European Environment Agency

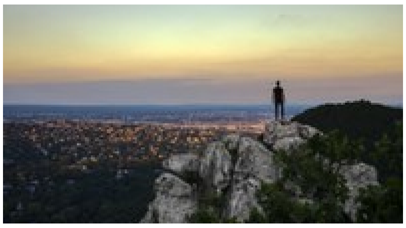
EEA Report | No 19/2018

EEA Environmental indicator report 2018 – in support to the monitoring of the Seventh Environment Action Programme

Supplementary information to Priority Objective 3 of the Seventh Environment Action Programme 'to safeguard the Union's citizens from environment-related pressures and risks to health and well-being' – online briefings underpinning the monitoring of Priority Objective 3:

Environment and health

Outdoor air quality in urban areas



Indicator	EU indicator past trend		Selected objective to be met by 2020	Indicative outlook for the EU meeting the selected objective by 2020
Exceedance of air quality standards in urban areas (nitrogen dioxide: NO_2; dust particles: PM_{10}; fine particulate matter: $PM_{2.5}$; ozone: O_3)	NO_2, PM_{10}, $PM_{2.5}$	O_3	Meet Air Quality Directive standards for the protection of human health — Air Quality Directive	

There have been reductions in the exposure of the urban population to pollution levels above the EU air quality standards for particles and nitrogen dioxide, whereas exposure above the ozone standard has fluctuated so much over time that the trend is unclear. However, because of their widespread exceedance levels in urban areas, it is unlikely that the air quality standards for these pollutants will be met by 2020 throughout the EU.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2018

The Seventh Environment Action Programme (7th EAP) includes the objective of ensuring that outdoor air quality in the EU will have improved significantly by 2020, moving closer to World Health Organization (WHO) guidelines. Observing the existing EU air quality legislation standards is a chief milestone in this respect. Despite some improvements, mainly due to the implementation of EU legislation on emissions of air pollutants and on air quality, key EU air quality standards for the protection of human health — i.e. concentrations of particulate matter (PM), ozone (O3) and nitrogen dioxide (NO2) — are currently not being met in large parts of the EU. This is particularly true for urban areas, where more than 70 % of the EU population lives. These exceedances are mainly attributed to the high level of emissions from road traffic and residential combustion in urban areas, but also to agricultural and industrial emissions. Due to widespread exceedances in urban areas, it is unlikely that the air quality standards for PM, O3 and NO2 will be met by 2020, while achieving air quality in line with the WHO guidelines is much further away. Further action will be needed, in particular in relation to road traffic and residential combustion in urban areas.

Setting the scene

The 7th EAP (EU, 2013) aims to significantly improve outdoor air quality and move closer to World Health Organization (WHO) guidelines (WHO, 2006) by 2020. Air pollution is the number one environmental cause of death in the EU, responsible for more than 400 000 premature deaths per year (EEA, 2018a). According to WHO studies (WHO, 2013, 2016), exposure to particulate matter (PM) can cause or aggravate cardiovascular and lung diseases, heart attacks and arrhythmias, affect the central nervous system and the reproductive system, and cause cancer. Exposure to high ozone (O_3) concentrations can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases. Exposure to nitrogen dioxide (NO_2) worsens the symptoms of bronchitis in asthmatic children and reduces lung function growth. Health-related external costs range from EUR 330 billion to EUR 940 billion per year, depending on the valuation methodology, with evidence that the impacts of chronic ozone exposure add around 5 % to this total (EC, 2013).

Policy targets and progress

A chief cornerstone of the EU environmental acquis in the field of air quality is the Ambient Air Quality Directive (EU, 2008). This directive sets a number of air quality standards not to be exceeded by a certain year and thereafter.

The Communication on the ‘Clean Air Programme for Europe’ (EC, 2013) sets the short-term objective of achieving full compliance with existing legislation by 2020 at the latest, as well as the long-term objective of seeing no exceedances of the WHO guideline levels for human health. The key pollutants in terms of harm to human health which the Ambient Air Quality Directive addresses are particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2) and ground-level ozone (O_3) (EEA, 2016). The European air quality standards and the WHO air quality guidelines (WHO, 2006) for these pollutants are displayed in Table 1.

Table 1. Air quality standards under the EU Air Quality Directive and WHO air quality guidelines

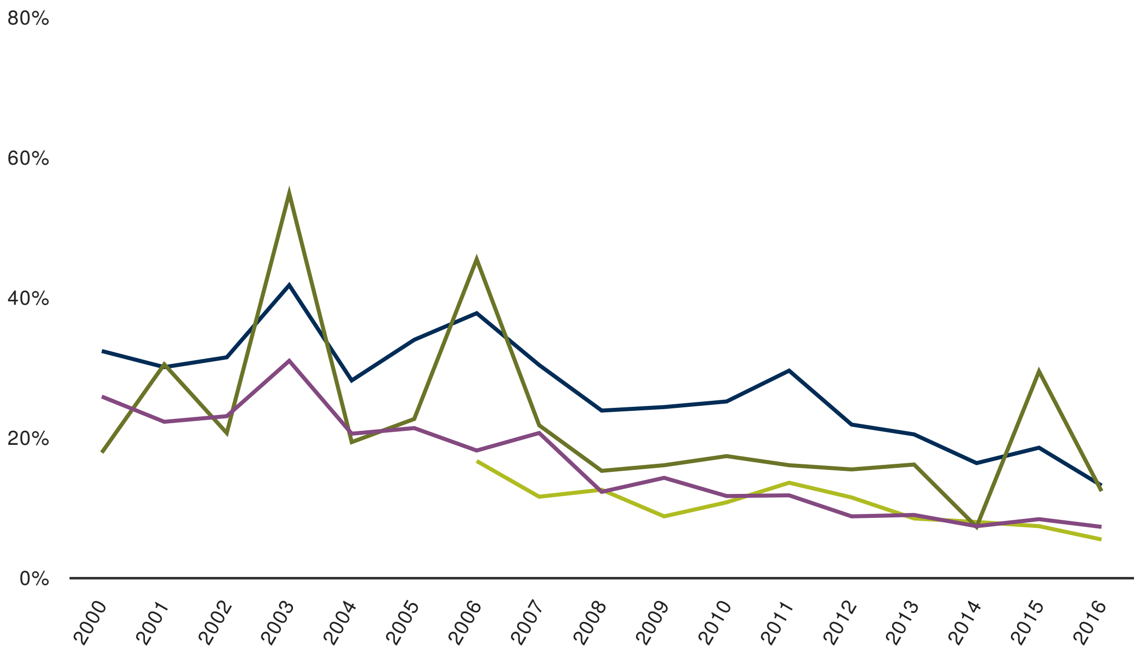
		Air Quality Directive		WHO guidelines	
Pollutant	**Averaging period**	**Objective**	**Comments**	**Objective**	**Comments**
$PM_{2.5}$	One day			25 μg/m³ (*)	99th percentile (3 days/year)
$PM_{2.5}$	Calendar year	Limit value, 25 μg/m³		10 μg/m³	
PM_{10}	One day	Limit value, 50 μg/m³	Not to be exceeded on more than 35 days per year.	50 μg/m³ (*)	99th percentile (3 days/year)
PM_{10}	Calendar year	Limit value, 40 μg/m³ (*)		20 μg/m³	
O_3	Maximum daily 8-hour mean	Target value, 120 μg/m³	Not to be exceeded on more than 25 days per year, averaged over three years	100 μg/m³	
NO_2	One hour	Limit value, 200 μg/m³ (*)	Not to be exceeded more than 18 times a calendar year	200 μg/m³ (*)	
NO_2	Calendar year	Limit value, 40 μg/m³		40 μg/m³	

Source: EU, 2008; WHO, 2006.

Note: 1. (*) Not considered in the indicator, where only the most stringent EU standards are used: the daily limit value for PM_{10} and the annual limit value for NO_2. According to the WHO air quality guidelines, the annual average for PM takes precedence over the 24-hour average, since, at low levels, there is less concern about episodic excursions.
2. In line with the Air Quality Directive: 'limit value' shall mean a level fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained; 'target value' shall mean a level fixed with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained where possible over a given period.

Figures 1 and 2 show the percentage of the urban population exposed to air pollutant concentrations above both EU standards (Figure 1) and WHO guidelines (Figure 2).

Figure 1. EU urban population exposed to air pollutant concentrations above selected air quality standards of the EU Air Quality Directive



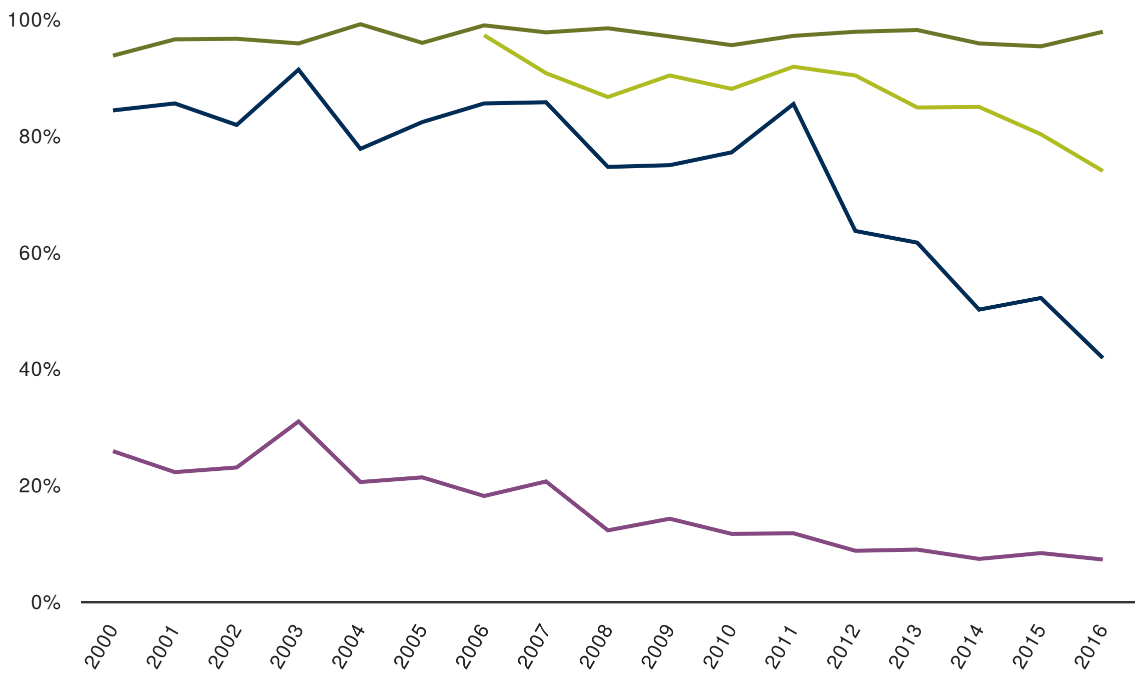
Data sources: a. Eurostat. Gisco - Urban Audit 2012 b. EEA. AirBase c. EEA. Air Quality e-Reporting (AQ e-Reporting) d. EEA – Indicator AIR003

Note:

The rationale for selection of pollutants and corresponding selected air quality standards is given in the specification section of indicator CSI 004.

Criteria:
- Percentage of the population exposed to annual $PM_{2.5}$ concentrations above 25 µg/m^3.
- Percentage of the population exposed to daily PM_{10} concentrations exceeding 50 µg/m^3 for more than 35 days a year.
- Percentage of the population exposed to maximum daily 8-hour mean O_3 concentrations exceeding 120 µg/m^3 for more than 25 days a year.
- Percentage of the population exposed to annual NO_2 concentrations above 40 µg/m^3.

Figure 2. EU urban population exposed to air pollutant concentrations above WHO air quality guidelines



Data sources: a. Eurostat. Gisco - Urban Audit 2012 b. EEA. Airbase c. EEA. Air Quality e-Reporting (AQ e-Reporting)
d. EEA – Indicator AIR003

Note:

The rational for selection of pollutants and corresponding WHO guidelines is given in the specification section of indicator CSI 004.

Criteria:

- Percentage of population exposed to annual $PM_{2.5}$ concentrations above 10 µg/m^3.
- Percentage of population exposed to annual PM_{10} concentrations above 20 µg/m^3.
- Percentage of population exposed to maximum daily 8-hour mean O_3 concentrations exceeding 100 µg/m^3 for at least one day a year.
- Percentage of population exposed to annual NO_2 concentrations above 40 µg/m^3.

Around one out of eight EU citizens currently living in urban areas are exposed to air pollutant levels exceeding one or more EU air quality standards. Moreover, up to 96 % of EU urban citizens are exposed to levels of one or more air pollutants deemed damaging to health by the WHO's more stringent guidelines (EEA, 2018b).

Particulate matter (PM)

Between 2006 and 2016, the exposure of the EU's urban population to concentrations of fine particulate matter ($PM_{2.5}$) above the EU limit value has decreased from 16 % to 5 % (Figure 1). With respect to the more stringent WHO guideline value (Figure 2), the exposure was much larger but also decreased from 97 % to 74 %. Both percentages have been on a decreasing trend since 2011 to reach their lowest value to date in 2016.

Notwithstanding limitations in data coverage in the early 2000s, the exposure of the EU's urban population to concentrations of dust particles (PM_{10}) above the EU limit value has decreased between 2000 and 2016 from 32 % to 13 %, with the highest value of 43 % observed in 2003 (Figure 1). For the more stringent WHO guideline value (Figure 2), the exposure was much larger but also decreased from 84 % to 42 %, with the highest value of 91 % observed in 2003. The lowest values to date were observed in both cases in 2016.

PM may be categorised as either primary (i.e. directly emitted to the atmosphere) or secondary (i.e. formed in the atmosphere from the so-called precursor gases).

Primary PM originates from both natural and anthropogenic sources. The main emitter sector is 'commercial, institutional and household fuel combustion'. For PM_{10}, 'industry' and 'agriculture' are in second and third place; and for $PM_{2.5}$, 'transport' and 'industry' occupy these places. All these sectors reduced their PM emissions in the EU in the 2000-2016 period, although higher relative reductions were observed for industry and transport, and only small reductions were observed for the other two sectors.

With the exception of ammonia, in the EU, reductions in emissions of the other secondary PM precursors (nitrogen oxides, sulphur oxides and non-methane volatile organic compounds) between 2000 and 2016 were much larger than reductions in emissions of primary PM.

However, reductions in both primary PM and precursors have not led to equivalent drops in the concentrations of PM. This is because chemical reactions of the precursors form secondary particles, and therefore the relationships between emissions and concentrations, are not linear. It can also be explained by uncertainties in the reported emissions of primary PM from the 'commercial, institutional and household fuel combustion' sector, by intercontinental transport of PM and its precursor gases from outside the EU, and by the contribution of natural sources to PM concentrations (EEA, 2016).

The contributions of the different emission sources to ambient air concentrations depend not only on the amount of pollutant emitted, but also on proximity to source, emission conditions (such as height and temperature) and other factors, such as dispersion conditions and topography. Sectors with low emission heights, such as traffic and household fuel combustion, generally make a more significant contribution to surface concentrations than emissions from high stacks.

Ozone (O_3)

Although reductions in European emissions of O_3 precursors have led to lower peak concentrations of O_3, the current target value is frequently exceeded. In the 2000-2016 period, between 8 % (in 2014) and 55 % (in 2003) of the urban population was exposed to concentrations above the target value (Figure 1), with the exposure fluctuating but not having a clear trend over time.

In relation to the more stringent WHO guideline (Figure 2), the proportion of the population exposed to concentrations above the guideline value is as high as 94-99 %, with no discernible change over time.

O_3 concentrations are determined by emissions of its precursors (mainly nitrogen oxides, non-methane volatile organic compounds and methane) and by meteorological conditions: ozone is formed in sunny conditions with high temperatures. In parallel to reductions in anthropogenic emissions of O_3 precursors, there have been increases in natural emissions and also in the intercontinental transport of O_3 and its precursors (Maas and Grennfelt, 2016). Additional factors that are also likely to mask the effects of measures taken to reduce anthropogenic emissions of O_3 precursors include climate change, emissions of non-methane volatile organic compounds from vegetation (difficult to quantify) and fire plumes from forest and other biomass fires (EEA, 2010). Formation of tropospheric ozone from increased concentrations of methane may also contribute to the sustained O_3 levels in Europe. In the EU, methane emissions from the energy and the waste sectors have been decreasing in the period 2000-2016, but much less so from the agricultural sector, which constitutes the larger emitter of methane (EEA, 2018a).

Nitrogen dioxide (NO_2)

Between 2000 and 2016, the fraction of the urban population exposed to concentrations in excess of the EU limit value and the identical WHO guideline value gradually decreased to levels below 10 %, with a minimum of 7 % observed both in 2014 and in 2016 (Figures 1 and 2). The highest exposure of the urban population to NO_2, 31 %, occurred in 2003.

Enforcement of current legislation on emission standards for key sources of air pollution has resulted in a reduction in NO_x emissions in all sectors. Nevertheless, emissions from transport keep NO_2 concentrations high close to main roads. This is mainly due to the fact that real driving emissions are much higher than the limits set in the Euro-standards.

Overall assessment at EU level

In conclusion, for particles and nitrogen dioxide, the proportion of the urban population in the EU exposed to levels above the EU air quality standards and to the WHO guidelines has been decreasing while the trend for ozone is unclear because of the high fluctuations over time. However, because of the widespread exceedance levels in urban areas it is unlikely that the air quality standards for these pollutants will be met by 2020 across the EU, while achieving air quality in line with the WHO guidelines is much further away (except for NO_2 for which the EU standard and the WHO guidelines are the same).

Effective air quality policies require action and cooperation at global, European, national and local levels, which must reach across most economic sectors and engage the public (EEA, 2018a). This has been recognised by the European Commission in its latest Communication ‘Clean Air for all’ (EC, 2018). Holistic solutions must be found that involve technological development, structural changes — including the optimisation of infrastructures and sustainable urban planning — and behavioural changes. These will be necessary to deliver a level of air quality across the EU that is more conducive to the protection of human health (EEA, 2016).

Country level information

Table 2 provides information on the urban population exposed to concentrations of air pollutants above the EU air quality objectives by country for 2016. Variations from country to country are not only related to the different pollutant concentrations but also, as explained in the methodology of EEA indicator ‘Exceedance of air quality standards in urban areas’ (EEA, 2018b), to:

- the number of available data series (monitoring stations and/or selected cities), which will influence the total monitored population;
- the uneven distribution of traffic and background stations in the different countries.

Table 2. Percentage of urban population exposed to concentrations of air pollutants above selected air quality standards of the Air Quality Directive, 2016

COUNTRIES	PM_{10} (daily limit value)	O_3 (target value)	NO_2 (annual limit value)
Austria	2	14	2
Belgium	0	0	3
Bulgaria	87	0	7
Croatia	99	81	3
Cyprus	6	0	0
Czech Republic	12	44	1
Denmark	0	0	2
Estonia	0	NA	0
Finland	0	0	< 1
France	< 1	10	2
Germany	< 1	3	5
Greece	29	73	2
Hungary	2	0	2
Ireland	0	0	0
Italy	44	61	30
Latvia	4	0	0
Lithuania	2	0	0
Luxembourg	0	0	5
Malta	NR	0	0
Netherlands	0	0	2
Poland	59	2	1
Portugal	0	0	< 1
Romania	0	0	0
Slovakia	1	0	0
Slovenia	100	0	0
Spain	2	17	6
Sweden	0	0	< 1
United Kingdom	0	0	14
EU-28	13	12	7

The colour coding of exposure estimates refers to the fraction of urban population exposed to concentrations above the reference level:

0%	< 5%	5-50%	50-75%	> 75%

Source: Air pollution country fact sheets (EEA, 2018c). The 2016 data aggregated at EU level are also available in (EEA, 2018b and 2018d).

Note:

1. NA = Not Available data – for further information please see indicator CSI 004.
2. NR = Not Representative – not enough number of stations to be representative.

Outlook beyond 2020

In 2013, the European Commission proposed a Clean Air Policy Package for Europe (EC, 2013), which aims to achieve full compliance with existing air quality legislation by 2020 and to further improve Europe's air quality by 2030 and beyond. As a result of this package, the 2001 National Emission Ceilings Directive (EU, 2001) was revised in 2016. The new National Emission Ceilings Directive (EU, 2016) establishes national emission reduction commitments applicable from 2020 onwards, and stricter commitments to be achieved by 2030 onwards, for sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds, ammonia and $PM_{2.5}$. In addition, and as part of the package, a new directive, the Medium Combustion Plant Directive, was approved in November 2015 (EU, 2015). This directive regulates sulphur dioxide, nitrogen oxides and dust emissions from the combustion of fuels in medium-sized combustion plants (with a rated thermal input of 1 and up to 50 megawatts). Since 2015, the Commission has also been revising the testing procedures for passenger cars and light duty vehicle emissions in view of their type-approval and placement on the market, which will ensure new vehicles' real-world emissions are in line with the existing legislation on Euro standards. The Eco-Design Directive (EU, 2009) covers residential heating appliances below 1MWth, including coal and biomass fired boilers. This will ensure that new appliances put on the market have to fulfil certain conditions to limit emissions of air pollutants; however, test procedures for those will need to be kept under control to avoid a situation, as for diesel vehicles, where test emissions and real-world emissions are in discrepancy.

These commitments made at the EU level, together with the on-going implementation of air quality measures at national, regional and local levels, are expected to improve air quality in Europe. However, the changes in meteorological conditions due to climate change are expected to increase O_3 concentrations as a result of expected increased emissions of both specific O_3 precursors and emissions from wildfires, with the latter likely to increase under periods of extensive drought (EEA, 2015).

About the indicator

This indicator shows the proportion of the EU urban population that is exposed to various potentially harmful concentrations of pollutants in excess of both the EU standards and WHO guidelines set for the protection of human health. For further information on the methodology, please refer to the EEA indicator CSI 004 'Exceedance of air quality standards in urban areas' (EEA, 2018b).

The indicator focuses on those pollutants that are most relevant in terms of health effects and urban concentrations: PM, both PM_{10} and fine PM, i.e. $PM_{2.5}$; O_3; and NO_2. When there is more than one standard, only the most stringent one is used. The indicator is based on measurements of air pollutants reported under the Air Quality Directive (EU, 2008) and the Decision on the exchange of information (EU, 2011).

Most air pollution is man-made and derives from the combustion of fossil or biomass fuels used in industry, transport and heating; industrial and agricultural processes; and other sources (EEA, 2018a). As most of these sources, particularly emissions from cars, are concentrated in urban areas where more than 70 % of the European population lives (Eurostat, 2016), air quality in urban areas is a useful proxy for tracking progress towards meeting the standards set out in the Air Quality Directive.

Footnotes and references

EC, 2013, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions 'A Clean Air Programme for Europe' (COM(2013) 918 final).

EC, 2018, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'A Europe that protects: Clean air for all' (COM(2018) 330 final).

EEA, 2010, The European environment — state and outlook 2010, European Environment Agency.

EEA, 2015, 'Effects of climate change: Air pollution due to ozone and health impacts (CLIM 006)' (http://www.eea.europa.eu/data-and-maps/indicators/air-pollution-by-ozone-2/assessment) accessed 19 April 2018.

EEA, 2016, Air quality in Europe — 2016 report, EEA Report No 28/2016, European Environment Agency.

EEA, 2018a, Air quality in Europe — 2018 report, EEA Report No 12/2018, European Environment Agency.

EEA, 2018b, 'Exceedance of air quality standards in urban areas (CSI 004)' (https://www.eea.europa.eu/data-and-maps/indicators/exceedance-of-air-quality-limit-3/assessment-4) accessed 17 October 2018.

EEA, 2018c, 'Air pollution country fact sheets' (https://www.eea.europa.eu/themes/air/country-fact-sheets) accessed 17 October 2018.

EEA, 2018d, 'Air quality e-reporting database' (https://www.eea.europa.eu/data-and-maps/data/aqereporting-8) accessed 28 May 2018.

EU, 2001, Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (OJ L 309, 22.11.2001, p. 22–30).

EU, 2004, Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (OJ L 23, 26.1.2005, p. 3–16).

EU, 2008, Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (OJ L 152, 11.6.2008, p. 1–44).

EU, 2009, Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285, 31.10.2009, p. 10–35).

EU, 2011, Commission Implementing Decision 2011/850/EU of 12 December 2011 laying down rules for Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council as regards the reciprocal exchange of information and reporting on ambient air (notified under document C(2011) 9068) (OJ L 335/86, 17.12.2011).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354, 28.12.2013, p. 171–200).

EU, 2015, Directive (EU) 2015/2193 of the European Parliament and the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants (OJ L 313, 28.11.2015, p. 1–19).

EU, 2016, Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (OJ L 344/1, 17.12.2016).

Eurostat, 2016, Urban Europe—Statistics on cities, towns and suburbs — Eurostat (http://ec.europa.eu/eurostat/documents/3217494/7596823/KS-01-16-691-EN-N.pdf/0abf140c-ccc7-4a7f-b236-682effcde10f) accessed 14 June 2018.

Eurostat, 2018, 'Life expectancy by age and sex' (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_mlexpec&lang=en) accessed 19 April 2018.

Maas, R., P. Grennfelt (eds), 2016. Towards Cleaner Air. Scientific Assessment Report 2016. EMEP Steering Body and Working Group on Effects on the Convention on Long-Range Transboundary Air Pollution, Oslo. xx+50pp.

WHO, 2006, WHO air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update 2005, World Health Organization, Regional Office for Europe, Copenhagen.

WHO, 2013, Health risks of air pollution in Europe — HRAPIE project. New emerging risks to health from air pollution — results from the survey of experts, World Health Organization, Regional Office for Europe, Copenhagen.

WHO, 2016, 'Ambient (outdoor) air quality and health', Fact sheet No 313, updated March 2014, World Health Organization (http://www.who.int/mediacentre/factsheets/fs313/en/) accessed 19 April 2018.

Environmental indicator report 2018 – In support to the monitoring of the 7th Environment Action Programme, EEA report No19/2018, European Environment Agency

Published on 29 Nov 2018

Environment and health

Air pollutant emissions

Indicator	Indicator past trend		Selected objective to be met by 2020	Indicative outlook for 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, $PM_{2.5}$ NH_3	**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 and of the new EU National Emission Ceilings Directive by the following percentages: SO_2 - 59 %; NO_X - 42 %; NH_3 - 6 %; NMVOCs - 28 % and $PM_{2.5}$ - 22 % compared with 2005 levels	SO_2, NO_x, NMVOCs, $PM_{2.5}$ NH_3

Air pollutant emissions have decreased and current projections suggest that the EU as a whole is on target to meet its 2020 EU and international air pollutant emission reduction commitments for all but ammonia emissions. The latter increased year-on-year between 2014 and 2016, and it is uncertain whether the ammonia reduction commitment will be met.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2018

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 from 2010 onwards 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 and under the old EU National Emission Ceilings Directive (NECD). The amended Gothenburg Protocol and the new NECD further specify emission reduction commitments from 2020 onwards for selected pollutants.

Emissions of these pollutants have generally decreased over the period examined (2005 to 2016). The EU as a whole is on course to meet its 2020 emission reduction commitments, with the potential exception of ammonia emissions, which increased year-on-year from 2014 to 2016. Further efforts may also be needed in the cases of nitrogen oxides and fine particulate matter to stay on track with meeting the 2020 emission reduction commitments while the reduction commitments for non-methane volatile organic compounds and sulphur dioxide have already been met. However, a number of EU Member States continue to report emissions above their respective NECD ceilings for 2010. Projected emissions for most Member States show they do not consider themselves on track to their 2020 reduction commitments for one or several pollutants.

Setting the scene

The 7th EAP (EU, 2013) sets out commitments to improve the implementation of existing legislation and to secure additional reductions in air pollution. 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, 2016). In Europe, the most problematic pollutants in terms of harm to human health are particulate matter (PM), ground-level ozone (O_3) and nitrogen dioxide (NO_2) (EEA, 2016). PM is emitted directly from emission sources but can also form in the atmosphere from various precursor pollutants including sulphur dioxide (SO_2), nitrogen oxides (NO_x) and ammonia (NH_3). Ground-level O_3 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. SO_2, NO_x and NH_3 also cause ecosystem acidification and eutrophication, as well as damage to buildings and vegetation. When absorbed by plants, O_3 damages plant cells, impairing their ability to grow and reproduce, and leading to reduced agricultural crop yields, decreased forest growth and reduced biodiversity. Air quality state and impacts are discussed in the briefings on outdoor air quality in urban areas (AIRS_PO3.1, 2018) and on the eutrophication of terrestrial ecosystems due to air pollution (AIRS_PO1.1, 2018).

Policy targets and progress

The earlier NECD (EU, 2001a) and the Gothenburg Protocol (UNECE, 1979) set emission ceilings for 2010 for European countries for SO_x (SO_2 in the NECD), NO_x, NMVOCs and NH_3. The 2012 amended Gothenburg Protocol (UNECE, 2012) and the new NECD (EU, 2016) also set 2020 emission reduction commitments for these same four pollutants, as well as for primary $PM_{2.5}$ emissions. The new NECD ensures that the old NECD 2010 emission ceilings apply until the end of 2019, transposes the amended Gothenburg Protocol 2020 reduction commitments and sets more ambitious reduction commitments for 2030 and beyond; for the latter see further information in the 'Outlook beyond 2020' section.

Anthropogenic emissions of certain air pollutants decreased between 2005 and 2016 in both the EU (Figure 1, left panel) and the EEA-33 (the 33 member countries of the European Environment Agency, including the 28 EU Member States) (Figure 1, right panel). However, NH_3 emissions have slowly increased since 2014 both in the EU and the EEA-33.

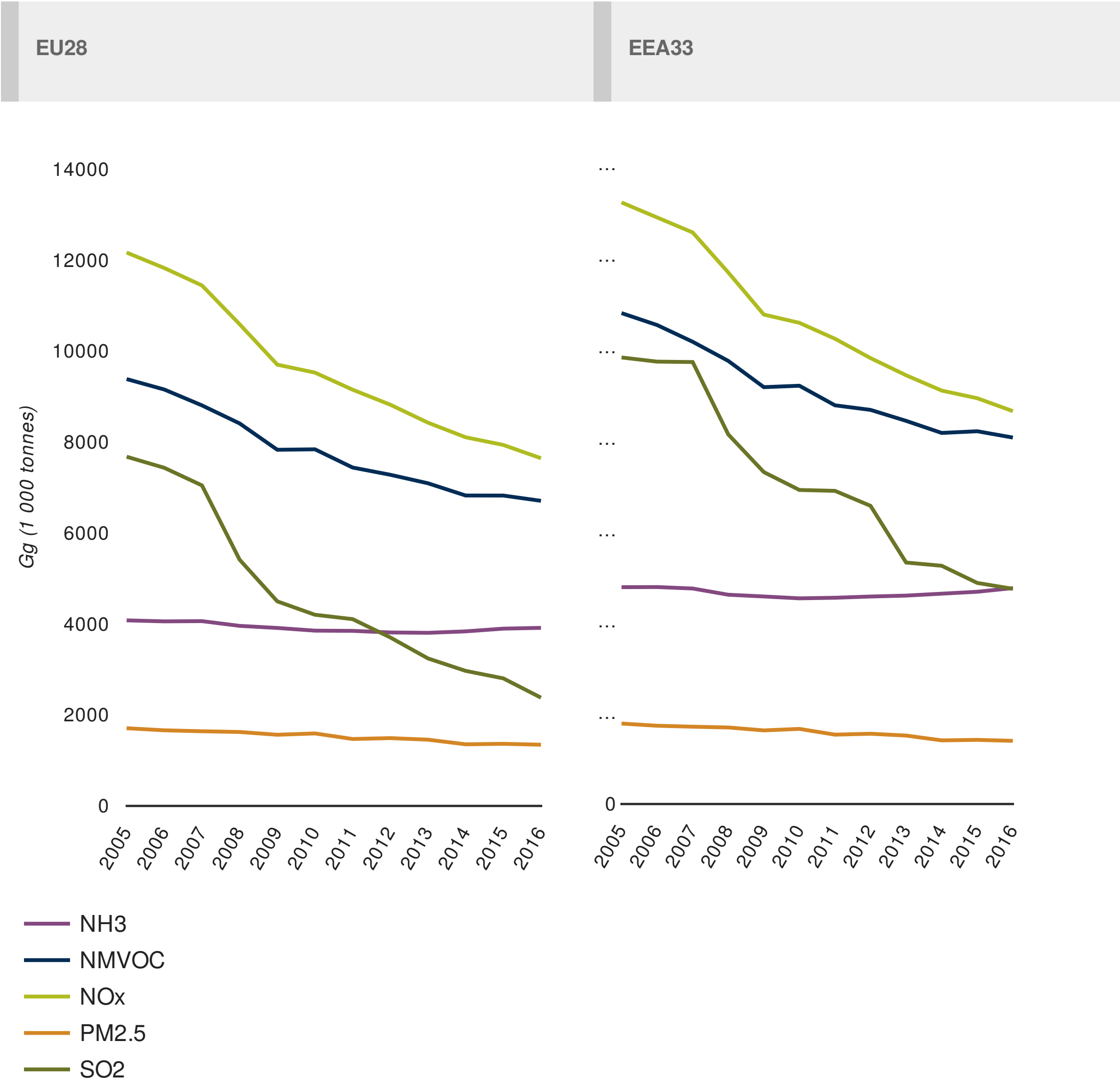
A number of Member States have reported emissions above the levels of their 2010 emission ceilings set out in the NECD (EEA, 2018a):

- NO_x: 14 Member States exceeded their emission ceilings in 2010 and two Member States continued to exceed them in 2016 (Austria and Ireland).
- NMVOCs: six Member States exceeded their emission ceilings in 2010 and one Member State (Hungary) continued to exceed it in 2016.
- SO_2: all Member States have met their emission ceilings for SO_2 since 2010.
- NH_3: five Member States (Denmark, Finland, Germany, Netherlands and Spain) exceeded their emission ceilings in 2010 and five Member States (Austria, Croatia, Germany, Ireland and Spain) exceeded their ceilings in 2016.

The new NEC Directive allows Member States, under certain circumstances, to adjust their reported emissions for compliance assessment with the national ceilings. Several Member States have applied to the European Commission for such adjustments, and where these adjustments were approved the number of exceeded ceilings decreased[1].

Future reductions in emissions are still required in most Member States in order for them to meet their respective emission reduction commitments from 2020 onwards, as set out in the amended Gothenburg Protocol and the new NECD.

Figure 1. Trends in emissions of air pollutants in the EU (left) and in the EEA-33 (right)



Source: National emissions reported to the Convention on Long-range Transboundary Air Pollution (LRTAP Convention), EEA, 2018b

In the paragraphs below, the trends in emissions of the individual pollutants over the 2005 to 2016 period are discussed.

Nitrogen oxides

Nitrogen oxides (NO_x) emissions continue to decrease and in 2016 they were 35 % below 2005 levels in the EEA-33 and 37 % below 2005 levels in the EU. Emission reductions have, however, not been as great as originally anticipated. This is because real-world driving emissions in the road transport sector — especially from diesel passenger vehicles and vans — have been, on average, four or five times higher than the European emission standards by vehicle type, which all vehicles must meet in a laboratory testing procedure. In 2016, the road transport sector contributed 36 % of total EU NO_x emissions (38 % in the EEA-33).

Sulphur oxides

In 2016, sulphur oxides (SO_x) emissions had fallen by approximately 69 % of their 2005 levels for the EU and 52 % of their 2005 levels for the EEA-33. This means that the EU target of reducing 2020 SO_x emissions by 59 % compared with their 2005 levels has already been met. The energy production and distribution sector has been responsible for most of the SO_x emissions – 58 % in 2016. This sector has also contributed about 80 % of the reduction in emissions. This has happened for various reasons, including stricter emission limits established under the Large Combustion Plants Directive (EU, 2001b) and the Industrial Emissions Directive (EU, 2010), 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

In 2016, non-methane volatile organic compound (NMVOC) emissions for the EEA-33 and the EU were approximately 25 % and 29 % lower compared with their 2005 levels. This means that the target of reducing the 2020 NMVOC emissions by 28 % compared with their 2005 levels has already been met. The largest source of NMVOC emissions is ‘solvent and product use’. Various EU measures have helped to reduce emissions over the period examined including stricter requirements for industrial facilities, limits on the solvent content of paints and mandatory vapour recovery equipment at petrol stations.

Ammonia

Ammonia (NH_3) emissions have remained more or less stable since 2005. 2016 emissions fell by 4 % from their 2005 level in the EU[2], whereas in the EEA-33 they decreased by 0.4 %. Agriculture dominates emissions of NH_3: in 2016, 92 % of emissions came from the agricultural sector. NH_3 emissions arise primarily from the decomposition of animal manure and the application of fertiliser. There are a number of technical measures available to mitigate ammonia emissions, yet little progress in reducing emissions is evident in the agricultural sector. In fact, NH_3 emissions increased in the EU for the last three consecutive years (2014-2016) of the period examined; the total increase from 2014 to 2016 was 2 % (2.6 % in the EEA-33). Key reasons behind this recent trend are the increase in amount of animal manure applied to soils — mostly as an organic fertiliser — and the increase in the use of inorganic fertilisers.

Particulate matter

Emissions of primary $PM_{2.5}$ (particulate matter with a diameter of 2.5 µm or less) were 21 % lower in 2016 compared with their 2005 levels both in the EEA-33 and in the EU. Most $PM_{2.5}$ emissions come from the 'commercial, institutional and households' sector, i.e. from small combustion plants at commercial and institutional facilities, as well as from households. The recently agreed Medium Combustion Plants Directive (EU, 2015) will help reduce future emissions of $PM_{2.5}$ from many facilities. It remains, however, challenging to reduce emissions from residential combustion, which is the largest source of $PM_{2.5}$ emissions (51 % of total $PM_{2.5}$ emissions in the EU in 2016). Furthermore, it continues to be a challenge to reduce emissions from road transport, which is the second largest source of $PM_{2.5}$ (11 % of total $PM_{2.5}$ emissions in the EU in 2016) (EEA, 2018b).

Overall assessment at EU level

National air pollutant emission projections reported in 2017 and 2018 and aggregated by the European Environment Agency (EEA) at EU level suggest that the EU as a whole is on target to meet 2020 EU and international emission reduction commitments, with the potential exception of ammonia (EEA own calculations based on EEA 2018c). 2020 reduction commitments for non methane volatile organic compounds and sulphur oxides emissions were already met in 2016. Further efforts in reducing the emissions of nitrogen oxides and of fine particulate matter may be necessary in order to remain on track to meeting the 2020 emission reduction commitments related to these two air pollutants. Ammonia emission projection results, as well as the increase in ammonia emissions for the past 3 years in a row (2014 - 2016), make the outlook for meeting 2020 reduction commitments for ammonia uncertain.

Country level information

Table 1 compares 2016 emissions by country with the respective emission reduction commitments for 2020. With regard to the EU Member States, the 2020 emission reduction commitments correspond to those of the new NECD. Projected emissions reported by all Member States in 2017 and 2018 show that 20 countries do not consider themselves on track towards meeting their reduction commitments set for 2020 for one or more of the pollutants (NOx, NH3, NMVOCs, SO2 and/or PM2.5) on the basis of policies and measures currently in place (EEA, 2018a). Regarding non-EU EEA member countries, the 2020 emission reduction commitments correspond to those in the Gothenburg Protocol. The colours indicate to what extent 2016 emissions exceeded the 2020 emission reduction commitment for each country and for the EU as a whole.

Table 1. 2016 emissions of air pollutants and 2020 air pollutant emission reduction commitments (Gothenburg Protocol or National Emission Ceilings Directive) by country

Emissions in Gg (1 000 tonnes)

	NH_3		NMVOC(*)		NOx(*)		PM2.5		SOx	
	Total emissions in 2016	Reduction commitments 2020	Total emissions in 2016	Reduction commitments 2020	Total emissions in 2016	Reduction commitments 2020	Total emissions in 2016	Reduction commitments 2020	Total emissions in 2016	Reduction commitments 2020
EEA-33	4 717.06		8 008.01		8 585.89		1 378.44		4 700.64	
EU-28	3 906.49	3 827.18	6 295.48	6 401.51	7 162.83	6 782.21	1 343.02	1 323.50	2 329.49	3 131.94
Austria	66.64	64.09	136.74	115.32	105.62	106.91	17.60	18.73	13.81	18.94
Belgium	67.84	73.47	113.47	125.66	125.68	171.02	24.59	36.17	42.32	80.99
Bulgaria	50.29	50.10	83.65	75.54	125.26	108.06	31.85	24.71	104.92	171.24
Croatia	35.01	41.78	69.87	75.06	52.37	56.00	18.41	33.50	14.71	26.42
Cyprus	5.55	5.77	9.26	9.45	14.95	11.83	1.32	1.24	16.32	6.45
Czechia	72.90	72.91	212.57	218.84	164.56	182.77	39.30	37.08	115.08	114.64
Denmark	67.12	67.30	67.29	83.06	115.15	82.77	20.55	17.18	10.24	17.04
Estonia	11.92	10.62	22.46	28.60	31.29	32.98	7.48	12.09	29.84	51.84
Finland	29.72	29.88	88.35	88.03	130.72	126.93	19.88	19.48	39.70	48.66
France	630.05	599.72	608.35	663.20	691.14	708.44	170.20	189.60	140.34	206.05
Germany	601.50	593.83	848.00	1 048.96	968.67	890.06	100.78	99.88	355.76	373.69
Greece	56.52	60.15	203.71	131.28	259.68	310.20	26.93	32.19	71.54	142.83
Hungary	87.10	77.40	140.66	107.95	116.53	105.68	53.22	34.53	23.05	22.23
Iceland	No Commitment under Gothenburg Protocol									
Ireland	116.70	112.16	46.84	65.50	91.23	66.19	14.73	19.15	13.77	25.12
Italy	382.22	403.13	904.14	827.91	761.23	729.37	161.57	156.00	116.30	265.95
Latvia	16.25	14.75	39.95	36.08	34.85	26.68	16.36	19.25	3.48	7.81
Liechtenstein	No Commitment under Gothenburg Protocol									
Lithuania	34.03	34.12	52.42	40.71	54.19	26.59	6.01	5.84	15.44	11.90
Luxembourg	6.39	5.89	8.65	8.49	8.77	8.61	0.59	1.42	0.98	1.57
Malta	0.80	1.50	3.07	2.50	4.80	5.40	0.26	0.98	1.94	2.53
Netherlands	127.85	133.52	143.43	149.27	249.57	193.67	10.67	12.26	27.91	48.36
Norway	28.32	25.00	152.46	130.50	151.42	151.00	27.49	27.10	15.61	21.60
Poland	267.11	296.58	608.86	425.75	726.43	574.88	145.51	141.64	581.52	477.15
Portugal	50.18	52.72	148.47	149.04	147.42	163.54	46.50	52.12	34.37	65.20
Romania	167.47	178.96	258.42	237.59	210.63	168.07	109.97	88.64	107.67	139.12
Slovakia	30.45	30.23	63.96	84.31	66.97	68.94	26.75	24.33	27.15	38.15
Slovenia	18.43	18.91	30.66	28.99	37.20	32.02	11.92	8.76	5.06	14.85
Spain	492.21	484.72	593.88	581.75	765.48	784.76	128.44	133.84	217.99	400.83
Sweden	53.10	49.25	158.86	149.74	130.79	109.87	18.36	21.68	19.05	27.85
Switzerland	57.21	59.00	70.75	70.80	62.96	55.20	6.69	7.30	6.20	12.00
Turkey	No Commitment under Gothenburg Protocol									
United Kingdom	289.06	265.06	818.57	788.45	892.91	771.35	107.91	86.53	179.16	316.83

Distance to Emission Reduction Commitment (**)

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

Notes:

(*) Emissions from 3B (Manure Management) and 3D (Crop Management) are not taken into account only for EU-28 Member States according to new NECD.

(**) For EU-28 Member States 2020 Emission Reduction Commitment under new NECD has been taken into account. For Norway and Switzerland 2010 Gothenburg Protocol Ceilings have been considered.

Emissions in Gg (1 000 tones)

Source: EEA, 2018c, 2018d

As noted earlier, future reductions in emissions will still be required in most countries for them to meet their respective emission reduction commitments for 2020. However, a number of countries already report emissions below the level required by 2020.

Outlook beyond 2020

In 2016, the EU adopted a new NECD, which sets emission reduction commitments for NO_x, NMVOCs, SO_2, NH_3 and $PM_{2.5}$ from 2020 onwards, but also more ambitious reduction commitments for 2030 and beyond. The 2030 commitments aim to cut the health impacts of air pollution (in terms of premature mortality) by half compared with 2005. Additional measures beyond the new NECD are still needed if the EU is to achieve the long-term objective — set in the European Commission's 'Clean Air Programme for Europe' (EC, 2013) — of air pollution levels that do not lead to unacceptable harm to human health and the environment (EEA, 2018a). A number of EU level measures already taken will start to deliver benefits in the next decade including the Medium Combustion Plants Directive and Best Available Techniques conclusions for a number of sectors such as the large combustion plants sector.

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, NH_3, NMVOCs and $PM_{2.5}$ for the years 2005 to 2016. Data for the EU Member States are taken from the latest EU emission inventory submission to the UNECE Long-range Transboundary Air Pollution (LRTAP) Convention. Data for the non-EU countries that are members of the EEA are taken from the reporting under the UNECE LRTAP Convention to the LRTAP Centre on Emission Inventories and Projections (EEA, 2018c, 2018d, 2018e).

Footnotes and references

[1] In 2018, new adjustment applications were submitted by four Member States (Austria, Hungary, Ireland and the United Kingdom). In addition, nine Member States (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg and Spain) asked for adjustments related to applications that were already approved by the European Commission (EC) in 2017. All adjustment applications will be reviewed by the EC. If approved, the number of Member States exceeding one or more emission ceilings in 2016 would decrease from six to four, with emissions from Hungary and Ireland subsequently falling below all of their respective ceilings. Austria would achieve an emission level below its NO_x ceiling from 2014 onwards and be very close to meeting its ceiling for NH_3 (EEA, 2018a).

[2] According to the scoreboard methodology, a change of more than 3 % in the indicator value from the base year to the latest available year is considered significant enough to qualify a trend as improving (or as deteriorating). This is why last year's scoreboard assessed the EU ammonia emissions past trend as stable since there was a 3 % decrease in the emissions between 2005 and 2015. However, this year's scoreboard assessed the trend as improving because the

decrease between 2005 and 2016 was 4 %. It should also be noted that the countries resubmit the full time series of their air pollutant emission data, including ammonia data, every year. This is because the countries may apply changes to account for improvements in methodology, corrections or adjustments following authorisation by the European Commission or the Steering Board of the UNECE European Monitoring and Evaluation Programme (depending on the country). This means that changes in the past trend scoreboard results in relation to ammonia emissions may be a result of such resubmissions.

EC, 2013, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions ‘A clean air programme for Europe’ (COM(2013) 918 final).

EEA, 2016, Air quality in Europe — 2015 report, EEA Report No 28/2016 European Environment Agency.

EEA, 2018a, ‘NEC Directive status 2018’ (https://www.eea.europa.eu/themes/air/national-emission-ceilings/nec-directive-reporting-status-2018) accessed 12 October 2018.

EEA, 2018b, Air quality in Europe — 2018 report, EEA Report No 12/2018 European Environment Agency.

EEA, 2018c, ‘National Emission Ceilings Directive emissions data viewer 1990-2016’, European Environment Agency (https://www.eea.europa.eu/data-and-maps/dashboards/necd-directive-data-viewer-1) accessed 15 October 2018.

EEA, 2018d, ‘Air pollutant emissions data viewer (LRTAP Convention)’, European Environment Agency (https://www.eea.europa.eu/data-and-maps/dashboards/air-pollutant-emissions-data-viewer-1) accessed 12 October 2018.

EEA, 2018e, European Union emission inventory report 1990–2016 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP), EEA Technical Report No 6/2018, European Environment Agency.

EU, 2001a, Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (OJ L 309, 27.11.2001, p. 22–30).

EU, 2001b, Directive (EC) 2001/80 of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants (OJ L 309, 27.11.2001, p. 1–21).

EU, 2010, Directive (EU) 2010/75 of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17–119).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' Annex A, paragraph 28d (OJ L, 354, 28.12.2013, p. 171–200).

EU, 2015, Directive (EU) 2015/2193 of the European Parliament and the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants (OJ L 313, 28.11.2015, p. 1–19).

EU, 2016, Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (OJ L 344/1, 17.12.2016).

IIASA, 2014, The Final Policy Scenarios of the EU Clean Air Policy Package, TSAP Report No 11, International Institute for Applied Systems Analysis, (http://www.iiasa.ac.at/web/home/research/researchPrograms/air/policy/TSAP_11-finalv1-1a.pdf) accessed 6 April 2018.

UNECE, 1979, The Geneva Convention on Long-range Transboundary Air Pollution, United Nations Economic Commission for Europe. (https://www.unece.org/fileadmin/DAM/env/lrtap/full%20text/1979.CLRTAP.e.pdf) accessed 6 April 2018.

UNECE, 2012, 1999 Protocol to abate acidification, eutrophication and ground-level ozone to the Convention on Long range Transboundary Air Pollution, amended on 4 May 2012, United Nations Economic Commission for Europe (http://www.unece.org/env/lrtap/multi_h1.html) accessed 6 April 2018.

AIRS briefings

AIRS_PO3.1, 2018, Outdoor air quality in urban areas.

AIRS_PO1.1, 2018, Eutrophication of terrestrial ecosystems due to air pollution.

Environmental indicator report 2018 – In support to the monitoring of the 7th Environment Action Programme, EEA report No19/2018, European Environment Agency

Published on 29 Nov 2018

Environment and health

Quality of bathing waters

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook for the EU meeting the selected objective by 2020
Bathing water quality		Increase the number of bathing waters classified as 'excellent' or 'good' under the Bathing Water Directive	

The share of bathing waters that meet excellent and good quality standards is likely to increase further due to implementation of the Bathing Water Directive, in particular the measures on poor quality waters.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2018

The Seventh Environment Action Programme (7th EAP) includes an objective that, by 2020, citizens throughout the EU will benefit from high standards of bathing water. The Bathing Water Directive requires that Member States take realistic and proportionate measures to increase the number of bathing waters classified as 'excellent' or 'good'. Minimum water quality standards were met by 96.0 % of all EU bathing waters identified for the 2017 bathing season. Overall, bathing water quality is improving over time due to investment in the sewerage system, better waste water treatment and the reduction of pollution from farms.

Setting the scene

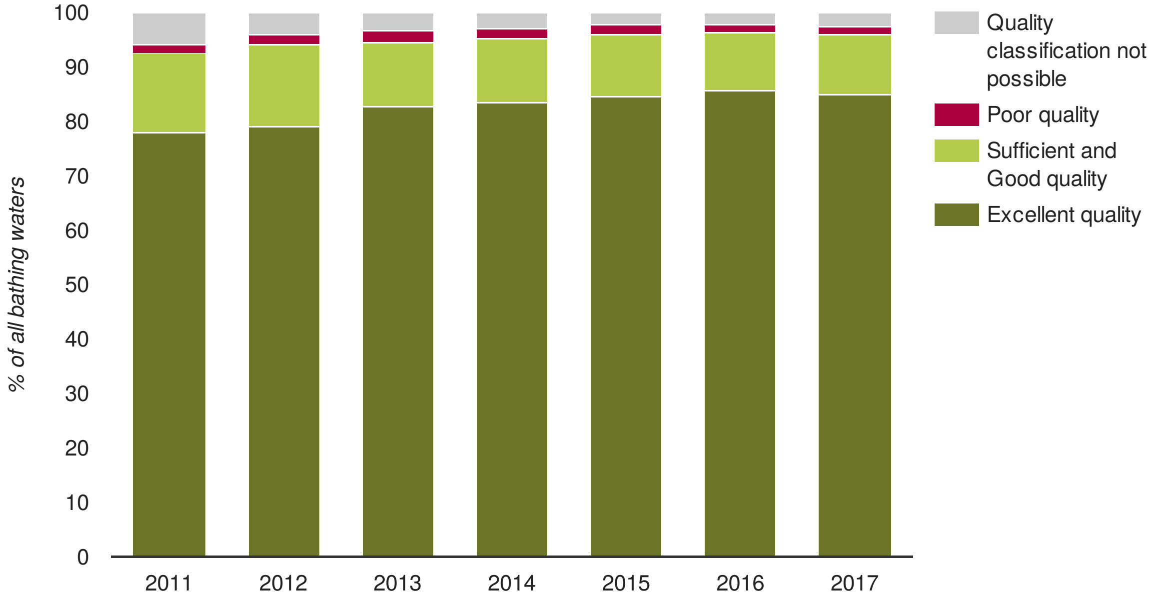
The 7th EAP (EU, 2013) includes an objective that, by 2020, citizens throughout the EU will benefit from high standards of bathing water. Bathing water quality is a cause for concern for public health, as swimming at beaches or bathing lakes contaminated with faecal bacteria can result in illness. The major sources of pollution responsible for faecal bacteria are sewage and water draining from farms and farmland. Such pollution increases during heavy rain and floods, when pollution is washed into rivers and seas, and as a result of overflowing sewerage networks. In addition to good water quality for bathing, clean unpolluted water is required for ecosystems and to support economic activities such as tourism.

Policy targets and progress

The Bathing Water Directive (EU, 2006) has the aim of increasing the number of bathing waters classified as 'excellent' or 'good'. It also includes a shorter term goal that, by 2015, all waters should have been of at least 'sufficient' quality. In the context of this briefing, and with the aim of linking the objective of the 7th EAP regarding bathing water to the Bathing Water Directive, bathing waters that meet the minimum water quality standards of the Directive (meaning that they were of at least 'sufficient' bathing water quality) are considered to have achieved the high standards called for under the 7th EAP.

Figure 1 provides an overview for the period 2011-2017 of the classification of EU bathing waters into the excellent, sufficient (including good) and poor categories, as well as those bathing waters that could not be classified.

Figure 1. Overall bathing water quality in the EU



Data sources: EEA. WISE bathing water quality database (data from annual reports by EU Member States)

Note:

1. The category 'quality classification not possible' includes waters for which there were not enough samples, new bathing waters, bathing waters with changes or bathing waters that had been closed.
2. The full separation of the good and sufficient water quality classes has been possible only for the last three reporting years (2015-2017), which is why the time series shows the good and sufficient classes together.

The share of bathing waters in the EU that meet minimum water quality standards (excellent, good and sufficient standards) increased from 92.6 % in 2011 to 96.0 % in 2017 with the share of bathing waters in the EU meeting excellent standards having increased at a higher rate (from 78.1 % in 2011 to 85.0 % in 2017).

The proportion of bathing waters in the EU whose status is poor remained relatively constant (between 1.4 % and 2.0 %) during the 2011-2017 period with the lowest value observed both in 2016 and 2017 (EEA, 2018).

Overall, bathing water quality is improving over time. It is encouraging to observe that more and more bathing waters are not only reaching the minimum quality standards set by the Bathing Water Directive but are achieving the highest (excellent) quality standards.

Many years of investment in the sewerage system, better waste water treatment and the reduction in pollution from farms have led to Europe's bathing waters being much cleaner today than they were some 40 years ago when the original Bathing Water Directive was adopted (EU, 1976). The implementation of the Urban Wastewater Treatment Directive (EU, 1991) and a focus on reducing overflow from sewers have been instrumental in reducing pollution and in improving the quality of several low-quality bathing waters (EEA, 2018).

However, there are still poor quality bathing waters. The major sources of pollution responsible for faecal bacteria in bathing waters today are insufficiently treated or untreated waste water as a result of system failures, overflows from sewage treatment works or from scattered houses with misconnected drains and poorly located or poorly maintained septic tanks, poorly stored slurry or manure from livestock that washes into streams, and animal (mostly dog) and bird faeces on beaches or crowded beaches with many swimmers.

Weather is an additional factor that affects bathing water quality. In wet summers, large amounts of rainwater cause stormwater overflow and the release of diluted sewage into bathing waters or streams that discharge close to beaches. Rainwater also washes animal waste from urban and rural areas into surface water drains and rivers. In years with below average sunshine, water quality is also affected, as the sun’s ultraviolet rays kill the faecal bacteria found in the water.

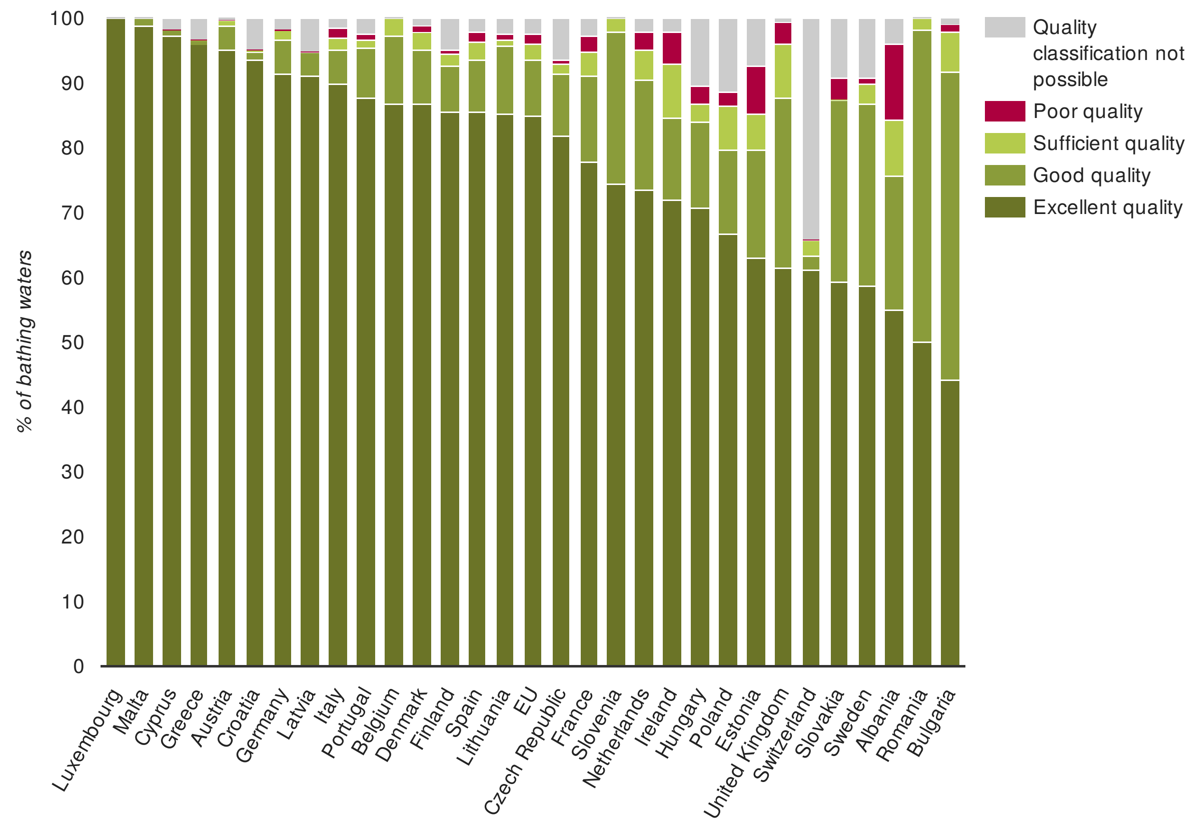
In order to further improve bathing water quality, it is imperative, especially in the case of poor quality bathing waters, that the sources of pollution be assessed. The bathing water profiles prepared under the Bathing Water Directive should provide an indication of pollution sources in the catchment area of the bathing water and, together with historical data on rainfall, stream flow and sea currents, should provide information on the upstream sources of pollution to be targeted with measures. Management measures are primarily implemented for sufficient or poor quality bathing waters.

The outlook towards the 2020 goal of increasing the number of bathing waters classified as 'excellent' or 'good' under the Bathing Water Directive remains positive. This is despite the fact that compared with 2016, there was a drop in the share of EU bathing waters meeting minimum water quality standards (excellent, good or sufficient) in 2017 – from 96.3 % in 2016 to 96.0 % in 2017. The decrease was quite minor and occurred mainly because the 2017 summer was rather wet as well as because of methodological changes implemented by Romania and Sweden. The share of bathing waters that meet excellent and good quality standards is likely to increase to 2020 due to the implementation of the Bathing Water Directive and in particular the effect of measures for poor quality waters.

Country level information

Figure 2 provides the results for bathing water quality in 2017 for the EU Member States and two other EEA member countries. In general, bathing water quality was of a high standard across the countries.

Figure 2. Bathing water quality in 2017, by country



Data sources: EEA. Bathing Water Directive - Status of bathing water

Note:

1. The category 'quality classification not possible' includes waters for which there were not enough samples, new bathing waters, bathing waters with changes or bathing waters that had been closed.

2. Methodology problems in Sweden have affected the results; see also the Swedish country report: https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/assessments/state-of-bathing-water/country-reports-2017-bathing-season/sweden-2017-bathing-water-report/view.

All reported bathing water sites in Austria, Belgium, Croatia, Cyprus, Greece, Latvia, Luxembourg, Malta, Romania, Slovenia and Switzerland achieved at least sufficient quality in 2017 (according to minimum quality standards set by the Bathing Water Directive). In five countries, 95 % or more of bathing waters were assessed as being of excellent quality: Luxembourg (all 12 reported bathing waters), Malta (98.9 % of all sites), Cyprus (97.3 % of all sites), Greece (95.9 % of all sites) and Austria (95.1 % of all sites).

The three EU countries with the highest numbers of bathing water sites where water quality is classified as poor are France (80 sites or 2.4 %), Italy (79 bathing water sites or 1.4 %) and Spain (38 sites or 1.7 %). In comparison with the 2016 season, the number of poor quality bathing waters decreased in all three countries. The EU countries with the highest proportion of bathing waters where water quality is poor were Estonia (7.4 % or four bathing waters), Ireland (4.9 % or seven bathing waters) and the United Kingdom (3.3 % or 21 bathing waters) (EEA, 2018).

Outlook beyond 2020

Bathing water quality is not only essential for public health reasons. Clean unpolluted water is necessary to improve ecosystem resilience. Both can be achieved with more integrated and sustainable water resource management. This would require more robust implementation of the Water Framework Directive (EU, 2000), with River Basin Management Plans developed to improve the poorer quality bathing waters. This would serve to maintain the trend towards consistently high-quality EU bathing waters beyond 2020.

About the indicator

This indicator provides an overview of the bathing water quality in 2017 at more than 21 500 bathing waters in the EU Member States. It also presents the evolution of bathing water quality from 2011 to 2017 at EU aggregated level. During the bathing season, samples from coastal and inland bathing waters are taken and analysed against two microbiological parameters that may indicate the presence of faecal pollution, namely intestinal enterococci and Escherichia coli (also known as E. coli). After the end of the bathing season, and based on 4 years of data, bathing waters are classified into one of the bathing water quality classes (excellent, good, sufficient or poor). Some bathing waters have not been classified because there were insufficient samples or because they are new or have undergone changes affecting water quality.

Footnotes and references

EEA, 2018, European bathing water quality in 2017, EEA Report No 2/2018, European Environment Agency.

EU, 1976, Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water (archived).

EU, 1991, Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (OJ L 135, 30.5.1991, p. 40–52).

EU, 2000, Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

EU, 2006, Council Directive 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC (OJ L 64, 4.3.2006, p. 37–51).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354, 28.12.2013, p. 171–200).

Environmental indicator report 2018 – In support to the monitoring of the 7th Environment Action Programme, EEA report No19/2018, European Environment Agency

Published on 29 Nov 2018

Environment and health

Number of countries that have adopted a climate change adaptation strategy/plan

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook for the EU meeting the selected objective by 2020
Number of countries that have adopted a climate change adaptation strategy and/or plan	N.A.[1]	Make decisive progress in adapting to the impact of climate change — 7th EAP	

There has been an increase in the number of countries that have adopted a national adaptation strategy and/or plan and this is expected to continue. However, information on the 'decisive progress' of these policies towards reducing vulnerability and enhancing resilience to climate change is limited, preventing firm conclusions with respect to the 2020 outlook

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2018

The Seventh Environment Action Programme (7th EAP) calls for decisive progress to be made in adapting to the impact of climate change. Climate change has had and will continue to have many impacts on the environment, human health and the economy. European society must adapt in order to address the adverse impacts of climate change, and to complement efforts to mitigate it. Such mitigation and adaptation actions will increase the resilience of the EU's economy and society, while stimulating innovation and protecting the EU's natural resources. To date, 25 EU Member States have adopted a national adaptation strategy (NAS) and 15 have developed a national adaptation plan (NAP). There has been an increase in the number of countries that have adopted national adaptation strategies and/or plans and this is expected to continue, and to deepen, with additional countries adopting follow-up adaptation policies and implementation plans. However, information on the progress of these policies in reducing vulnerability and enhancing resilience is limited, so the outlook towards 2020 for this 7th EAP objective remains uncertain.

Setting the scene

The 7th EAP calls for decisive progress to be made in adapting to climate change to make Europe more climate resilient (EU, 2013a). Climate change impacts can be seen in global sea level rise, changes in precipitation (e.g. increases in northern and north-western Europe and decreases in southern Europe), decreasing snow cover, glaciers, sea ice and ice sheets. These changes lead to a wide range of often adverse impacts on environmental systems, economic sectors, and human health and well-being in Europe (EEA, 2017a; IPCC, 2014). Climate change adaptation addresses the adverse effects of climate change and builds resilience to reduce vulnerabilities and risks to the environment, human health and the economy (including infrastructure).

Policy targets and progress

The European Commission's White Paper (EC, 2009) and EU strategy on adaptation to climate change (EC, 2013) encourage all Member States to adopt comprehensive adaptation strategies. The strategy promotes action in cities and the mainstreaming of adaptation in relevant EU policies and programmes. In addition, it provides funding for actions, enhances research under the Horizon 2020 programme for environment and climate action[2], and promotes information sharing through the European Climate Adaptation Platform[3].

Adaptation policy will receive EU financial resources from the EU budget between 2014 and 2020. It is intended that 20 % of the budget should be used for climate-related actions (i.e. adaptation and climate change mitigation).

The European Commission evaluated the EU strategy and published the results in a report on 12 November 2018 (EC, 2018a; 2018b). The report included an adaptation preparedness scoreboard, with key process-based indicators that measured Member States' levels of readiness. The evaluation concluded, inter alia, that the EU strategy succeeded in promoting adaptation planning (including strategies) in the Member States at all levels, but was less effective on the carrying out and monitoring of the planning (EC, 2018a; 2018b).

Country level information

Table 1 provides an overview of progress with the adoption of national and sectoral climate change adaptation strategies and plans by EEA member countries[4].

National Adaptation Strategies (NASs) usually address overarching issues that allow them to position adaptation on the policy agenda. These strategies recognise the importance of expected climate change impacts and the need to adapt, and they facilitate the process of coordinating the adaptation response, increasing awareness of adaptation and stakeholder involvement, assessing risks and vulnerabilities, and identifying knowledge gaps.

National Adaptation Plans (NAPs) usually aim to implement NASs and to organise activities for achieving their objectives, typically through sectoral implementation. Although adaptation implementation at national level is still at an early stage, adaptation planning work is under way in most countries.

To date, 25 EU Member States and three other EEA member countries have adopted NASs. In addition, 15 EU Member States and two other EEA member countries have developed NAPs[5]. Table 1 shows that over the last five years there has been a steady increase in the number of NASs and NAPs being adopted by countries. Over the same period, several countries that adopted their NAS some years ago reviewed and adopted a revised NAS.

Progress is expected to continue as the EU Member States without a NAS today are in the process of drafting one. It is also expected that additional countries will adopt NAPs and that they will implement more specific adaptation policies and actions in line with their strategies and plans.

Regarding the implementation of adaptation policies and actions (EEA, 2017b), sectors addressed mostly in the NASs and the NAPs are freshwater management, flood risk management, agriculture and forestry. The adaptation actions in these sectors have mostly consisted of mainstreaming adaptation priorities into these national sectoral policy areas. Several countries have also developed national health strategies and action plans, including early warning systems for heatwaves and enhanced surveillance of infectious diseases (EEA, 2014).

A limited number of countries have started to monitor and report on adaptation policies and actions at national level (EEA, 2014). So far, even fewer countries are evaluating adaptation policies at national level; there are various reasons for this, including the fact that implementation of adaptation has only just begun (EEA, 2015). The countries that monitor these use mainly 'process-based' methods, which assess to what extent agreed steps in the action-taking process have been carried out. Very few countries use 'outcome-based' approaches to assess if and how vulnerability has decreased and/or resilience has increased, because such approaches use complex methodologies and are resource intensive (ETC/CCA, 2018). It will therefore not be possible to determine with any certainty whether or not decisive progress in adapting to the impacts of climate change can be achieved by 2020.

Transnational cooperation in adaptation to climate change has increased with the recognition of the importance of adaptation as a cross-cutting policy area. Adaptation actions take place, for example, within the EU Strategy for the Baltic Sea Region, the Danube Commission and the Carpathian and Alpine Conventions[6]. Adaptation action is often linked to the sharing of natural resources such as transboundary water catchments (EEA, 2017a).

Table 1. Overview of national climate change adaptation strategies and plans, by country

EEA Member states	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria								NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP *	NAS+NAP
Belgium						NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS+NAP	NAS+NAP
Bulgaria														
Croatia														
Cyprus													NAS+NAP	NAS+NAP
Czech Republic											NAS	NAS	NAS+NAP	NAS+NAP
Denmark				NAS	NAS	NAS	NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
Estonia													NAS+NAP	NAS+NAP
Finland	NAS	NAS	NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP *	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
France		NAS	NAS	NAS	NAS	NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
Germany				NAS	NAS	NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
Greece												NAS	NAS	NAS
Hungary				NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS
Ireland								NAS	NAS	NAS	NAS	NAS	NAS	NAS+NAP *
Italy											NAS	NAS	NAS	NAS
Latvia														
Lithuania								NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
Luxembourg							NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS
Malta								NAS	NAS	NAS	NAS	NAS	NAS	NAS
Netherlands			NAS	NAS	NAS	NAS	NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP *	NAS+NAP	NAS+NAP
Poland									NAS	NAS	NAS	NAS	NAS	NAS
Portugal						NAS	NAS	NAS	NAS	NAS	NAS *	NAS	NAS	NAS
Romania									NAS	NAS	NAS	NAS+NAP *	NAS+NAP	NAS+NAP
Slovakia										NAS	NAS	NAS	NAS	NAS
Slovenia												NAS	NAS	NAS
Spain		NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
Sweden														NAS
United Kingdom				NAS	NAS	NAS	NAS	NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
Iceland														
Liechtenstein														
Norway									NAS	NAS	NAS	NAS	NAS	NAS
Switzerland								NAS	NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP
Turkey						NAS	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP	NAS+NAP

- (blank) No policy
- (NAS) National adaptation strategy (NAS) adopted
- (NAS+NAP) National adaptation strategy (NAS) and national adaptation plans (NAP) in place
- * National adaptation strategy (NAS) updated

Data source: EC, 2018b, EEA, 2017b, EEA, 2014

Note: For the EU Member States the table is based on information reported by the Member States under the European mechanism for monitoring and reporting information relevant to climate change (EU, 2013b), via the country fiches of the European Commission Adaptation Scoreboard (EC, 2018b) and complemented by additional information provided on a voluntary basis to the EEA up to 30 September 2018. For other EEA member countries, information is provided on a voluntary basis to the EEA up to 30 September 2018.

Outlook beyond 2020

Because of expected future climate change impacts, efforts to adapt to climate change and to make Europe more climate resilient need to be strengthened in future. NASs and NAPs, together with the EU's adaptation strategy (EC, 2013), are expected to be further implemented and mainstreaming of climate change adaptation in policies is expected to continue. Key global agreements that can also enhance action on adaptation in Europe include:

- the Paris Agreement (UNFCCC, 2015), which requires countries to take adaptation action that is complementary to climate change mitigation action, and
- the 2015 UN Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) (UNISDR, 2015), which acknowledges climate change as one of the drivers of disaster risk and requires countries to take risk prevention and reduction measures.

About the indicator

This indicator shows the number of countries that have adopted an adaptation strategy and/or plan. It indicates how many countries have made progress on adapting to climate change by putting this issue on the policy agenda (through adaptation strategies) and by organising specific activities that will help achieve the aims of their adaptation strategies (through national and/or sectoral adaptation action plans). Many of these action plans have been in place for only a few years (see Table 1), so implementation has started rather recently. There is limited quantitative information available (and in only a few countries) on the effectiveness of adaptation strategies and plans regarding enhanced resilience and reduced vulnerabilities and risks. This indicator is therefore not yet able to show the effectiveness of these strategies and plans in making Europe more climate resilient. More information on this is expected to become available in future when more countries implement monitoring, reporting and evaluation adaptation schemes.

Footnotes and references

[1] N.A. It is not possible to measure a trend, since this is a binary measure, i.e. whether or not a policy has been adopted.

[2] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/fighting-and-adapting-climate-change-1 accessed 5 February 2018.

[3] http://climate-adapt.eea.europa.eu/ accessed 5 February 2018.

[4] The NAS and NAP definitions are at present rather generic leaving room for interpretation as to whether country documents qualify as a NAS/NAP. The results presented in Table 1 should therefore be read with this in mind.

[5] Furthermore, Bulgaria and Sweden have regional adaptation plans covering multiple sectors in place for all regions without a NAS and/or a NAP being in place.

[6] EU Strategy for the Baltic Sea Region (https://www.balticsea-region-strategy.eu/) accessed 5 March 2018, Danube Commission (http://www.danubecommission.org/dc/en/) accessed 5 March 2018, Carpathian Convention (http://www.carpathianconvention.org/), Alpine Convention (http://www.alpconv.org/en/convention/default.html) accessed 5 March 2018.

EC, 2009, White Paper 'Adapting to climate change: Towards a European framework for action', Brussels (COM(2009) 147/4) (https://ec.europa.eu/health/archive/ph_threats/climate/docs/com_2009_147_en.pdf) accessed 5 February 2018.

EC, 2013, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'An EU Strategy on adaptation to climate change' (COM(2013) 216 final of 16 April 2013) (http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52013DC0216) accessed 5 February 2018.

EC, 2016, Evaluation Roadmap: Evaluation of the EU Adaptation Strategy (http://ec.europa.eu/smart-regulation/roadmaps/docs/2016_clima_011_evaluation_adaptation_strategy_en.pdf) accessed 5 February 2018.

EC, 2018a, Report from the Commission to the European Parliament and the Council on the implementation of the EU Strategy on adaptation to climate change (COM(2018) 738 final of 12 November 2018) (http://ec.europa.eu/transparency/regdoc/rep/1/2018/EN/COM-2018-738-F1-EN-MAIN-PART-1.PDF) accessed 12 November 2018.

EC, 2018b, Commission Staff Working Document ‘Adaptation preparedness scoreboard Country fiches’ Accompanying the document Report from the Commission to the European Parliament and the Council on the implementation of the EU Strategy on adaptation to climate change (SWD(2018)460 final of 12 November 2018) (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=SWD:2018:460:FIN&from=EN) accessed 12 November 2018.

EEA, 2014, National adaptation policy processes in European countries — 2014, EEA Report No 4/2014, European Environment Agency (http://www.eea.europa.eu/publications/national-adaptation-policy-processes) accessed 5 February 2018.

EEA, 2015, National monitoring, reporting and evaluation of climate change adaptation in Europe, EEA Technical Report No 20/2015, European Environment Agency (http://www.eea.europa.eu/publications/national-monitoring-reporting-and-evaluation) accessed 5 February 2018.

EEA, 2017a, Climate change, impacts and vulnerability in Europe 2016 — An indicator-based report, European Environment Agency (http://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016) accessed 5 February 2018.

EEA, 2017b, Updated country pages in the European Climate-ADAPT Platform (http://climate-adapt.eea.europa.eu/countries-regions/countries) accessed 5 February 2018.

ETC/CCA, 2018, Indicators for adaptation to climate change at national level - Lessons from emerging practice in Europe, ETC/CCA Technical Paper 2018/3 (https://cca.eionet.europa.eu/docs/TP_3-2018) accessed 12 November 2018.

EU, 2013a, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354/171, 28.12.2013), Annex A, paragraphs 45 and 54 (http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013D1386) accessed 5 February 2018.

EU, 2013b, Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC (OJ L 165/13, 18.6.2013) (http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R0525) accessed 5 February 2018.

IPCC, 2014, Climate change 2014: Impacts, adaptation, and vulnerability — Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC, Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA (http://www.ipcc.ch/report/ar5/wg2/) accessed 12 February 2018.

UNFCCC, 2015, Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015, Adoption of the Paris Agreement, UNFCCC, Bonn, /CP/2015/10/Add.1. (http://unfccc.int/resource/docs/2015/cop21/eng/10.pdf) accessed 5 February 2018.

UNISDR, 2015, Sendai Framework for Disaster Risk Reduction 2015–2030, United Nations Office for Disaster Risk Reduction, Geneva (https://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf) accessed 12 February 2018.

Environmental indicator report 2018 – In support to the monitoring of the 7th Environment Action Programme, EEA report No19/2018, European Environment Agency

Environment and health

Environmental noise

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook for the EU meeting the selected objective by 2020
Exposure to environmental noise		Significantly decrease noise pollution – 7th EAP	

Efforts to reduce environmental noise tend to be offset by an increase in the number of people being exposed to high noise levels, in particular due to increasing road and aviation traffic, and an increase in the number of city inhabitants.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2018

The Seventh Environment Action Programme (7th EAP) includes an objective that noise pollution in the EU should be decreased significantly by 2020, moving closer to World Health Organization (WHO) recommended levels. Exposure to outdoor noise is monitored under the Environmental Noise Directive (END) against two thresholds; an indicator for the day, evening and night periods (Lden) that measures exposure to noise levels associated with 'annoyance' and an indicator for night periods (Lnight) that is designed to assess sleep disturbance. These thresholds do not correspond directly to the WHO recommended values and currently there is no mechanism in place for tracking progress against the latter values. Data reported under the Directive indicate that noise remains a major environmental health problem in Europe. For example, in 2012 — the year for which the most recent data have been compiled — approximately 100 million people in the EU were estimated to be exposed to road traffic noise levels exceeding the Lden indicator threshold. During the night period, about 70 million people were estimated to be exposed in the EU to road traffic noise levels exceeding the Lnight indicator threshold. As a result of such exposure to noise, approximately 16 600 cases of premature death occur each year in Europe, predominately from road traffic. Where comparable, reported data suggest that noise exposure levels remained relatively stable between 2007 and 2012. Efforts to reduce the noise from individual sources are being offset by continuing migration to urban areas and increases in vehicle traffic. This is likely to continue in the future, with transport demand set to increase, including road transport, and with predicted increases in aircraft noise. It is therefore unlikely that noise pollution will decrease significantly by 2020.

Setting the scene

The 7th EAP (EU, 2013) includes an objective to significantly decrease noise pollution by 2020, moving closer to WHO recommended levels. The WHO (2011) has identified noise from transport as the second most significant environmental cause of ill health in Western Europe, the first being air pollution from fine particulate matter (AIRS_PO3.1, 2018). Environmental noise exposure can lead to annoyance, stress reactions, sleep disturbance, poor mental health and wellbeing, impaired cognitive function in children, and negative effects on the cardiovascular and metabolic system. Environmental noise causes approximately 16 600 cases of premature death in Europe[1] each year, with almost 32 million adults estimated to suffer annoyance and over 13 million adults estimated to suffer sleep disturbance (ETC-ACM, 2016)[2].

Policy targets and progress

The Environmental Noise Directive (END) is the main EU instrument through which land-based noise emissions are monitored and actions developed. It defines environmental noise as ‘unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity’ (EU, 2002). It places an obligation on EU Member States to assess noise levels by producing strategic noise maps for all major roads, railways, airports and urban areas[3]. Based on these noise-mapping results, Member States must prepare action plans containing measures that address noise issues and their effects for those areas where the specific END reporting thresholds (55 dB averaged across the day, evening and night periods (L_{den}) and 50 dB averaged across the night period (L_{night})) have been surpassed. The Directive neither sets limit values for noise exposure, nor prescribes measures for inclusion in the action plans. Finally, Member States are required to select and preserve areas of good acoustic environmental quality, referred to as ‘quiet areas’.

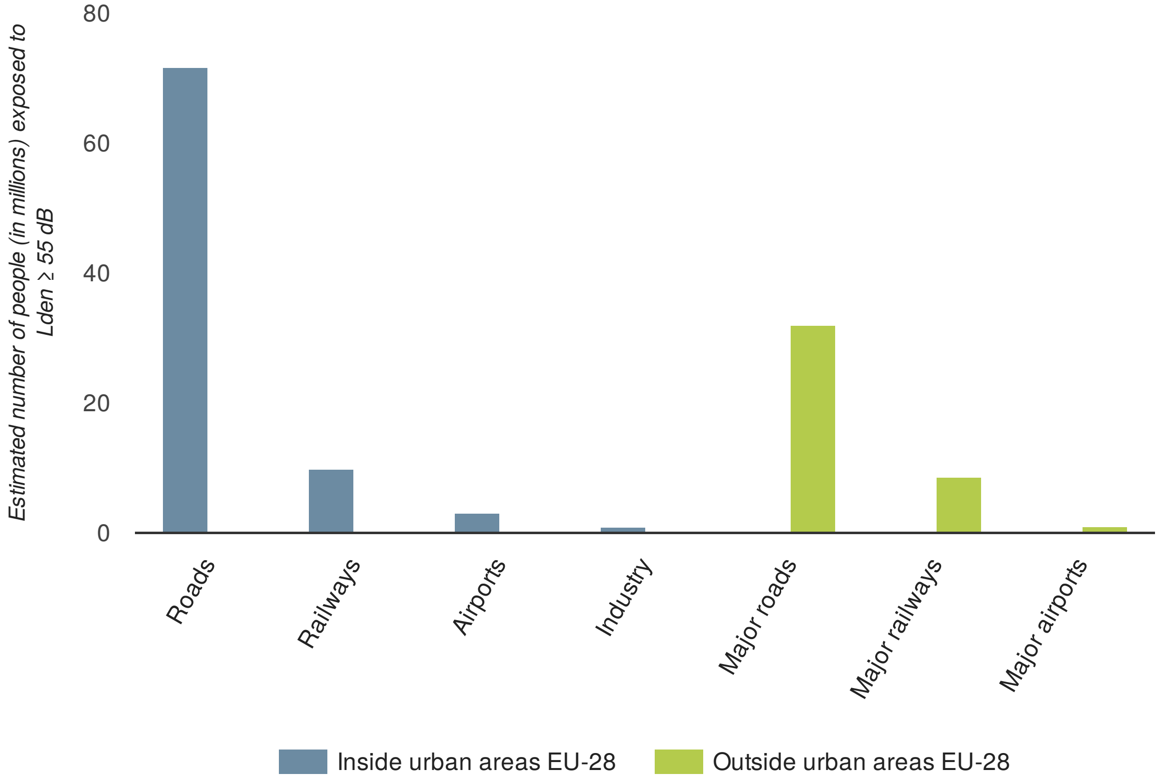
High environmental (i.e. outdoor) noise levels are defined in the 7th EAP as noise levels for L_{den} above 55 dB and for L_{night} above 50 dB.

During the night, environmental noise starting at L_{night} levels below 40dB can cause negative effects on sleep such as body movements, awakenings, self-reported sleep disturbance, as well as effects on the cardiovascular system that become apparent above 55 dB. All these impacts can contribute to a range of health effects, including premature mortality (WHO, 2009). The WHO established a night-time outdoor noise guideline value for L_{night} of 40 dB with the aim of protecting the public, including vulnerable groups such as children, the chronically ill and the elderly. An outdoor noise L_{night} value of 55 dB was recommended as an interim target for countries where the night-time noise guideline cannot be achieved in the short term and where policymakers adopt a stepwise approach. The WHO night-time noise guideline is stricter than the L_{night} threshold of 50 dB set under the END, providing a higher level of protection for human health. However, assessments cannot be made by comparing noise levels in the EU with WHO recommended levels, as Member States are not obliged to report this information.

Figure 1 provides an overview of the number of people exposed to levels of environmental noise in the EU within and outside urban areas that are above the L_{den} noise indicator threshold set by the END. The major source of noise pollution (measured in terms of number of affected people), both inside and outside urban areas, is road traffic. Noise from trains and aircraft has a much lower impact in terms of overall population exposure to noise, but it remains a major source of localised noise pollution (EEA, 2015).

It is estimated that about 100 million people in the EU are exposed to L_{den} levels from road traffic noise that are above 55 dB. Exposure to noise from night-time road traffic is also significant, with approximately 70 million EU citizens exposed to harmful L_{night} levels above 50 dB (EEA 2018). In addition, many people are also exposed to rail, aircraft and industrial noise, particularly in towns and cities. While high levels of aircraft noise do not affect a wide geographical area, its harmful effects have been shown to include impairment of reading and long-term memory in children attending schools that are affected by aircraft flight paths (Clark and Paunovic, 2018).

Figure 1. Estimated number of people in the EU exposed to high annual average noise levels, 2012



Data sources: a. EEA. Reported data on noise exposure covered by Directive 2002/49/EC b. EEA – Indicator CSI051

Notes: 1. This chart is based on data officially reported by countries under the EU Environmental Noise Directive (2002/49/EC). Due to gaps in the reported data, a gap-filling routine is used to estimate the total population exposure to high noise levels.
2. Urban areas are defined in the Environmental Noise Directive as urban agglomerations that make up that part of the territory, delimited by a Member State, that has a population in excess of 100 000 persons and a population density such that the Member State considers it to be an urbanised area.
3. The numbers of people exposed can only be summed for the same source inside and outside urban areas and not across sources, since the latter could lead to double counting.
4. 55 dB Lden is the EU indicator threshold for noise exposure defined in the Environmental Noise Directive. It indicates an annual average level during the day, evening and night; dB=decibel.

Examples of measures to reduce noise exposure currently being undertaken by countries include installing road and rail noise barriers, optimising aircraft movements around airports as well as using urban planning measures. However, it is widely acknowledged that the most effective actions to reduce exposure tend to be those that reduce noise at source, for example by reducing the number of vehicles on the road, introducing quieter tyres for road vehicles or laying quieter road surfaces.

A major problem for the effectiveness of such measures is that, given the different factors that determine traffic noise, a single measure alone is often not sufficient to significantly reduce exposure and improve health and wellbeing.

In terms of assessing past trends in noise exposure, data were reported to the EEA in 2007 and 2012 under two rounds of noise mapping assessments. There are comparability issues between the two reporting rounds because of different reporting requirements across them, a lack of common assessment methods and incomplete reporting of exposure assessments.

However, the analysis of a sub-set of comparable, reported data revealed that exposure to noise has remained broadly constant between 2007 and 2012.

Efforts to reduce noise from individual sources have been offset by the higher numbers of people exposed to high noise levels, mainly because of increasing passenger road and aviation traffic (EC, 2018) and increasing numbers of city inhabitants (Eurostat, 2016). The construction of new roads may have also exposed new areas and populations to road traffic noise.

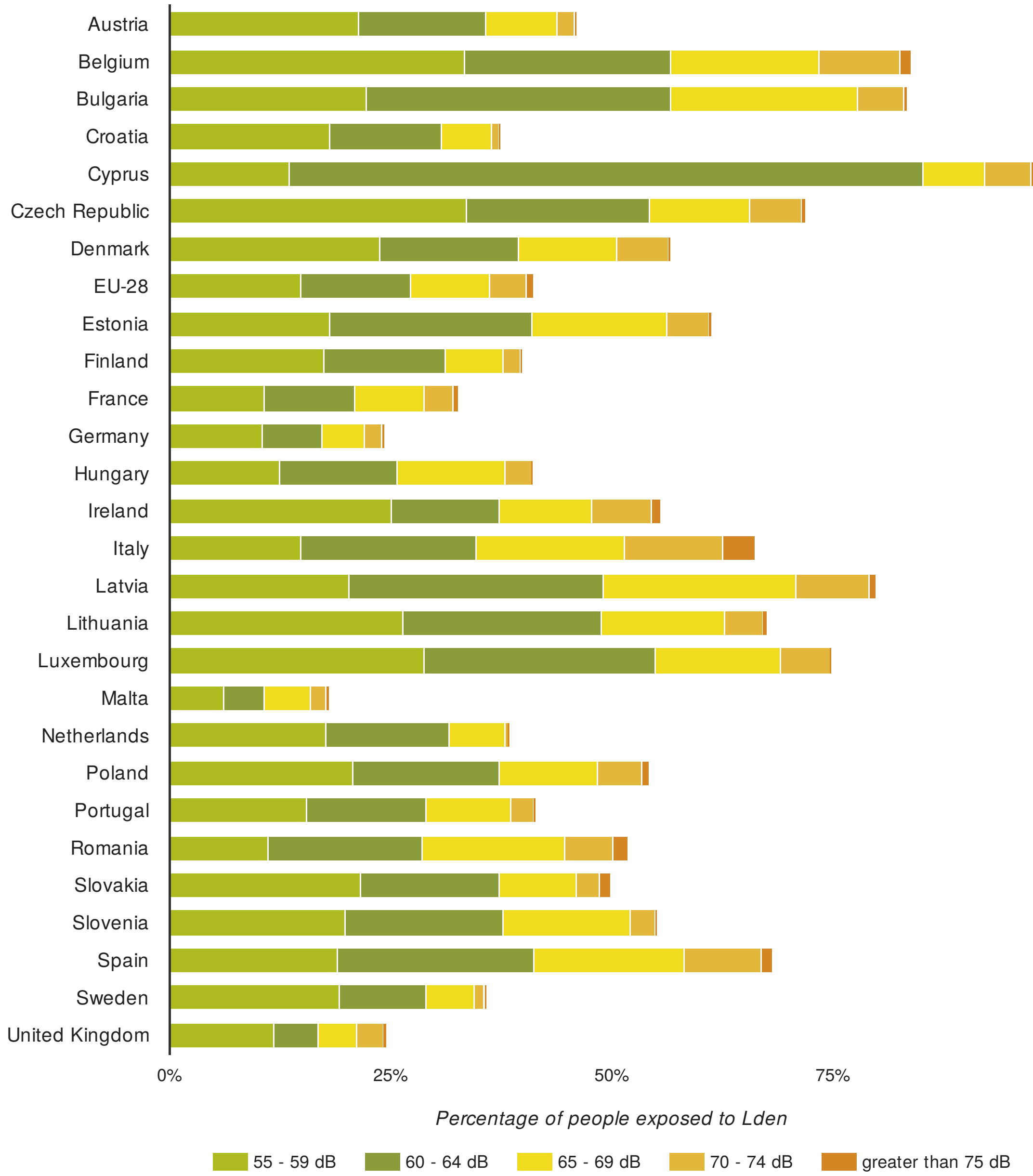
Finally, it is unlikely that noise pollution will decrease significantly by 2020, given that transport demand is expected to increase (EC, 2016), air traffic noise has been predicted to increase (EASA et al, 2016) and the number of city inhabitants is also set to increase (Eurostat, 2016).

Country level information

Road traffic is the most widespread noise source in Europe and is the source that causes the largest number of people to be exposed to noise levels above END threshold levels for L_{den} and L_{night}. This is true at the European scale, at country scale and both inside and outside urban areas. Nevertheless, a wide variation can be identified between countries in the number of people exposed to road traffic noise in urban areas. This is significantly influenced by factors such as the number of urban areas per country, the total number of inhabitants per urban area, and differences in the methods countries have used to estimate noise exposure. The correlation between the total number of inhabitants in an urban area and the number of people exposed to road traffic noise is very strong.

Fifteen Member States reported that more than 50 % of inhabitants of urban areas (an urban agglomeration with more than 100 000 inhabitants) were exposed to road noise L_{den} levels above 55 dB (Figure 2). Of these, four reported figures of more than 75 % for the equivalent exposure (i.e. Cyprus followed by Belgium, Bulgaria and Latvia). At the other end of the scale, the reported number of inhabitants exposed to road noise L_{den} levels above 55 dB in Malta, Germany, and the United Kingdom (in order of magnitude) was below 25 %. As mentioned above, however, country-specific data are not necessarily comparable due to the different modelling approaches for estimating noise exposure currently used across the Member States.

Figure 2. Percentage of population exposed to high annual average road-noise levels within urban areas, by country, 2012



Data sources: EEA. Reported data on noise exposure covered by Directive 2002/49/EC

Note: 55 dB Lden is the EU indicator threshold for noise exposure defined in the Environmental Noise Directive. It indicates an annual average level during the day, evening and night; dB=decibel.

Outlook beyond 2020

Regarding the long-term outlook for exposure to environmental noise in Europe, there are a number of challenges to reducing population exposure to noise pollution. Economic growth and expanding transport networks can lead to increased transport levels that could, in turn, increase noise pollution. At the same time, trends towards increasing urbanisation (Eurostat, 2016) could lead to higher numbers of people being exposed. Transport demand, including for passenger cars is expected to increase by 2050 (EC, 2016 and EEA, 2015), with noise from road traffic representing the dominant source of environmental noise and noise from air traffic also set to increase (EASA et al, 2016). While the use of electric cars currently contributes to lower noise levels at low speeds in urban areas, the new EU regulation on the sound levels of motor vehicles (EU, 2014) will require the installation of artificial sound generators in all electric and hybrid vehicles by 2021 to improve safety for pedestrians. Whether or not exposure to noise increases or decreases beyond 2020 depends on the relative rates of these as well as of other developments.

About the indicator

The END requires two main indicators to be applied in the assessment and management of environmental noise. The first indicator (L_{den}) is the annual average noise level for the day, evening and night periods and is designed to measure 'annoyance'. The END defines an L_{den} threshold of 55 dB. The second indicator (L_{night}) is the annual average noise level for night-time periods and is designed to assess sleep disturbance. The END defines an L_{night} threshold of 50 dB. Member States must report the numbers of people who are exposed to noise levels above both thresholds for each noise source (e.g. roads, railways, airports and industry). The EEA uses the reported data to publish an indicator for environmental noise in Europe that focuses on environmental noise exposure to L_{den} and L_{night} (EEA, 2018). A complete assessment of exposure to environmental noise and a prognosis regarding the future outlook are hindered by the fact that exposure estimates reported by countries are not complete. In such instances, the gaps in the reported data have been filled with expert estimates. The lack of comparable and common assessment methods often causes significant inconsistencies between exposure estimates from different countries, for regions and cities within a single country and across the two reporting rounds (2007 and 2012) for which data have been compiled to date.

Footnotes and references

[1] The estimates cover the 28 EU Member States as well as the five member countries of the European Environment Agency (Iceland, Liechtenstein, Norway, Switzerland and Turkey).

[2] The 2012 noise exposure data were updated in this 2018 environmental noise briefing, compared with the 2012 data presented in the 2017 environmental noise briefing. The update reflects the more recent country submissions and redeliveries under the END that were received by EEA by the end of March 2017 and subsequently processed and quality checked. The differences compared with the previous year's data set are minimal, and therefore the number of premature deaths and of adults estimated to suffer annoyance and sleep disturbance were left unchanged.

[3] The END defines major roads as those having more than three million vehicle passages per year, major railways as those having more than 30 000 train passages per year, and major airports as those having more than 50 000 flight movements (take offs or landings) per year.

Clark, C., Paunovic, K., 2018, WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Cognition. Int. J. Environ. Res. Public Health 15(2), 285.

EASA, EEA and Eurocontrol, 2016, European Aviation Environmental Report 2016, European Aviation Safety Agency, Cologne.

EC, 2016, EU reference scenario 2016 — Energy, transport and GHG emissions — Trends to 2050, European Commission, Brussels.

EC, 2018, EU transport in figures — Statistical pocket book 2018 (https://publications.europa.eu/en/publication-detail/-/publication/52f721ed-c6b8-11e8-9424-01aa75ed71a1) accessed 15 November 2018.

EEA, 2014, Noise in Europe 2014, EEA Report No 10/2014, European Environment Agency.

EEA, 2015, Evaluating 15 years of transport and environmental policy integration, EEA Report No 7/2015, European Environment Agency.

EEA, 2017, Managing exposure to noise in Europe, (https://www.eea.europa.eu/themes/human/noise/sub-sections/noise-in-europe-updated-population-exposure) accessed 12 April 2018.

EEA, 2018, 'Population exposure to environmental noise (CSI 051/TERM 005) (https://www.eea.europa.eu/data-and-maps/indicators/exposure-to-and-annoyance-by-2/assessment-2) accessed 20 September 2018.

ETC-ACM, 2016, Blanes N, Fons J, Houthuijs D, Swart W, de la Maza MS, Ramos MJ, et al., Noise in Europe 2017: updated assessment., European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), Bilthoven, The Netherlands, (https://acm.eionet.europa.eu/reports/docs/ETCACM_TP_2016_13_NoiseInEurope2017.pdf) accessed 7 May 2018.

EU, 2002, Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise (OJ L 189, 18.7.2002, p. 12–25).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2016, Urban Europe — Statistics on cities, towns and suburbs — Eurostat (http://ec.europa.eu/eurostat/documents/3217494/7596823/KS-01-16-691-EN-N.pdf/0abf140c-ccc7-4a7f-b236-682effcde10f) accessed 12 April 2018.

WHO, 2009, Night noise guidelines for Europe, World Health Organization Regional Office for Europe, Copenhagen.

WHO, 2011, Burden of disease from environmental noise — Quantification of healthy life years lost in Europe, World Health Organization Regional Office for Europe, Copenhagen.

AIRS briefings

AIRS_PO3.1, 2018, Outdoor air quality in urban areas, European Environment Agency.

> Environmental indicator report 2018 – In support to the monitoring of the 7th Environment Action Programme, EEA report No19/2018, European Environment Agency

Published on 29 Nov 2018

Environment and health

Consumption of hazardous chemicals

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook for the EU meeting the selected objective by 2020
Consumption of chemicals, by hazard class		Risks for the environment and health associated with the use of hazardous substances, including chemicals in products, are assessed and minimised — 7th EAP	

While the consumption of chemicals that are hazardous to health and the environment has declined over the years, it is not possible to equate this to a reduction in the accumulated risks to the environment and health. This is mainly because not all hazards and sources of chemical exposures have been included. The outlook towards 2020 is therefore unclear.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2018

The Seventh Environment Action Programme (7th EAP) includes an objective of assessing and minimising risks to the environment and health associated with the use of hazardous substances. The consumption of chemicals provides benefits to society, but can also entail risks to the environment and human health. Risk depends on both the intrinsic hazard of chemicals and exposure to them, and while data on the hazardous properties of chemical substances is improving, the data quality is often unsatisfactory, and environmental and human exposure is poorly documented. The consumption volumes of industrial (i.e. manufactured) chemicals that are hazardous to human and environmental health are used as a rough proxy for exposure. From 2004 to 2016, the consumption of these hazardous chemicals declined by almost 11 % in the EU. This may indicate the move of the production of some hazardous chemicals outside Europe and/or a shift towards safer chemicals. However, as consumption volumes are not directly related to risks to the environment and to health from exposure to chemicals, the decline provides a weak indication of progress towards the objective. Furthermore, the indicator does not include some types of hazard, exposure from chemicals in imported products and from accumulated chemicals, and it does not take changing exposure patterns or mixture toxicity into account. Therefore, this briefing rather serves to highlight gaps in the evidence base for assessing risks to the environment and to human health associated with the use of hazardous substances.

Setting the scene

The 7th EAP (EU, 2013) includes a number of chemical-related goals, one of which is that health and environmental risks associated with the use of hazardous substances, including chemicals in products, should be assessed and minimised by 2020. Under the Regulation on the classification, labelling and packaging (CLP) of substances and mixtures, chemicals are classified as hazardous on the basis of properties that generate physical, environmental and health hazards (EU, 2008). While the consumption of chemicals provides benefits to society, exposure to hazardous chemicals emitted along the chemical life cycle (i.e. production, use, and disposal/incineration/recycling) can generate significant risks to health and ecosystems. The risk of disease is a combination of how hazardous (toxic) the chemicals are and how great the exposure is. Exposure is a result of the combined exposures to single chemicals from various sources, but also from mixtures of chemicals with various toxicities (Bopp, 2018). Hazardous chemicals have been detected in human populations and linked to environmental, product and dietary exposures (Smolders et al., 2015), as well as to workplace exposures. Human exposure to chemicals may lead to different disease outcomes such as allergy and cancer (Prüss-Ustün et al., 2011). Chemical pollution can degrade air and water quality, and can impact negatively on ecosystem services (Gross and Birnbaum, 2017), and terrestrial life (Hallmann, 2017) as well as aquatic organisms (Malaj, 2014).

Policy targets and progress

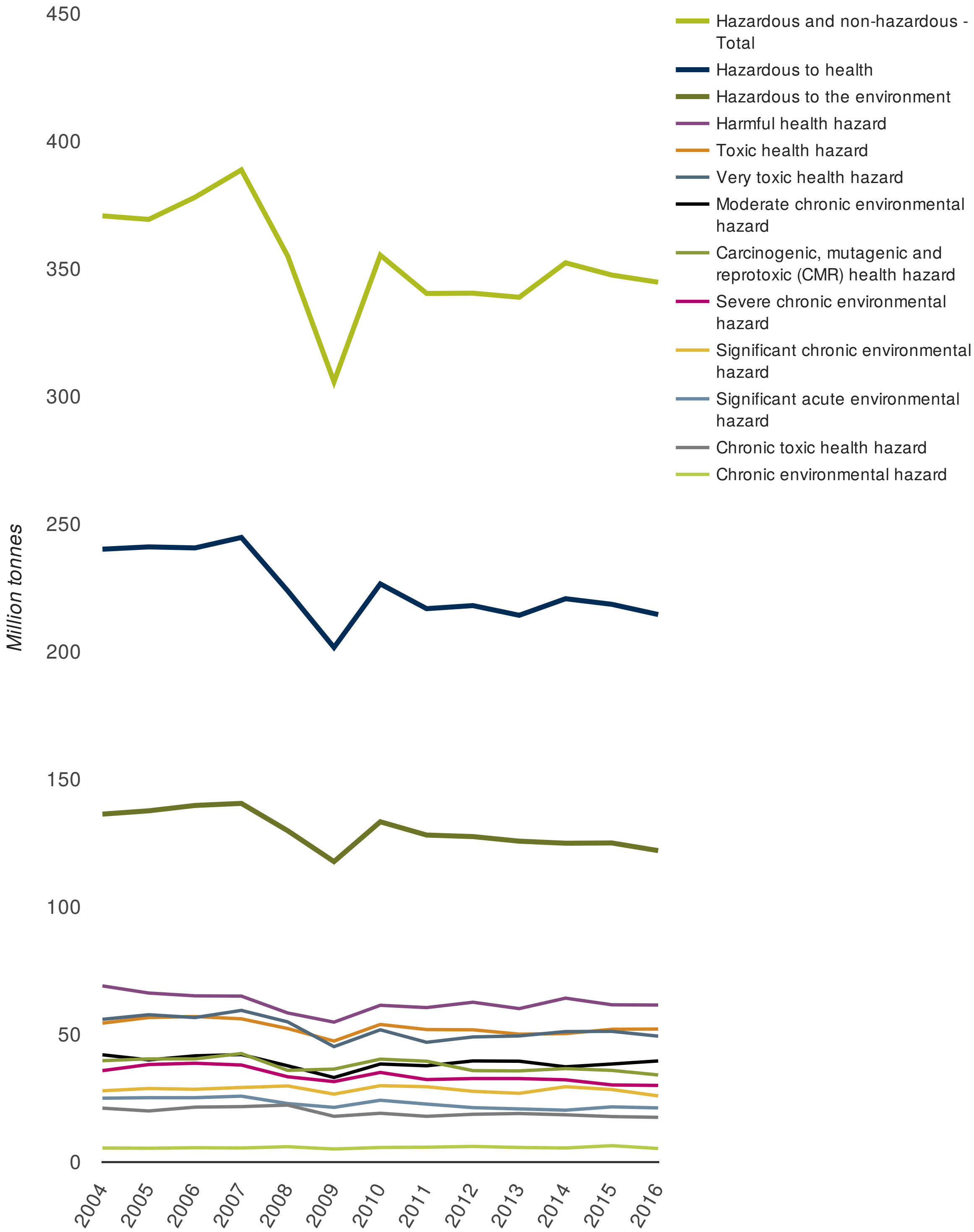
The Regulation on the registration, evaluation, authorisation and restriction of chemicals (REACH) (EU, 2006) aims to improve the protection of human health and the environment from the risks posed by chemicals. REACH also calls for the progressive substitution of the most hazardous chemicals, when suitable alternatives have been identified[1].

Eurostat has developed a set of indicators to monitor progress towards two major goals of REACH: to improve the quality of data for chemical risk assessment and to reduce the risks posed by chemicals to humans and the environment (Eurostat, 2009). Analysis using these indicators suggests that REACH implementation resulted in better risk control of known chemicals of concern for which specific actions had been set, e.g. for substances of very high concern (SVHCs) (Eurostat, 2012). However, since the SVHC indicator only measures chemicals indentified as SVHCs, it does not indicate if the replacement chemicals are of similar or less concern. The regulation of groups of chemicals rather than single substances is being considered by the European Commission (EC, 2017) as a means to speed up the risk assessment and to avoid the so-called ‘regrettable substitution’. Nevertheless, progress is slow because of low quality data (ChemicalWatch, 2017).

In this context, it was found (UBA, 2015) that for chemicals that are produced in quantities greater than 1 000 tonnes/yr, only one (1) of the 1 814 investigated registration dossiers submitted to the European Chemicals Agency under REACH was compliant. A total of 58 % were ‘non-compliant’ and the remaining 42 % were inconclusive, mainly as a result of poor quality data and non-conclusive results.

Figure 1 provides an EU overview of the total consumption of chemicals and the proportion that is hazardous to health and to the environment. It covers the 2004 to 2016 period.

Figure 1. Consumption of chemicals that are hazardous to health and the environment, EU



Data sources: Eurostat. Production and consumption of chemicals by hazard class [env_chmhaz]

> **Note**: The consumption volumes are apparent as they are calculated by adding the net imports (imports minus exports) of chemicals to the production volume of the chemicals.

The total consumption of ‘hazardous and non-hazardous' chemicals decreased by 7 % between 2004 and 2016. The most significant decrease took place between 2007 and 2009 (21 %), mainly as a result of the 2008 economic downturn including its aftermath in 2009 (CEFIC, 2014).

Over the 2004-2016 period, the consumption of hazardous chemicals decreased by almost 11 %, both for chemicals that are hazardous to the environment and for chemicals that are hazardous to health. The tonnage proportion of chemicals that are hazardous to health in the total consumption of chemicals (hazardous and non-hazardous) decreased from 65 % in 2004 to 62 % in 2016. The proportion of chemicals that are hazardous to the environment decreased from 37% to 35% over the same period[2]. The 11 % decrease in the total tonnage consumption of hazardous chemicals may have been partly caused by a move to produce chemicals (hazardous and non-hazardous) outside Europe (OECD, 2012), as well as by some substitution of substances of high concern (SVHCs) with safer chemicals, as also noted by Eurostat (Eurostat, 2012).

It is assumed that reduced consumption volumes of chemicals that are hazardous to human and environmental health will equate to a reduction in the total risk posed by chemicals, including those incorporated into products and sold in the EU. This analysis draws on the fact that risks are a combination of how hazardous the chemical is and how high the exposure is. Risk is calculated as follows: Risk = Hazard x Exposure. If there is no consumption, there is no exposure and there will be no risk. Similarly, if the chemicals pose no hazards, there will be no risk.

In practice however, the picture is a bit more complicated. A chemical may pose several types of hazards (toxicities) and combined exposure to multiple chemicals can add up and cause mixture toxicity (Bopp, 2018). The information on the types, potency and mixture toxicity of the hazards is currently incomplete. For example, developmental toxicities (endocrine disruption, neurotoxicity and immunotoxicity) (3) and nanomaterials are not specifically addressed by the CLP criteria. In addition, it is primarily the most consumed chemical substances (in tonnes) in the EU that are undergoing an extensive hazard evaluation (ECHA, 2018), with the consequence that hazards from the least consumed chemicals (tonnes) are not as rigorously assessed. Furthermore, the type of hazard and its potency may change as the initial ‘chemical ingredients’ react to produce other chemical products (e.g. polymers) and by-products, which are not evaluated. This adds uncertainty to the list of ‘non-hazardous’ chemicals in the current indicator.

Similarly, there are a number of difficulties in assessing exposure. In particular, the indicator does not include a number of exposure types and routes to humans and the environment that add to exposure. For example, the indicator does not include the chemicals used in the past which are still present in old materials including in recycled materials or which have accumulated in the environment, due to their persistency or high use volumes. For instance, old and recycled products may contain polychlorinated biphenyls (PCBs) in buildings (Wöhrnschimmel, 2016) or brominated flame retardants (BFRs) in furniture and electrical appliances (EEB 2017, EC 2018a). Furthermore, the indicator does not take into account the pollution that originates from production outside of the EU and which can be transferred via air, water and via products into the EU. It is, therefore, of concern that the global production and consumption of chemicals is increasing (OECD, 2012; Bernhardt et al., 2017: CEFIC, 2018).

These factors make it difficult to use EU consumption volumes of chemicals that are hazardous to health and the environment as a proxy for risks presented by those chemicals. It is, therefore, not possible to accurately report progress towards the goal of minimising risks to the environment and health on the basis of this indicator. It is, however, positive that there has been a decline of 11 % in the consumption of chemicals that are hazardous to the environment and health since 2004. The question is, however, if this positive trend is offset by other exposures not included in this indicator, namely via chemicals in imported or recycled/reused products, from accumulated persistent and legacy chemicals or from environmental contamination along the chemical's production, use, disposal and recycling life cycle. This questions the ability to reach the objective by 2020.

Outlook beyond 2020

The outlook beyond 2020 is uncertain for a number of reasons.

The global production of chemicals is foreseen to increase (OECD, 2012; Bernhardt et al., 2017 and CEFIC, 2018). Increased exposure will become more common. The need to recycle resources and a circular economy may keep populations exposed to legacy chemicals in recycled products and increased flooding due to climate change may remobilise deposited chemicals (EU, 2013; EC, 2017; Bogdal, 2009). In addition, trends in urbanisation and the tendency of people to spend more time indoors will increase exposure to indoor and outdoor air pollution.

As mentioned previously, estimating chemical risk is difficult because there is incomplete information on the hazards of chemicals to both humans and the environment. It is, however, certain that chemicals for which its hazards and exposure have not yet been characterised, do pose a risk, and that higher exposure leads to higher risk. There is also a lack of information on exposure levels, as well as on associations between exposure and impact to humans and to the environment, and the causal mechanisms involved. For humans, recent EU funded research aims to close that gap by using human biomonitoring to generate evidence for the link between exposure to mixtures of chemicals and the health of the European population (EEA, 2018).

The importance of achieving a high level of protection of human health and the environment through a non-toxic environment strategy — as foreseen in the 7th EAP by 2018, — was emphasised by the European Environment Council in their conclusions from 19 December 2016 (Council, 2016). The non-toxic environment strategy should address the sensitivity of vulnerable groups, very persistent chemicals, endocrine disrupting chemicals and exposure to chemicals in products. Recent initiatives by the EU, Member States and the OECD aim to increase the use of less hazardous chemicals by promoting the innovation and use of non-chemical alternatives, and chemicals and products that are safer-by-design across their entire life cycles (EEA, 2018). The recent REFIT exercise that assessed the effectiveness and coherence of the EU chemicals legislation (EC, 2018b and 2018c) found that there is a need to speed up the substitution of hazardous chemicals with less hazardous alternatives. It identified the benefits of developing cross-horizontal legislation criteria for the identification of hazards such as persistency and endocrine disruptors (EDs), of grouping chemicals more widely, and of addressing combined exposure and mixture toxicity. It also found that certain areas such as workplaces need more attention to reduce exposures to e.g. carcinogens, mutagens and reproductive toxicants (CMRs). Moreover, it found that the issue of tracking chemicals of concern in products — particularly imported, reused and recycled products — needed more attention to guarantee the quality of these products.

In 2002, participants at the United Nations World Summit on Sustainable Development, including the EU and its Member States, made a commitment to the sound management of chemicals throughout their life cycle. This commitment aims ‘to achieve, by 2020, that chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment’ (UN, 2002). This goal was reaffirmed at the Rio+20 conference (UN, 2012). Furthermore, work has been launched by the UN to prepare recommendations for a future platform for the sound management of chemicals and waste beyond 2020. In addition, the Sustainable Development Goals (UN, 2015) set a global agenda until 2030 and define the risks from chemicals under several topics, including goals to ensure sustainable consumption and production patterns, to ensure healthy lives and promote well-being for all at all ages, and to ensure the availability and sustainable management of water and sanitation for all.

About the indicator

The indicator tracks the consumption of industrial (i.e. manufactured) chemicals that are hazardous to human health and the environment. The consumption indicators build on the results of the production indicators. The consumption volume is apparent and is calculated by adding the net imports (imports minus exports) of hazardous chemicals to the production volume of hazardous chemicals (Eurostat, 2017). It includes five toxicity classes of chemicals that are hazardous to human health and five toxicity classes of chemicals that are hazardous to the environment; the classes are illustrated in Figure 1. These classes of chemicals exhibit properties that have an impact on human health and the environment and are derived from the hazard statements described under the Regulation on the classification, labelling and packaging of substances and mixtures (EU, 2008). Further information on how the toxicity classes are assigned is available in EC, 2016.

The scope of the indicator is limited, since it does not cover all possible impacts on human health or the environment, or the ways in which exposure may occur. By taking the consumption of chemicals that are hazardous to health and the environment as a rough proxy for exposure, a fall in consumption may imply a reduction in exposure. However, there are a number of limitations when extrapolating exposure from consumption, as also described in the policy targets and progress section.

Footnotes and references

[1] In addition to the horizontal REACH legislation, products (i.e. articles and chemical mixtures and formulations) may be regulated through a number of thematic regulations, which may have specific policy targets. These include the regulations on biocides (EU, 2012), fertilisers (EU, 2004a), pharmaceuticals (EU, 1965), detergents (EU, 2004b), cosmetics (EU, 2009) and food contact materials (EU, 2004c). The thematic regulations typically aim at minimising exposure to hazardous chemicals during the use phase of the final (commercial) product, and do not assess chemical exposure to the environment (or humans) during the production or the disposal/reuse phases. Products produced outside the EU are also relevant for human health and the environment but they are not part of the chemical consumption data.

[2] Most of the chemicals that are hazardous to health are also hazardous to the environment.

[3] Exposure of unborn or young children to developmental toxicity chemicals may lead to diseases later in life or in the following generations (Mennigen, 2018).

Bernhardt E.S., et al., 2017, 'Synthetic chemicals as agents of global change', Front Ecol Environ 2017; 15(2): 84–90, doi:10.1002/fee.1450.

Bogdal C., et al., 2009, 'Blast from the Past: Melting Glaciers as a Relevant Source for Persistent Organic Pollutants', Environmental Science & Technology 2009 43 (21), 8173-8177, doi: 10.1021/es901628x.

Bopp S.K., et al, 2018, 'Current EU research activities on combined exposure to multiple chemicals, review', Environment International, 120, 544-562.

CEFIC, 2015, 'Competitiveness of the European Chemical Industry – How to regain ground in the global market' (http://www.cefic.org/Documents/RESOURCES/Reports-and-Brochure/Competitiveness-of-the-European-chemical-industry-2014.pdf) accessed 4 September 2018.

CEFIC, 2018, 'Positive growth continues in 2018 for EU chemicals sector' (http://www.cefic.org/Documents/RESOURCES/Chemical%20Trends%20Report/2018-04-23_Cefic_Chemicals_Trends_Report.pdf) accessed 6 September 2018.

Chemical Watch 2017, REACH data quality comes under renewed fire: Poor dossier quality is slowing substance evaluation (https://chemicalwatch.com/57000/reach-data-quality-comes-under-renewed-fire) accessed 28 August 2018.

Council, 2016, Outcome of the Council meeting, 3512nd Council meeting, Environment, Brussels, 19 December 2016, Council of the European Union, 15703/16 (http://www.consilium.europa.eu/en/meetings/env/2016/12/19/) accessed 16 July 2018.

EC, 2016, Compilation of chemical indicators — Development, revision and additional analyses, KS-TC-15-006, ISSN: 2315-0807, (https://ec.europa.eu/eurostat/web/products-statistical-working-papers/-/KS-TC-15-006?inheritRedirect=true) accessed 30 October 2018.

EC, 2017, 'Study for the strategy for a non-toxic environment of the 7th Environment Action Programme Final Report' (http://ec.europa.eu/environment/chemicals/non-toxic/pdf/NTE%20main%20report%20final.pdf) accessed 16 July 2018.

EC, 2018a, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the implementation of the circular economy package: options to address the interface between chemical, product and waste legislation, COM(2018) 21 of 16.1.2018 (https://ec.europa.eu/docsroom/documents/27321) accessed 3 September 2018.

EC, 2018b, 'Chemicals, Fitness Check', European Commission Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (GROW) (http://ec.europa.eu/growth/sectors/chemicals/ec-support_en) accessed 28 August 2018.

EC, 2018c, 'Better Regulation, Fitness Check' European Commission Directorate General for the Environment (http://ec.europa.eu/environment/chemicals/better_regulation/index_en.htm) accessed 28 August 2018.

ECHA, 2017, 'Strategy to promote substitution to safer chemicals through innovation' (https://echa.europa.eu/documents/10162/2792271/mb_58_2017_2_annex_strategy_substitution_safer_alternatives_en.pdf/d1c31c63-4047-e7be-75d1-12320a4a8489) accessed 22 October 2018.

ECHA, 2018, 'Information requirements' (https://echa.europa.eu/regulations/reach/registration/information-requirements) accessed 6 September 2018.

EEA and JRC, 2013,' Environment and human health', joint report by the EEA and the European Commission Joint Research Centre (JRC), EEA Report No 5/2013, European Environment Agency, Copenhagen.

EEA, 2018, Chemicals for a sustainable future, ISBN 978-92-9213-936-0, doi: 10.2800/92493, European Environment Agency, Copenhagen.

EEB, 2017, 'Keeping it clean: How to protect the circular economy from hazardous substances', European Environmental Bureau report prepared by ClientEarth (https://www.documents.clientearth.org/library/download-info/keeping-it-clean-how-to-protect-the-circular-economy-from-hazardous-substances/) accessed 6 September 2018.

EU, 1965, Council Directive 65/65/EEC of 26 January 1965 on the approximation of provisions laid down by Law, Regulation or Administrative Action relating to proprietary medicinal products, Official Journal of the European Union L22, 369–373 (1965).

EU, 1967, Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (OJ 196, 16.8.1967, p. 1–98).

EU, 2004a, Regulation (EC) No 1257/2014 of 24 November 2014 amending Regulation (EC) No 2003/2003 of the European Parliament and of the Council relating to fertilisers for the purposes of adapting Annexes I and IV, Official Journal of the European Union, L337, 53–65 (2004).

EU, 2004b, Regulation (EC) No 648/2004 of the European Parliament and of the Council of 31 March 2004 on detergents, Official Journal of the European Union L104, 1-35 (2004).

EU, 2004c, Regulation (EC) No. 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC, Official Journal of the European Union L338, 4-17 (2004).

EU, 2006, Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (OJ L 396, 30.12.2006, p. 1).

EU, 2008, Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, Official Journal of the European Union, L 353, 31.12.2008, 1–1355.

EU, 2009, Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products, Official Journal of the European Union L104, 1-35 (2004).

EU, 2012, Regulation (EC) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, Official Journal of the European Union, L 167, 1–123 (2012).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2009, The REACH baseline study. A tool to monitor the new EU policy on chemicals — REACH, Eurostat, Luxembourg.

Eurostat, 2012, The REACH baseline study 5 years update — Comprehensive study report, 2012 edition (http://ec.europa.eu/eurostat/web/products-statistical-working-papers/-/KS-RA-12-019) accessed 16 July 2018.

Eurostat, 2017, 'Statistics explained - Chemicals production and consumption statistics' (http://ec.europa.eu/eurostat/statistics-explained/index.php/Chemicals_production_and_consumption_statistics) accessed 16 July 2018.

Gross L., Birnbaum L.S., 2017, 'Regulating toxic chemicals for public and environmental health', PLoS Biol 15(12): e2004814 (https://doi.org/10.1371/journal.pbio.2004814) accessed 16 July 2018.

Hallmann C.A. et al., 2017, 'More than 75 percent decline over 27 years in total flying insect biomass in protected areas', PLOS ONE 12, e0185809 (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809) accessed 31 October 2018.

Malaj, E. et al., 2014, 'Organic chemicals jeopardize the health of freshwater ecosystems on the continental scale', Proceedings of the National Academy of Sciences, 111(26), 9549–9554, (http://doi.org/10.1073/pnas.1321082111) accessed 31 October 2018.

Mennigen, J. A., et al., 2018, 'Transgenerational effects of polychlorinated biphenyls: 1. Development and physiology across 3 generations of rats' Environmental Health: A Global Access Science Source, 17(1), 1–12, (http://doi.org/10.1186/s12940-018-0362-5) accessed 24 August 2018.

OECD, 2012, 'OCED Environmental Outlook to 2050 – The consequences of inaction', OECD Publishing (http://dx.doi.org/10.1787/9789264122246-en) aAccessed 16 July 2018.

Prüss-Ustün A., et al., 2011, 'Knowns and unknowns on burden of disease due to chemicals: a systematic review', Environmental Health, (10:9) (http://www.ehjournal.net/content/10/1/9) accessed 16 July 2018.

Smolders R., et al., 2015, 'Interpreting biomarker data from the COPHES/DEMOCOPHES twin projects: Using external exposure data to understand biomarker differences among countries', Environmental Research, (141:86-95) (http://linkinghub.elsevier.com/retrieve/pii/S0013-9351(14)00276-X) accessed 16 July 2018.

UBA, 2015, REACH Compliance: Data availability of REACH registrations. Part 1: Screening of chemicals > 1000 tpa, 43/2015, Report no. (UBA-FB) 002111 (http://www.umweltbundesamt.de/publikationen/reach-compliance-data-availability-of-reach) accessed 24 August 2018.

UN, 2002, Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August–4 September 2002, United Nations, New York.

UN, 2012,The future we want, United Nations General Assembly Resolution A/Res/66/288 of 27 July 2012 on the outcome of the Rio+20 Conference, United Nations, New York.

UN, 2015,Transforming our world: the 2030 Agenda for Sustainable Development, United Nations Resolution A/RES/70/1 of 25 September 2015, United Nations, New York.

Wöhrnschimmel, H., at al.,2016, 'Ten years after entry into force of the Stockholm Convention: What do air monitoring data tell about its effectiveness?' Environmental Pollution, 217, 149–158, (http://doi.org/10.1016/j.envpol.2016.01.090) accessed 31 October 2018.

Environmental indicator report 2018 – In support to the monitoring of the 7th Environment Action Programme, EEA report No19/2018, European Environment Agency

Published on 29 Nov 2018

Environment and health

Pesticide sales

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook for the EU meeting the selected objective by 2020
Total sales of pesticides		The use of plant protection products does not have any harmful effects on human health or unacceptable influence on the environment, and such products are used sustainably — 7th EAP	

The total sales of pesticides remained constant between 2011 and 2016, indicating that there was no less reliance on pesticides in Europe. This indicator does not allow, at present, for a full evaluation of progress towards the 2020 objective as pesticide sales are not synonymous with the risk of harmful effects on humans and the environment. The outlook towards 2020 is therefore unclear.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2018

The Seventh Environment Action Programme (7th EAP) sets the objective that by 2020 the use of plant protection products does not have any harmful effects on human health or unacceptable influence on the environment, and that such products should be used sustainably. Total reported sales of pesticides in the EU did not decrease between 2011 and 2016. The shares of different pesticide sale groups also remained relatively constant until 2015, while changes in 2016 may have been influenced by the 5-yearly update of allowed pesticides. Pesticide sales do not adequately indicate the harmful effects of pesticide use on human health and the environment. This is because these harmful effects also depend, inter alia, on the hazardous properties and on the actual use of the pesticides. It is therefore not possible, based on this indicator, to reach firm conclusions on progress towards meeting the selected 7th EAP objective by 2020. However, the evolution of pesticide sales data does not point to a Europe wide shift towards pesticide use reducing environmental and human exposure to these chemicals. This raises concerns over the likelihood of the objective being met by 2020.

Setting the scene

Pesticide (or plant protection product) use plays an important role in agricultural production, and in horticulture and forestry, by preventing disease and infestation of crops. However, pesticides applied to crops can enter the soil, as well as surface and groundwaters via leaching and run-off. They affect habitats and contribute to biodiversity loss, including large reductions of insect populations (Ewald, 2015 and Hallmann, 2017).[1] This may in turn lead to the deterioration of ecosystem services, such as insect-mediated pollination, soil formation and composition, and the provision of clean drinking water. Pesticide residues in food may, in addition, pose a risk to human health (Bjørling-Poulsen et al., 2008), while residues in animal feed pose risks to animal health and can enter the food chain. Particular concerns have been raised regarding the health impacts of human exposure to pesticides with endocrine-disrupting properties (Mnif et al., 2011) and the associated costs to human health (Trasande et al., 2015).[2] Other human health concerns relate to the neurotoxicity of e.g. insecticides, which can affect brain function, particularly if exposure occurs during foetal development (Bjørling-Poulsen et al., 2008).

The 7th EAP (EU, 2013a) sets the objective, that by 2020 the use of plant protection products should not have any harmful effects on human health or unacceptable influence on the environment, and that such products should be used in a sustainable way.

Policy targets and progress

Adopted in 2009, the Directive on the Sustainable Use of Pesticides (EU, 2009a) aims to reduce impacts on human health and the environment. To this end, Member States would have to establish National Action Plans including quantitative objectives, targets, measures and timetables. These plans should promote low-pesticide-input pest management and non-chemical methods, including both integrated pest management and organic farming. The first National Action Plans were communicated to the Commission in 2012 and are to be reviewed by the Member States at least every 5 years. Member States are to take all necessary measures to achieve the targets set out in the National Action Plans. A review by the EU Commission (EC, 2017c) revealed that in 2017 all Member States had plans in place.

Under the Regulation on plant protection products (EU, 2009b), the European Commission is required to identify active substances (i.e. active ingredients) with certain properties as candidates for substitution. Member States will then evaluate whether or not these active ingredients might be replaced by other pesticides that are less harmful. While this process is currently in the early stages of implementation, over time it should promote the use of less harmful pesticides and provide incentives to industry to develop pesticides with less hazardous properties.

The contamination of surface waters with pesticides is managed under the Water Framework Directive (EU, 2000), which requires upstream controls to reduce emissions, discharges and losses of substances under the Priority Substances Directive (EU, 2013b). The Groundwater Directive (EU, 2006) sets a maximum concentration of pesticides in groundwater. Member States also identify and set quality standards for River Basin Specific Pollutants in surface waters and Threshold Values in groundwaters for substances including some individual pesticides. The Drinking Water Directive (EU, 1998) stipulates a maximum concentration of 0.1 µg/l for any single pesticide and its relevant metabolites (to a maximum of 0.5 µg/l for total pesticides) in potable water. In 2013 — the latest year with available information — about 7 % of groundwater drinking water stations reported excessive levels for one or more of the 31 measured pesticides and their degradation products. In river drinking water stations up to 5 % had excessive levels in 2013 (Eurostat, 2013).

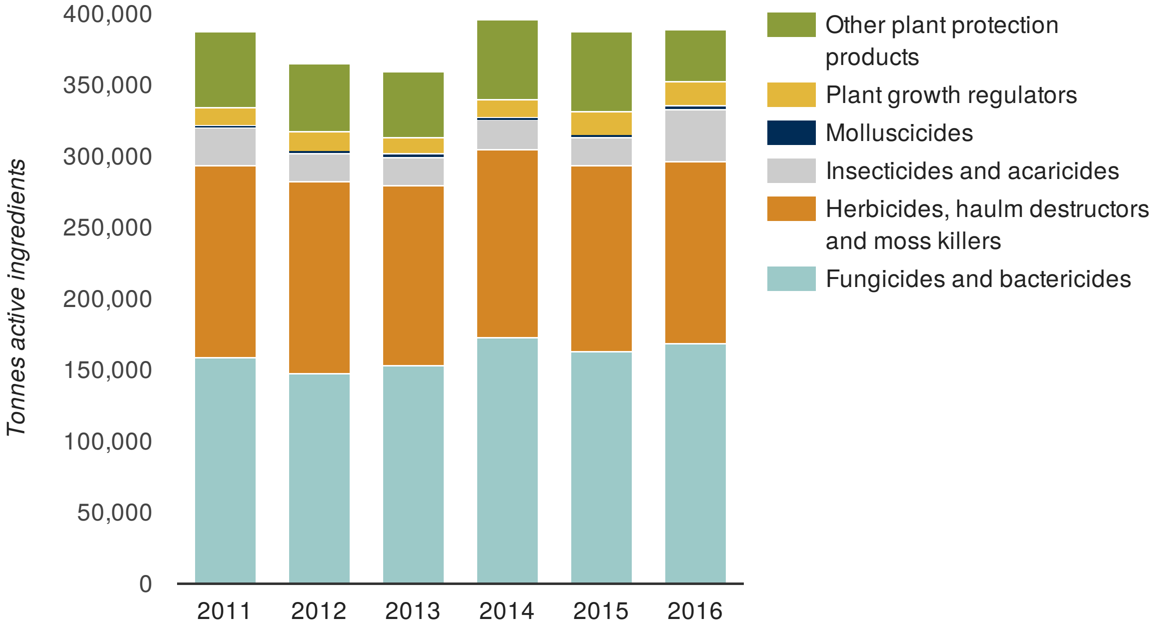
Thresholds are also applied for pesticide residues in food and feed (EU, 2005; EU, 2002). The latest annual report by the European Food Safety Authority concluded that 97.2 % of samples analysed fell within the maximum pesticide residue levels in food permitted in EU legislation (EFSA, 2017).
As harmonised monitoring data regarding the application of pesticides are not available, this briefing uses total pesticide sales figures as a rough proxy for tracking progress towards meeting the 7th EAP selected objective outlined above by 2020.

Figure 1 depicts the total sales of pesticides (in tonnes of active ingredients) in the EU over the 2011-2016 period, including the break down by pesticide group. It shows that the total pesticide sales for this period were relatively constant —2016 sales were 0.6 % higher than 2011 sales. It should be noted, however, that comparing the average of the last 3 years of the series (2014-2016) with the average of the first 3 years of the series (2011-2013) shows an increase in pesticide sales of 5.6 % over the period examined. Figure 1 also shows that the shares of different pesticide sales groups remained relatively constant until 2015. Changes in 2016 may have been influenced by the update of the list of allowed pesticides, which took place in 2016 [3].

Overall, the sales of pesticides are influenced by multiple factors, including weather conditions, crop types, farm profitability, distributor inventories and agricultural policies (Eurofins Agroscience Services Group, 2017). One factor driving particularly the insecticides market over time is for instance the development of insect resistance to specific chemicals (UNEP, 2012).

Pesticide sales only indicate a reliance on pesticides in terms of quantitative volumes of sold pesticides. Other relevant factors are not taken into account, such as actual application patterns and the hazards (toxic properties) of the active ingredients and additives (adjuvants) present in the pesticide product (Mesnage, 2014; Defarge, 2018). In fact, proper assessment of the environmental and human health risks would have required information on the use and toxicity of the pesticide sales groups as well as of the individual pesticides within each group. Such information is currently not available at European level (EC, 2017b). The weather, landscape, habitat and soil characteristics of the receiving ecosystem, as well as proximity to water bodies, also influence how pesticides disperse in the environment.

Figure 1. Total pesticides sales, EU



Data sources: Eurostat. Pesticide sales [aei_fm_salpest09] (24.04.2018)

Note: Where no data were reported, the gaps were filled using data from the closest year, with preference given to the previous year, when available. The gap filled spreadsheet is available on demand. In 2016, the classification of pesticide groups was updated and while this likely does not affect the sold volumes of a pesticide group, the toxicity of the groups may therefore not be fully compatible with data for 2011-2015.

With the aim of enabling an assessment of EU-level progress in reducing the risks and adverse effects of pesticides on human health and the environment, the Directive on the Sustainable Use of Pesticides envisages the establishment of harmonised risk indicators. It was foreseen to use data on pesticide use to develop these indicators. However, data collected under the Regulation on pesticide statistics (EU, 2009c) on the agricultural use of pesticides by crop proved to be too disparate in the first 5-year reporting period (EC, 2017a). Further harmonisation efforts are needed, which in the future would facilitate a better understanding of the risks to the environment and human health. Furthermore, there are examples of indicators that were developed by some countries (EC, 2017b) and this shows that it is possible to better monitor progress towards a more sustainable use of pesticides.

To enhance our understanding of current risks to human health and the environment, the data on pesticides sales would have to be combined not only with specific information on actual application and toxicity of the substances involved but, if possible, also with monitoring data on their occurrence in environmental media and human exposure. A complicating factor is that e.g. some herbicides also act as insecticides, and that some new insecticides are effective at a lower volume than those they replace (UNEP, 2012).

In this respect, and as mentioned earlier, under the Water Framework Directive, Member States monitor surface and groundwater bodies for priority substances, River Basin Specific Pollutants and groundwater pollutants of which several are pesticides. In addition, groundwater monitoring data are currently being reported to the EEA, which plans to publish the results in the course of 2018 (EEA, 2018). With regard to human exposure, a research initiative on Human Biomonitoring for Europe (HBM4EU) has been established to deliver data on the exposure of the European population to chemicals [4], including pesticides. These activities could complement the pesticide sales data to support a more robust assessment of the risks from pesticides to human health and the environment.

Apart from the active pesticide ingredients, plant protection products contain substantial amounts of additives, such as adjuvants and synergists, which are added to control, typically by increasing the uptake and toxicity of the active substances. Adjuvants can be toxic to both humans and the environment (Mesnage et al., 2014; Defarge, 2018) and fall within the scope of the Regulation (EU, 2009b). Currently no specific rules for the authorisation of adjuvants (including data requirements, notification, evaluation, assessment and decision making procedures) have been set at EU level.

Finally, the EU has recently reviewed measures in the Member States under the Directive on the Sustainable Use of Pesticides (EC 2017c). Referring specifically to the situation in Denmark, Germany, the Netherlands and Sweden, it concluded that, for example, stricter authorisation of pesticides has reduced the risk profile of the substances used. Pesticides sales data at country level (see Figure 2) shows that in three of these countries (Denmark, the Netherlands and Sweden), the use of pesticides is also declining. In other countries, however, an increasing trend can be observed. From a risk governance perspective, further reduction of the hazard profile of the authorised pesticides should ideally go hand in hand with measures to effectively reduce the reliance of agriculture, horticulture and forestry on pesticides.

In conclusion, the indicator tells us little about the absolute magnitude of the risks pesticides pose to humans and the environment. However, total sales of pesticides have not decreased since 2011 and the shares of different pesticides sales groups also remained relatively constant until 2015 (changes in 2016 may have been influenced by the 5-yearly update of allowed pesticides). Therefore, based on these data it is not possible to conclude that environmental and human exposures to pesticides have been reduced. This raises concerns as to the likelihood of the 7th EAP policy objective being met by 2020.

Country level information

In 2016, the countries with the highest quantities of pesticides sold were Spain followed by France, Italy, Germany and Poland, together making up 71 % of the EU's pesticide sales (Eurostat, 2018a).

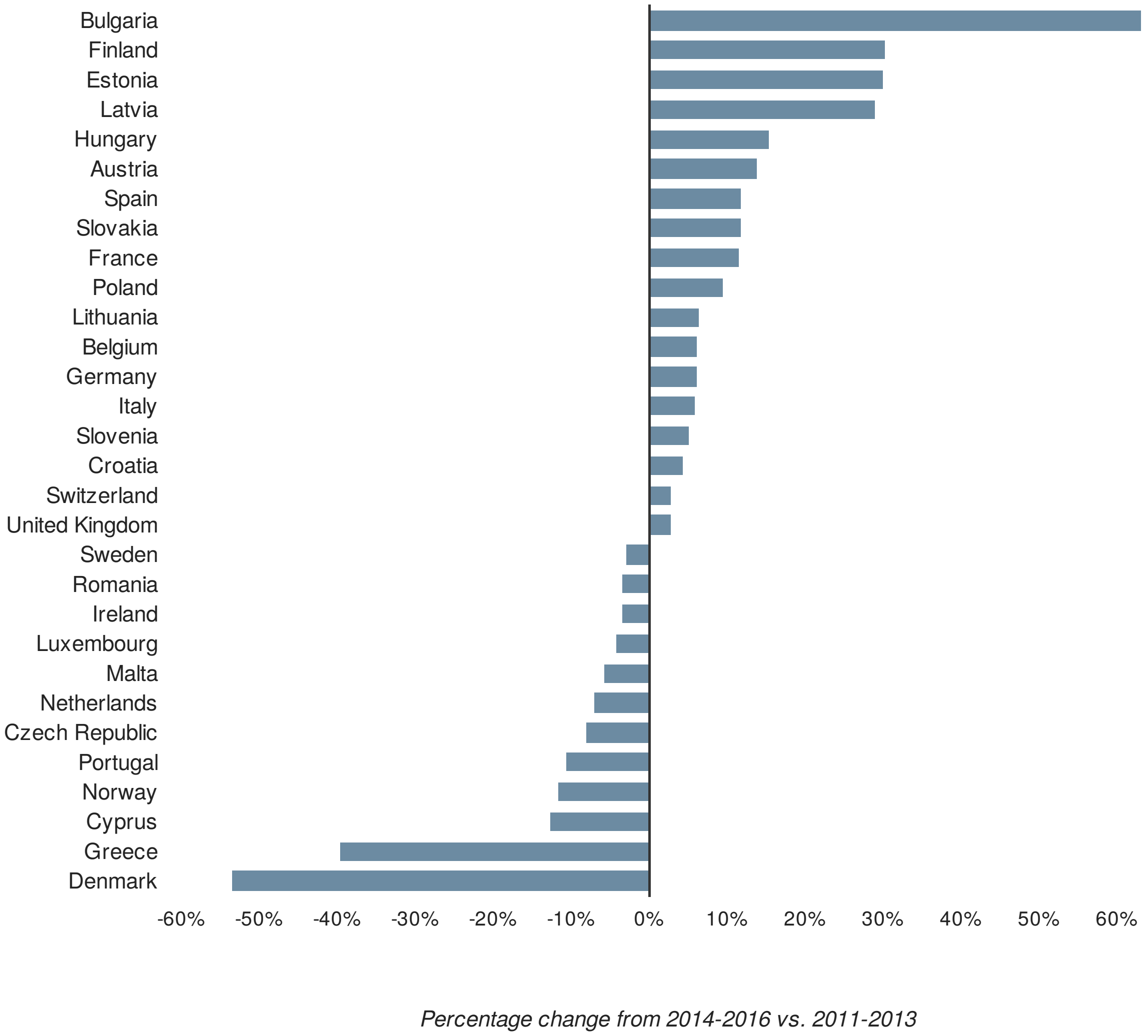
Figure 2 shows the percentage change in the sales of pesticides (in kilograms of active ingredients) per country for the average pesticide quantity sold in the period 2014-2016 compared with 2011-2013. Values were averaged over a three year period to minimise variations due to weather, disease and market conditions among others.

Figure 2 depicts considerable variation and contrasting trends in country pesticides sales. In more than half of the EU countries as well as in Switzerland, the average quantity of pesticides sold in the period 2014-2016 increased compared with the average quantity sold between 2011 and 2013. The biggest increases were in Bulgaria (63 %), followed by Finland and Estonia (30 %). The biggest decreases were in Denmark (54 %) and Greece (40 %).

In addition, an important consideration is the amount of pesticides applied per area of agricultural land. This is because countries with more intensive agriculture apply, on average, more pesticides per area of agricultural land than countries with less intensive agriculture. However, pesticides may be used for other purposes than agriculture, such as for lawns, golf courses, forestry and in public spaces. This is why Figure 2 shows instead the percentage change in the sales of pesticides.

As explained above, multiple economic, environmental and administrative/classification factors may influence the sales of pesticides in a specific year and country.

Figure 2. Percentage change in pesticide sales by country



Data sources: Eurostat. Pesticide sales [aei_fm_salpest09] (24.04.2018)

Note: The average volumes of pesticides sold (kg of active ingredient) per country for the periods 2011-2013 and 2014-2016 are available online by hovering over this figure, pressing 'Explore and then selecting 'Table'. Where no data were reported, the gaps were filled using data from the closest year, with preference to the previous year, when available. The gap filled spreadsheet is available on demand. Data for 2016 are not fully compatible with data for 2011-2015 due to changes in the classification of pesticide groups.

Outlook beyond 2020

There are a number of conflicting trends expected to influence future demand for pesticides. The implementation of National Action Plans by Member States should foster the sustainable use of pesticides in the long term, as well as promoting integrated pest management and organic farming.

The EU has seen an upward trend in organic farming, with the total organic area in the EU having increased from 5.6 % in 2012 to 6.7 % in 2016 of the total utilised agricultural area (Eurostat, 2017). While a continuation of this trend in future years may serve to reduce overall EU demand for pesticides, there is a significant variation in the proportion of organic farming in agricultural production among different EU Member States.

On the other hand, global food production will need to increase in order to feed a population estimated to rise above 9.6 billion by 2050 (EEA, 2015). The associated increase in demand may drive further intensification of agricultural production and lead to an increased demand for agrochemicals (in the EU or in third countries). This may also lead to an increase in human exposure to pesticides from imported foods, which have higher pesticide residue levels, including of pesticides that are no longer allowed in the EU (EFSA, 2017). Climate change may also influence the future use pattern of pesticides. Moreover, further research is needed to fully understand how the adjuvants and synergists in pesticide formulas may present risks in themselves or promote the risk of pesticides to the environment or to people (Martin et al., 2011).

In terms of technological developments, precision agriculture and smart technology offer the potential to optimise the relationship between productivity and inputs, thereby increasing the sustainability of agricultural production. The approach employs sensors and global navigation satellite systems to manage spatial and temporal variability in the demand for agricultural inputs. In the case of pesticides, this involves ensuring that application rates are precisely tailored to needs, for example, by responding to variability in the scale and density of crops or the presence of natural enemies of insect pests. Further research is required to fully understand the environmental benefits of precision agriculture and to promote its uptake, where relevant (JRC, 2015).

About the indicator

The indicator provides data on the volumes of sales of the active substances (or active ingredients) contained in pesticides; the data are broken down by main pesticide groups. Sales data for active substances are reported by Member States to Eurostat under the Regulation on pesticide statistics (EU, 2009c). This Regulation covers pesticides, or plant protection products, defined as products consisting of or containing active substances, safeners or synergists (Foy and Pritchard, 2018), and intended for one of the following uses:

- protecting plants or plant products against all harmful organisms or preventing the action of such organisms, unless the main purpose of these products is considered to be for reasons of hygiene rather than for the protection of plants or plant products;
- influencing the life processes of plants, such as substances influencing their growth, other than as a nutrient; preserving plant products, in so far as such substances or products are not subject to special European Community provisions on preservatives;
- destroying undesired plants or parts of plants, except algae, unless the products are applied on soil or water to protect plants; or
- checking or preventing undesired growth of plants, except algae.

An active substance (ingredient) is a substance or micro-organism, including viruses, that acts in a general or specific way against harmful organisms or on plants, parts of plants or plant products. This indicator does not address biocides.

Pesticide sales data can only provide a proxy for the actual use of pesticides, as they do not account for storage for later use, wastage or the transport of pesticide products across borders. Data on the actual application of pesticides by crop and by region, as well as monitoring for a wider range of pesticides and pesticide adjuvants in the environment, water and in human blood, would allow improved understanding of the risks to human health and the environment. The European Commission report on the implementation of the Regulation on pesticide statistics explains, inter alia, why data on the use of pesticides are not yet available (EC, 2017a).

Footnotes and references

[1] Pesticides in European streams have been linked to a reduction in regional biodiversity of up to 42 % for invertebrates (Beketov et al., 2013) and, from 1989 to 2013 in some areas, reductions of up to 78 % for insects, 86 % for pollinators such as bees, and 27 % for species (Vogel, 2017). This has been linked to a combination of pesticide use (Geiger et al. 2010) and land-use changes. As a consequence, certain bird species populations (for example farmland birds) are declining as is the ability to produce fruits, berries and honey in Europe.

[2] In September 2017, the European Commission adopted scientific criteria to identify endocrine disruptors in plant protection products and in biocides (EC, 2017a) with the aim of protecting human health and the environment.

[3] The list of substances in the pesticide statistics regulation (EU, 2009c) is updated every 5 years to add substances that are newly authorised and to remove those that are no longer authorised. The new 5-year cycle started in 2016.

[4] Website for Human Biomonitoring for Europe (HBM4EU): https://www.hbm4eu.eu/about-hbm4eu/

Beketov M.A. et al., 2013, 'Pesticides reduce regional biodiversity of stream invertebrates', PNAS vol. 110 no. 27, 11039–11043, doi: 10.1073/pnas.1305618110.

Bjørling-Poulsen M. et al., 2008, 'Potential developmental neurotoxicity of pesticides used in Europe', Environmental Health, 2008;7:50. doi:10.1186/1476-069X-7-50.

Defarge N. et al., 2018, ’Toxicity of formulants and heavy metals in glyphosate-based herbicides and other pesticides’, Toxicology Reports, 5(October 2017), 156–163 (http://doi.org/10.1016/j.toxrep.2017.12.025) accessed 16 November 2018.

EC, 2017a, Report from the Commission to the European Parliament and the Council on the implementation of Regulation (EC) No 1185/2009 of the European Parliament and of the Council of 25 November 2009 concerning statistics on pesticides (COM(2017) 109 final).

EC, 2017b, OVERVIEW REPORT ON THE IMPLEMENTATION OF MEMBER STATES' MEASURES TO ACHIEVE THE SUSTAINABLE USE OF PESTICIDES UNDER DIRECTIVE 2009/128/EC, European Commission, Ref.Ares(2017)4789706-02/10/2017, (DG SANTE) 2017-6291.

EEA, 2015, European environment — state and outlook 2015: Assessment of global megatrends, European Environment Agency.

EEA, 2018, European waters — Assessment of status and pressures 2018, EEA Report No 7/2018, European Environment Agency, Copenhagen.

EFSA, 2017, ‘The 2015 European Union report on pesticide residues in food’, European Food Safety Authority, Scientific report, EFSA journal 2017; 15(4): 4791 134 pp. doi:10.2903/j.efsa.2017.4791.

EU, 1998, Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption (OJ L 330, 5.12.1998, p. 32–54).

EU, 2000, Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

EU, 2002, Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed (OJ L 140, 30.5.2002, p. 10–22).

EU, 2005, Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC (OJ L 70, 16.3.2005, p. 1–16).

EU, 2009a, Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides (OJ L 309, 24.11.2009, p. 71–86).

EU, 2009b, Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC (OJ L 309, 24.11.2009, p. 1–50).

EU, 2009c, Regulation (EC) No 1185/2009 of the European Parliament and of the Council of 25 November 2009 concerning statistics on pesticides (OJ L 234, 10.12.2009, p. 1–22).

EU, 2013a, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annex A, paragraph 54e (OJ L 354, 28.12.2013, p. 171–200).

EU, 2013b, Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy (OJ L 226, 24.8.2013, p. 1–17).

Eurofins Agroscience Services Group, 2017, ‘Annual Review 2016. Agrow Agribusiness intelligence’, (www.eurofins.com/agroscienceservices) accessed 15.05.2018.

Eurostat, 2013, ‘Agri-enviornmental indicator – pesticide pollution of water’ (http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Agri-environmental_indicator_-_pesticide_pollution_of_water) accessed 16 March 2018.

Eurostat, 2017, 'Organic farming statistics' (http://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics) accessed 16 March 2018.

Eurostat, 2018a, 'Pesticide sales', aei_fm_salpest09 (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=aei_fm_salpest09&lang=en) accessed 16 March 2018.

Eurostat, 2018b, 'Utilised agricultural area by categories', tag00025 (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tag00025&lang=en) accessed 16 March 2018.

Eurostat, 2018c, ‘Agri-environmental indicator – consumption of pesticides’ (https://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_consumption_of_pesticides, #Key_messages) accessed 30 October 2018.

Ewald J.A. et al., 2015, ‘Influences of extreme weather, climate and pesticide use on invertebrates in cereal fields over 42 years’, Global Change Biology 21(11):3931-3950 (https://doi.org/10.1111/gcb.13026 PMID: 26149473) accessed 17 November 2017.

Foy L.F. and Pritchard D.W., 2018, ‘Pesticide Formulation and Adjuvant Technology, CRC Press, ISBN 9781351425322.

Geiger F. et al., 2010, 'Persistent negative effects of pesticides on biodiversity and biological control potential on European farmland', Basic and Applied Ecology, Volume 11, Issue 2, March 2010, 97-105, ISSN 1439-1791, (https://doi.org/10.1016/j.baae.2009.12.001) accessed 16 March 2018.

Hallmann C.A. et al., 2017, ‘More than 75 percent decline over 27 years in total flying insect biomass in protected areas’, PLoS ONE 12 (10): e0185809 (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809)accessed 16 March 2018.

JRC, 2015, Precision agriculture: An opportunity for EU farmers — Potential support with the CAP 2014-2020, DG for Internal Policies, Study, Joint Research Centre of the European Commission, Seville.

Martin A. et al., 2011, ‘Pesticides and Formulation Technology’, Purdue University, Purdue Extension, PPP-31, Revised 1/11 (https://www.extension.purdue.edu/extmedia/ppp/ppp-31.pdf) accessed 16 March 2018.

Mesnage R. et al., 2014, 'Major pesticides are more toxic to human cells than their declared active principles', BioMed Res Int. 2014;2014. doi:10.1155/2014/179691.

Mnif W. et al., 2011, 'Effect of endocrine disruptor pesticides: A review', International Journal of Environmental Research and Public Health, (8.6) 2265–2303.

Trasande L. et al., 2015, 'Estimating burden and disease costs of exposure to endocrine-disrupting chemicals in the European Union', The Journal of Clinical Endocrinology and Metabolism, (100.4) 1245–1255.

UNEP, 2012, 'Global Chemical Outlook'. http://web.unep.org/chemicalsandwaste/what-we-do/policy-and-governance/global-chemicals-outlook) accessed 12 May 2018.

Vogel G., 2017, 'Where have all the insects gone?' (http://www.sciencemag.org/news/2017/05/where-have-all-insects-gone) accessed 16 March 2018.

Environmental indicator report 2018 – In support to the monitoring of the 7th Environment Action Programme, EEA report No19/2018, European Environment Agency

Published on 29 Nov 2018