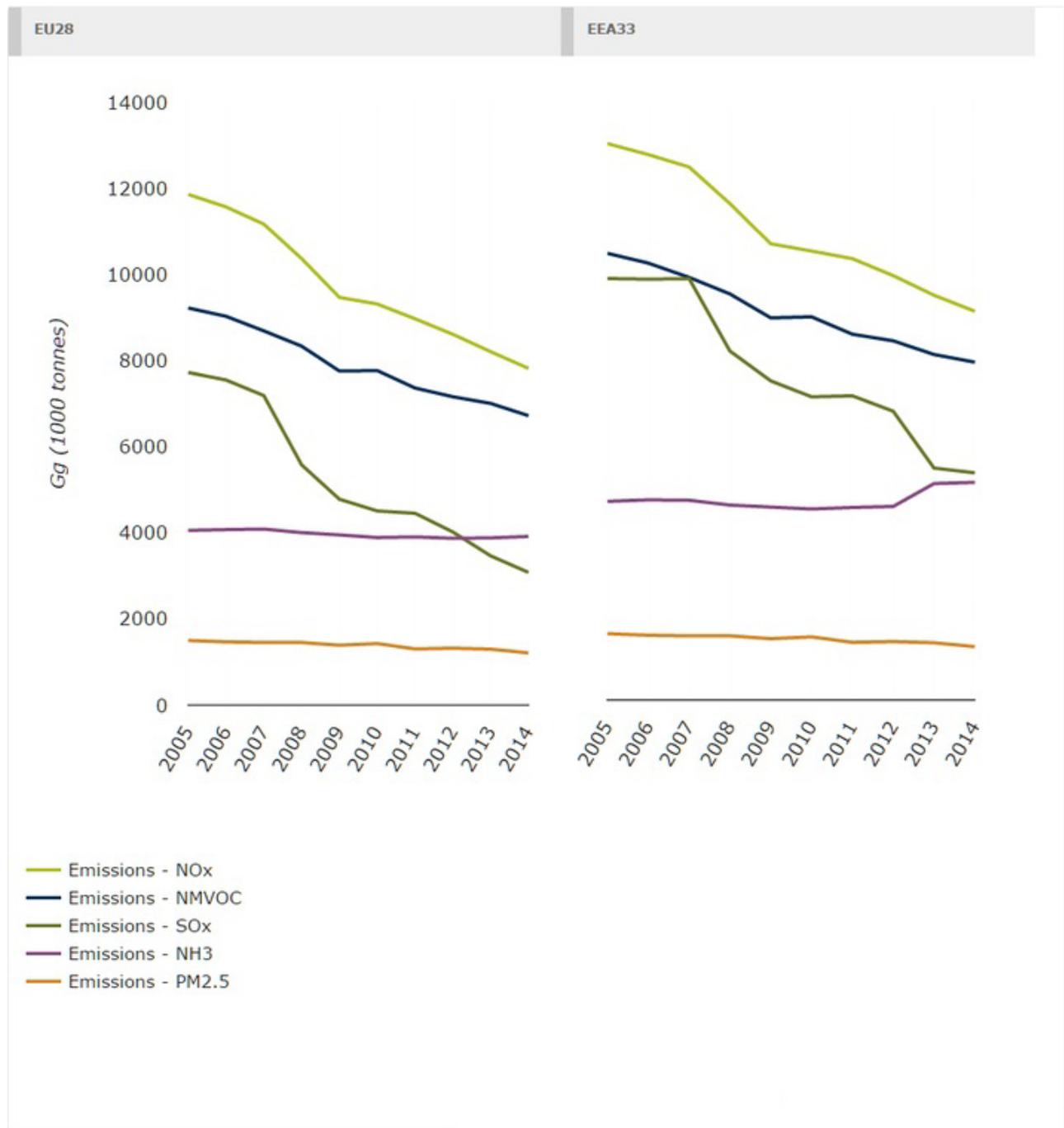
A number of Member States have reported emissions above the levels of their 2010 emission ceilings set out in the NECD, and some significantly so (by 10 % or more) (EEA, 2016b):

- NO_x: 12 Member States exceeded their ceilings in 2010 and six Member States continued to exceed their emission ceilings in 2014 (Austria, Belgium, France, Germany, Ireland and Luxembourg).
- NMVOCs: five Member States exceeded their ceilings in 2010 and three Member States exceeded ceilings in 2014 (Denmark, Germany and Ireland).
- SO₂: all Member States met emission ceilings for SO₂ in 2010, 2011, 2012, 2013 and 2014.
- NH₃: six Member States (Austria, Denmark, Finland, Germany, the Netherlands and Spain) exceeded their ceilings in 2010, 2011, 2012, 2013 and 2014.

Future reductions in emissions are still required in most Member States in order for them to meet their respective emission reduction commitments for 2020, as set out in the amended Gothenburg Protocol (UNECE, 2012).

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Figure 1. Trends in emissions of air pollutants in the EU-28 (left) and in the EEA-33 (right), 2005–2014



Source: National emissions reported to the Convention on Long-range Transboundary Air Pollution (LRTAP Convention), EEA, 2016c

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In the paragraphs below, the trends in emissions of the individual pollutants over the 2005 to 2014 period are discussed.

Nitrogen oxides

NO_x emissions for the EEA-33 and the EU-28 continue to decrease and are more than 25 % below 2005 levels. Emission reductions have, however, not been as great as originally anticipated. This is because real-world driving emissions in the road transport sector — especially for diesel passenger vehicles and vans — are, on average, four or five times higher than the European emission standards by vehicle type that all vehicles must meet in a laboratory testing procedure. The transport sector presently contributes 46 % of total EU NO_x emissions (47% in the EEA 33; EEA, 2016a).

Sulphur oxides

In 2014, SO_x emissions had fallen to approximately 40 % of their 2005 levels for the EU-28 and 54 % of their 2005 levels for the EEA-33. The energy production and distribution sector has been responsible for the largest reductions in emissions. This has happened for various reasons, including the closure of a number of old or uneconomical large combustion plants, which typically burn coal, and improvements in energy efficiency at industrial facilities, which have also reduced emissions.

Non-methane volatile organic compounds

NMVOC emissions for the EEA-33 and the EU-28 have fallen by approximately 24 % and 27% compared with their 2005 levels, and nearly all countries have reported emissions below their 2010 emission ceilings. The largest source of NMVOC emissions is 'solvent and product use'. Various EU measures have helped to reduce emissions over the past two decades, including stricter requirements for industrial facilities, limits on the solvent content of paints and mandatory vapour recovery equipment at petrol stations.

Ammonia

NH₃ emissions have remained largely stable since 2005 compared with the other pollutants. They fell by only 4 % from their 2005 level in the EU-28, while in the EEA-33 NH₃ emissions have actually increased by almost 10 % since 2005. Agriculture dominates emissions of NH₃: they arise primarily from the decomposition of animal manure and fertiliser application. There are a number of available technical measures to mitigate ammonia emissions, yet little progress in reducing them is evident in the agricultural sector.

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Particulate matter

Emissions of primary PM_{2.5} (particulate matter with a diameter of 2.5 µm or less) have reduced by almost 20% for both the EEA-33 and the EU-28 compared with their 2005 levels. Most PM_{2.5} emissions come from small combustion plants at commercial and institutional facilities, as well as from households. Although the recently agreed Medium Combustion Plants Directive (EU, 2015) will help reduce future emissions of PM_{2.5} from many facilities, it remains challenging for many authorities to regulate and reduce emissions from residential combustion. The latter is an important source of air pollution in many Member States. Road transport is the second most important source of PM_{2.5}.

Based on this assessment of the progress made in reducing emissions of the individual pollutants, current projections suggest that the EU is on target to meet the 2020 Gothenburg Protocol emission reduction commitment (albeit with some uncertainty with respect to PM_{2.5}) (IIASAA, 2014).

Country-level information

Table 1 shows both the 2014 emissions and the Gothenburg Protocol emission reduction commitments for 2020. The colours indicate to what extent the 2014 emissions exceed the 2020 emission reduction commitment for each Member State and the EU as a whole.

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Table 1. 2020 Gothenburg Protocol emission reduction commitments and 2014 emissions of air pollutants by Member States

	NH ₃		NMVOC		NO _x		PM _{2.5}		SO _x	
	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020
EEA-33	5 097		7 912.1		9 103.7		1 249.4		5 320.1	
EU-28	3 841	4 372	6 473	7 531.7	7 362	7 557.7	1 214.4	1 211.4	3 082.9	4 047.1
Austria	67	65.4	110.5	107.9	151	147.9	16.6	17.7	16	19.5
Belgium	66.3	67.0	122.1	140.3	140	187.5	28	29.2	42.2	81.3
Bulgaria	31.1	46.1	94.8	82.2	133.3	109.1	28.5	22.8	188.9	171.3
Croatia	25.5	34.3	60.4	55.9	55.2	56.8	19.2	12.7	15.6	26.2
Cyprus	4.6	5.2	6.8	7.1	17.2	11.9	1	1.4	16.8	6.4
Czech Republic	69.2	69.2	137.7	171.7	170.4	181.5	22.9	28.9	126.9	114.5
Denmark	64	67.5	70	96.4	113.4	89.4	18.3	19.2	11.4	16.8
Estonia	13	10.5	22.5	29.9	33.3	33.5	7.8	12	40.8	51.8
Finland	35	31.3	75.3	87.4	137.5	121.5	24.1	24.7	43.6	48.7
France	707.5	658.1	639	677.7	740	714.3	168.8	186	169.4	210.1
Germany	674	644.4	830	1164.1	974	959.2	104.4	96.7	388	374.2
Greece	60.8	62.8	125.1	101.4	247.5	287.4			138.1	140.6
Hungary	83.6	80.1	116.1	101.5	120	109.9	25.9	23.5	27.1	22.3
Iceland	No commitment under the Gothenburg Protocol									
Ireland	105.3	108.9	87.1	78.6	77	69.7	14.6	15.9	19.3	25.9
Italy	393.4	400.4	849.3	832.8	790.3	749.1	152.1	148.5	130.5	264.7
Latvia	17.5	16.3	54.2	45.4	34.6	29.8	17.7	18.9	3.8	8.1
Liechtenstein	No commitment under the Gothenburg Protocol									
Lithuania	41	40	69	55	51	31	17	15	18	14
Luxembourg	6.1	6.1	8	10.7	24	33.4	2	2.4	1.6	1.6
Malta	1.6	1.5	3	2.6	6.5	5.4	0.8	1	4.7	2.6
Netherlands	133.8	138.8	143.1	166.1	234.8	202	12.7	13.4	29.1	46.2
Norway	25.7	25	137.7	130.5	139.8	151	27.2	27.1	16.6	21.6
Poland	265.1	270.9	606.3	437.9	723.1	595.6	134.9	138.9	800.1	511
Portugal	49.4	46.8	168.9	174.3	159.6	164.7	44.4	48.5	34.8	65.3
Romania	162.4	177.8	319.4	291	218	174.2	115.9	82.4	175.8	138.3
Slovakia	36.9	36.9	105.6	106.5	84.7	66.9	30.4	25	45.3	38.3
Slovenia	19.1	20.6	31.8	35.7	39.5	31.5	12.3	10	8.8	15.2
Spain	372.7	374.3	613.7	658.5	801.7	838.8	68.1	83.2	254.6	421.9
Sweden	53.9	48.7	183.9	164.2	135	116.8	20.5	21.5	24	28.1
Switzerland	62.7	59	80	70.8	68.5	55.2	7.5	7.3	7.9	12
Turkey	No commitment under the Gothenburg Protocol									
United Kingdom	281.3	281.9	818.7	773.4	949.2	727.6	105.1	75.9	307.6	291.6

Distance to emission reduction commitment

- Target has been achieved
- 0–10 % to target
- 10–20 % to target
- > 20 % to target

Note: EU Member States are marked blue; Greece has not reported any data for PM_{2.5}.

Source: based on EEA (2016d).

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As noted earlier, future reductions in emissions will still be required in most Member States so that they meet their respective emission reduction commitments for 2020, set out in the Gothenburg Protocol. However, a number of Member States already report emissions below the level required by 2020.

Outlook beyond 2020

As part of the Clean Air Policy Programme for Europe (EC, 2013), the European Commission has proposed a revised NECD, which proposes national emission reduction commitments for 2020 in line with those already agreed under the amended 2012 Gothenburg Protocol and new emission reduction commitments for 2030 and beyond. The 2030 commitments would apply to the pollutants currently covered (NO_x, NMVOCs, SO₂, and NH₃) and would add PM_{2.5}. In the absence of new commitments to reduce emissions, only slow progress in further reducing emissions beyond 2030 is anticipated. The European Commission's proposal would deliver, by 2030, an estimated 52 % reduction in premature mortality compared with the current emissions baseline (2005). Additional measures beyond the NECD proposal are still needed if Europe is to achieve the long-term objective of air pollution levels that do not lead to unacceptable harm to human health and the environment.

About the indicator

This indicator deals with the emissions of key anthropogenic air pollutants. It covers anthropogenic emissions of the air pollutants SO_x, NO_x, NH₃, NMVOCs, and PM_{2.5} for the years 2005 to 2014. Data are taken from the latest EU emission inventory submission to the LRTAP Convention (EEA, 2016b, 2016c).

Footnotes and references

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Annual Indicator Report Series (AIRS)

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AIRS briefings

2. AIRS_PO3.1, 2016, Outdoor air quality in urban areas

3. AIRS_PO1.1, 2016, Eutrophication of terrestrial ecosystems due to air pollution

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