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Environment and health

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Outdoor air quality in urban areas

Indicator	EU indicator past trend		Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Exceedance of air quality limit values in urban areas (nitrogen dioxide: NO_2; coarse dust particles: PM_{10}; ozone: O_3;fine particulate matter: $PM_{2.5}$)	▲ NO_2, PM_{10}	▲ O_3, $PM_{2.5}$	Meet Air Quality Directive standards for the protection of human health — Air Quality Directive	●
Despite reductions in concentrations in urban areas of coarse dust particles and nitrogen dioxide and no significant change in ozone and fine particulate matter, due to their high and widespread exceedance levels in urban areas it is unlikely that the air quality standards for these pollutants will be met by 2020				

The Seventh Environment Action Programme (7th EAP) includes the objective of ensuring that outdoor air quality in the EU has significantly improved 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, due to the implementation of EU legislation on emissions of air pollutants and air quality, key EU air quality standards for the protection of human health — concentrations of particulate matter (PM), ozone (O_3) and nitrogen dioxide (NO_2) — are currently not being met in various air quality monitoring stations in the EU. This is particularly true for urban areas, where more than 70 % of the EU population lives. This can be mainly attributed to the high level of emissions from road traffic and residential combustion in urban areas and unfavourable conditions for the dispersion of emissions due to topography and meteorological issues. Based on current trends and because of their high and widespread exceedances in urban areas, it is unlikely that the air quality standards for these pollutants 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.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

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, 2016a). According to WHO studies (WHO, 2013, 2014), 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) increases 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 on the impacts of chronic ozone exposure adding 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 Air Quality Directive (EU, 2008). This directive set 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 most troublesome pollutants in terms of harm to human health are particulate matter (PM), nitrogen dioxide (NO_2) and ground-level ozone (O_3). 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

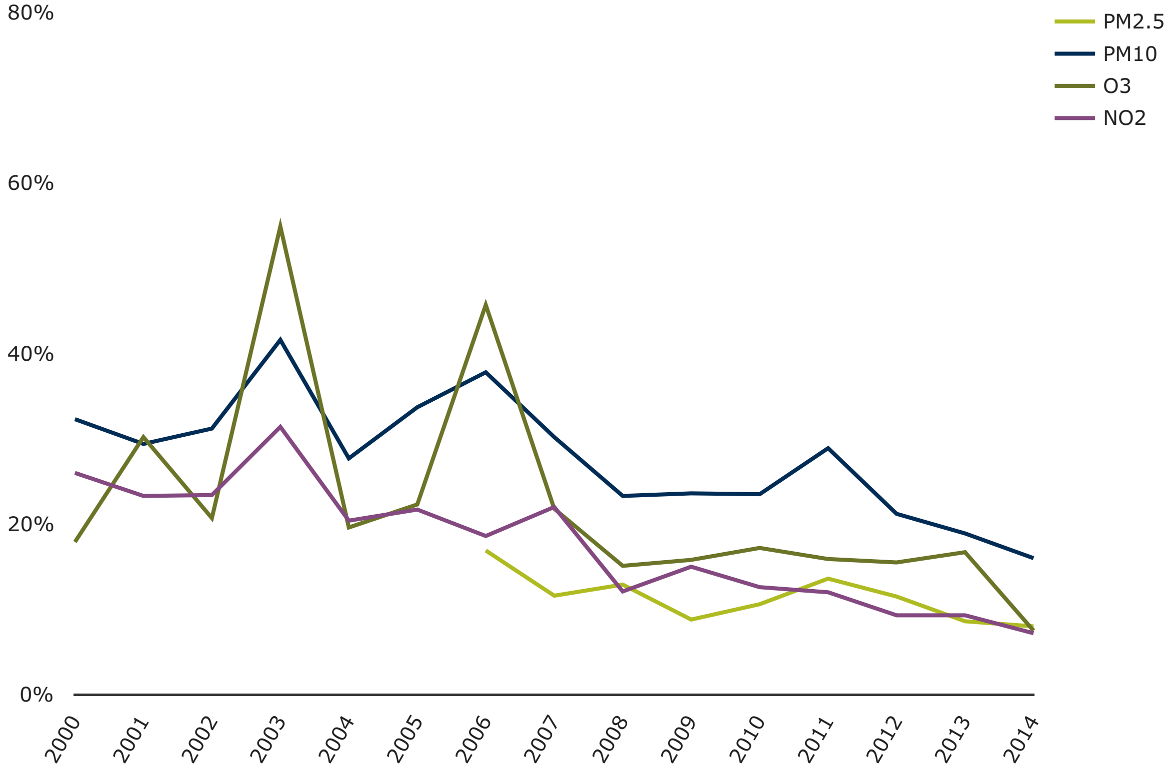
		Air Quality Directive		WHO guidelines	
Pollutant	**Averaging period**	**Objective and legal nature and concentration**	**Comments**	**Concentration**	**Comments**
$PM_{2.5}$	One day			25 µg/m³ (*)	99th percentile (3 days/year)
$PM_{2.5}$	Calendar year	Target value, 25 µg/m³	The target value has become a limit value since 1 January 2015	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	

Notes:
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.

Source: EU, 2008; WHO, 2006.

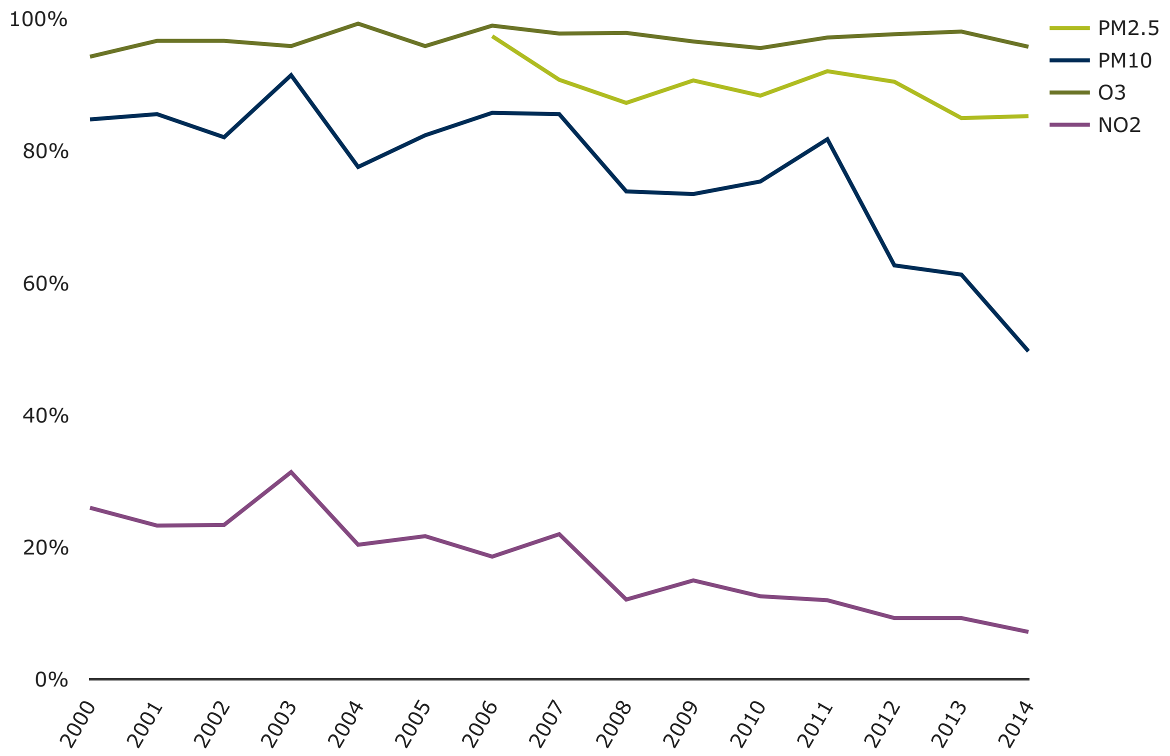
Figures 1 and 2 show the percentage of the urban population exposed to air pollutant concentrations above both EU standards (Figure 1) and WHO guidelines (Figure 2).

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 CSI004

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



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}.

Data sources: a. Eurostat. Gisco - Urban Audit 2012 b. EEA. Airbase c. EEA. Air Quality e-Reporting (AQ e-Reporting) d. EEA – Indicator CSI004

Around one sixth of Europeans currently living in urban areas are exposed to air pollutant levels exceeding some EU air quality standards. Moreover, up to 96 % are exposed to levels of some air pollutants deemed damaging to health by the WHO's more stringent guidelines (EEA, 2016a).

Particulate matter (PM)

Between 2006 and 2014, 8 – 17 % of the EU's urban population is estimated to have been exposed to concentrations of fine particulate matter ($PM_{2.5}$) in excess of the EU target value set for the protection of human health (Figure 1). With respect to the more stringent WHO guideline value (Figure 2), a much larger proportion of the urban population (85 – 97 %) was exposed to concentrations above this threshold. The time series are considered too short to draw any firm conclusions on changes over time.

Notwithstanding limitations in data coverage in the early 2000s, a significant proportion of the EU urban population (16 – 42 %) was exposed to concentrations of coarse dust particles (PM_{10}) in excess of the EU daily limit value set for the protection of human health during the 2000–2014 period (Figure 1). A slightly decreasing tendency can be observed throughout the whole period.

For the more stringent WHO guideline value (Figure 2), a higher proportion of the urban population (50 – 92 %) was exposed to concentrations above this threshold. Here, a decreasing tendency is also observed, as in the case of the EU limit value.

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 sectors are 'commercial, institutional and household fuel combustion' and 'industry'. In third place, 'agriculture' is listed for PM_{10} and transport for $PM_{2.5}$. All these sectors reduced their PM emissions in the EU in the 2000–2014 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, the reductions in emissions of the other secondary PM precursors (nitrogen oxides, sulphur oxides, and non-methane volatile organic compounds) were much larger than the reductions in primary PM from 2000 to 2014 in the EU.

However, the reductions in both primary PM and precursors have not led to equivalent drops in the concentrations of PM. This is due to the fact that, due to chemical reactions of the precursors to form secondary particles, 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 Europe, and by the contribution of natural sources to PM concentrations (EEA, 2016b).

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 on more than 25 days a year. In the 2000–2014 period, between 8 % (in 2014) and 55 % (in 2003) of the urban population was exposed to concentrations above the target value (Figure 1). In the last 7 years, the proportion of the urban population exposed has not exceeded 20 %, with no significant change 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 and by meteorological conditions: ozone is formed in sunny conditions with high temperatures. Apart from reductions in anthropogenic emissions of O_3 precursors, there have been increases in natural emissions and also in intercontinental transport of O_3 and its precursors. Additional factors are also likely to mask the effects of European measures to reduce anthropogenic emissions of O_3 precursors, including 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.

Nitrogen dioxide (NO_2)

Between 2000 and 2014, 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 around 10 %, with a minimum of 7 % in 2014 (Figures 1 and 2). The highest exposure of the urban population to NO_2, 31 %, occurred in 2003.

Enforcement of current legislation 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.

Based on the current trends, explained above, and because of their high and widespread exceedances in urban areas, it is unlikely that air quality standards for these pollutants will be met by 2020, while achieving air quality in line with the WHO guidelines is much further away. Effective air quality policies require action and cooperation on global, European, national and local levels, which must reach across most economic sectors and engage the public. Holistic solutions must be found that involve technological development, structural changes —

including the optimisation of infrastructures and urban planning — and behavioural changes. These will be necessary to deliver a level of air quality across the EU that is conducive to the protection of human health (EEA, 2016b).

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 the year 2014. Variations from country to country are not only related to the different pollutant concentrations but also 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. Urban population exposed to concentrations of air pollutants above selected air quality standards of the Air Quality Directive, 2014

COUNTRIES	PM10 (daily limit value)	O3 (target value)	NO2 (annual limit value)
Austria	0	13	1
Belgium	1	0	2
Bulgaria	97	0	0
Croatia	NA	NA	NA
Cyprus	6	0	0
Czech Repuplic	27	0	1
Denmark	0	0	2
Estonia	0	0	0
Finland	0	0	0
France	1	4	3
Germany	1	4	7
Greece	2	48	2
Hungary	29	7	0
Ireland	0	0	0
Italy	39	26	15
Latvia	4	0	4
Lithuania	3	0	0
Luxembourg	0	NA	0
Malta	100	NA	NA
Netherlands	0	0	2
Poland	84	0	1
Portugal	0	0	1
Romania	3	0	0
Slovakia	46	9	1
Slovenia	0	0	0
Spain	2	20	3
Sweden	0	0	1
United Kingdom	0	0	21
EU-28	16	7	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%

Note: NA = no available data, for further information please see indicator CSI004.
Source: Air pollution country fact sheets (EEA, 2014) updated with 2014 data. The 2014 data aggregated at EU level are also available (EEA, 2016a, 2016c).

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, it has recently been agreed to revise the 2001 National Emission Ceilings Directive (EU, 2001). The proposed new directive establishes new national emission reduction commitments applicable from 2020 and stricter commitments from 2030 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 1and up to 50 megawatt).

These new commitments, together with the on-going implementation of air quality improvement 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; these can increase under periods of extensive drought (EEA, 2015).

Finally, it is expected that the age group composition of the EU population will continue to shift towards higher numbers of the elderly because of continuing increases in life expectancy (Eurostat, 2016). The overall potential air pollution-related health impact of this change remains uncertain.

About the indicator

This briefing shows the proportion of the EU urban population that is exposed to various potentially harmful concentrations of pollutants in excess of both EU standards and WHO guidelines set for the protection of human health. For further information on the methodology, please refer to the EEA indicator ‘Exceedance of air quality limit values in urban populations’ (EEA, 2016a).

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 or $PM_{2.5}$; 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 Decisions on the exchange of information (EU, 2011).

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

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Air pollutant emissions

Indicator	Indicator past trend		Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
	EU 28	**EEA 33**		
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: $PM_{2.5}$)	SO_2, NO_x, NMVOCs, NH_3, $PM_{2.5}$	SO_2, NO_x, NMVOCs, $PM_{2.5}$ NH_3	Reduce air pollutant emissions in accordance with the requirements of the amended Gothenburg Protocol by the following percentages by 2005: SO_2 59 %, NO_X 42 %, NH_3 6 %, NMVOCs 28 %, $PM_{2.5}$ 22 % compared to 2005 levels	
Air pollutant emissions have declined and current projections suggest that the EU is on target to meet the 2020 Gothenburg Protocol emission reduction commitments				

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

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

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

Air pollution is responsible for more than 400 000 premature deaths in Europe each year. It also harms crop growth and ecosystems, and damages the built environment (EEA, 2016a). In Europe, the most problematic pollutants in terms of harm to human health are particulate matter (PM), ground-level ozone (O_3) and nitrogen dioxide (NO_2). PM is emitted directly from emission sources but also can 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. The 7th EAP (EU, 2013) sets out commitments to improve the implementation of existing legislation and to secure additional reductions in air pollution. Air quality state and impacts are discussed in the briefing on outdoor air quality in urban areas (AIRS_PO3.1, 2016)(2) and the Eutrophication of terrestrial ecosystems to due to air pollution briefing (AIRS_PO1.1, 2016)(3)

Policy targets and progress

The NECD (EU, 2001) and the Gothenburg Protocol (UNECE, 1979) set emission ceilings for 2010 for European countries for SO_x (SO_2 in the NECD), NO_x, NMVOCs and NH_3. The 2012 amended Gothenburg Protocol (UNECE, 2012) also sets 2020 emission reduction commitments for these same four pollutants, as well as for $PM_{2.5}$.

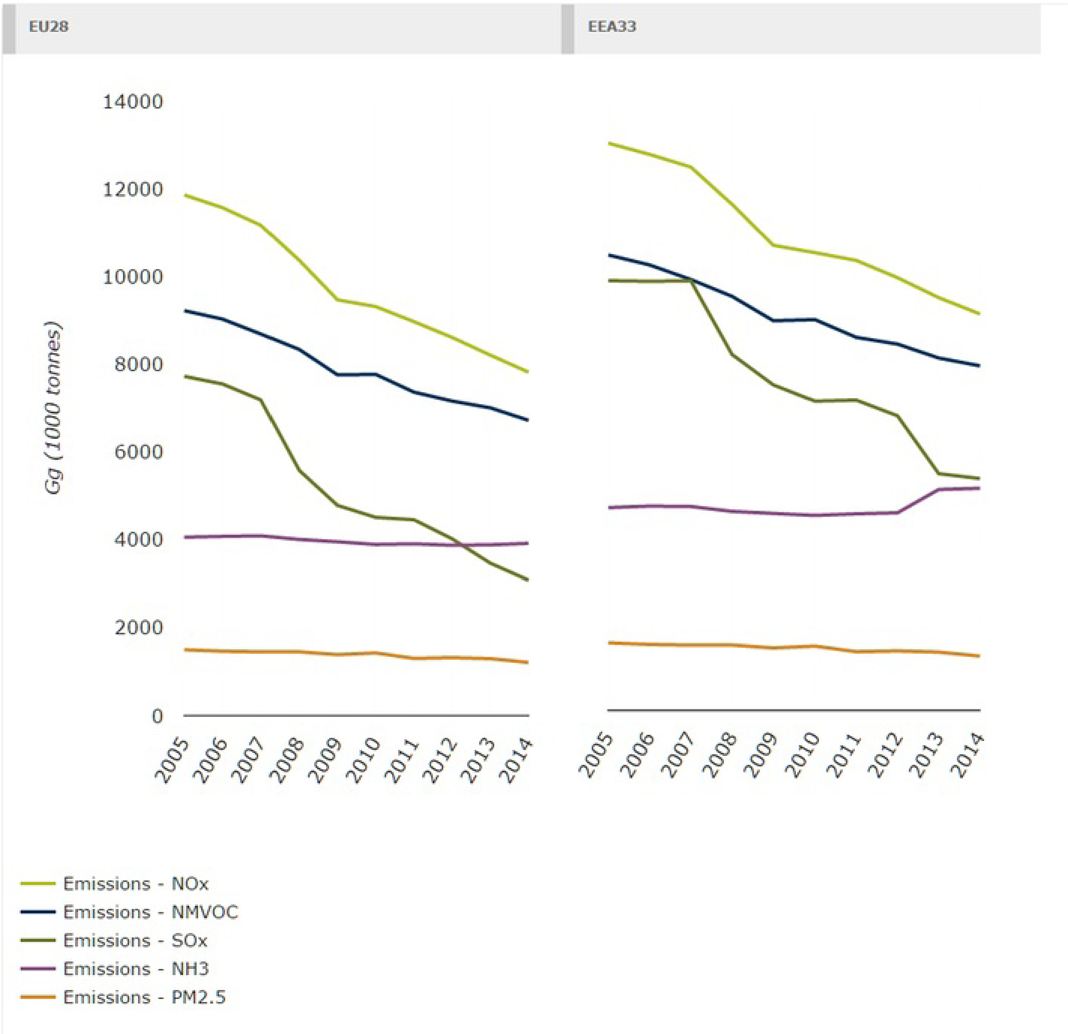
Anthropogenic emissions of certain air pollutants have decreased in both the EU-28 (Figure 1, left panel) and the EEA-33 (the 33 member countries of the European Environment Agency, which includes the 28 EU Member States) between 2005 and 2014 (Figure 1, right panel). However, for both NH_3 and $PM_{2.5}$, little progress has been made in reducing emissions.

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

- NO_x: 12 Member States exceeded their ceilings in 2010 and six Member States continued to exceed their emission ceilings in 2014 (Austria, Belgium, France, Germany, Ireland and Luxembourg).
- NMVOCs: five Member States exceeded their ceilings in 2010 and three Member States exceeded ceilings in 2014 (Denmark, Germany and Ireland).
- SO_2: all Member States met emission ceilings for SO_2 in 2010, 2011, 2012, 2013 and 2014.
- NH_3: six Member States (Austria, Denmark, Finland, Germany, the Netherlands and Spain) exceeded their ceilings in 2010, 2011, 2012, 2013 and 2014.

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

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



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

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

Nitrogen oxides

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

Sulphur oxides

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

Non-methane volatile organic compounds

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

Ammonia

NH_3 emissions have remained largely stable since 2005 compared with the other pollutants. They fell by only 4 % from their 2005 level in the EU-28, while in the EEA-33 NH_3 emissions have actually increased by almost 10 % since 2005. Agriculture dominates emissions of NH_3: they arise primarily from the decomposition of animal manure and fertiliser application. There are a number of available technical measures to mitigate ammonia emissions, yet little progress in reducing them is evident in the agricultural sector.

Particulate matter

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

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

Country-level information

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

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

	NH_3		NMVOC		NO_x		$PM_{2.5}$		SO_x	
	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020	Total emissions in 2014	Reduction commitments 2020
EEA-33	5 097		7 912.1		9 103.7		1 249.4		5 320.1	
EU-28	3 841	4 372	6 473	7 531.7	7 362	7 557.7	1 214.4	1 211.4	3 082.9	4 047.1
Austria	67	65.4	110.5	107.9	151	147.9	16.6	17.7	16	19.5
Belgium	66.3	67.0	122.1	140.3	140	187.5	28	29.2	42.2	81.3
Bulgaria	31.1	46.1	94.8	82.2	133.3	109.1	28.5	22.8	188.9	171.3
Croatia	25.5	34.3	60.4	55.9	55.2	56.8	19.2	12.7	15.6	26.2
Cyprus	4.6	5.2	6.8	7.1	17.2	11.9	1	1.4	16.8	6.4
Czech Republic	69.2	69.2	137.7	171.7	170.4	181.5	22.9	28.9	126.9	114.5
Denmark	64	67.5	70	96.4	113.4	89.4	18.3	19.2	11.4	16.8
Estonia	13	10.5	22.5	29.9	33.3	33.5	7.8	12	40.8	51.8
Finland	35	31.3	75.3	87.4	137.5	121.5	24.1	24.7	43.6	48.7
France	707.5	658.1	639	677.7	740	714.3	168.8	186	169.4	210.1
Germany	674	644.4	830	1164.1	974	959.2	104.4	96.7	388	374.2
Greece	60.8	62.8	125.1	101.4	247.5	287.4			138.1	140.6
Hungary	83.6	80.1	116.1	101.5	120	109.9	25.9	23.5	27.1	22.3
Iceland	No commitment under the Gothenburg Protocol									
Ireland	105.3	108.9	87.1	78.6	77	69.7	14.6	15.9	19.3	25.9
Italy	393.4	400.4	849.3	832.8	790.3	749.1	152.1	148.5	130.5	264.7
Latvia	17.5	16.3	54.2	45.4	34.6	29.8	17.7	18.9	3.8	8.1
Liechtenstein	No commitment under the Gothenburg Protocol									
Lithuania	41	40	69	55	51	31	17	15	18	14
Luxembourg	6.1	6.1	8	10.7	24	33.4	2	2.4	1.6	1.6
Malta	1.6	1.5	3	2.6	6.5	5.4	0.8	1	4.7	2.6
Netherlands	133.8	138.8	143.1	166.1	234.8	202	12.7	13.4	29.1	46.2
Norway	25.7	25	137.7	130.5	139.8	151	27.2	27.1	16.6	21.6
Poland	265.1	270.9	606.3	437.9	723.1	595.6	134.9	138.9	800.1	511
Portugal	49.4	46.8	168.9	174.3	159.6	164.7	44.4	48.5	34.8	65.3
Romania	162.4	177.8	319.4	291	218	174.2	115.9	82.4	175.8	138.3
Slovakia	36.9	36.9	105.6	106.5	84.7	66.9	30.4	25	45.3	38.3
Slovenia	19.1	20.6	31.8	35.7	39.5	31.5	12.3	10	8.8	15.2
Spain	372.7	374.3	613.7	658.5	801.7	838.8	68.1	83.2	254.6	421.9
Sweden	53.9	48.7	183.9	164.2	135	116.8	20.5	21.5	24	28.1
Switzerland	62.7	59	80	70.8	68.5	55.2	7.5	7.3	7.9	12
Turkey	No commitment under the Gothenburg Protocol									
United Kingdom	281.3	281.9	818.7	773.4	949.2	727.6	105.1	75.9	307.6	291.6

Distance to emission reduction commitment

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

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

Source: based on EEA (2016d).

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

Outlook beyond 2020

As part of the Clean Air Policy Programme for Europe (EC, 2013), the European Commission has proposed a revised NECD, which proposes national emission reduction commitments for 2020 in line with those already agreed under the amended 2012 Gothenburg Protocol and new emission reduction commitments for 2030 and beyond. The 2030 commitments would apply to the pollutants currently covered (NO_x, NMVOCs, SO_2, and NH_3) and would add $PM_{2.5}$. In the absence of new commitments to reduce emissions, only slow progress in further reducing emissions beyond 2030 is anticipated. The European Commission's proposal would deliver, by 2030, an estimated 52 % reduction in premature mortality compared with the current emissions baseline (2005). Additional measures beyond the NECD proposal are still needed if Europe is to achieve the long-term objective of air pollution levels that do not lead to unacceptable harm to human health and the environment.

About the indicator

This indicator deals with the emissions of key anthropogenic air pollutants. It covers anthropogenic emissions of the air pollutants SO_x, NO_x, NH_3, NMVOCs, and $PM_{2.5}$ for the years 2005 to 2014. Data are taken from the latest EU emission inventory submission to the LRTAP Convention (EEA, 2016b, 2016c).

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

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Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Quality of bathing waters

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of 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 are likely to increase further due to implementation of the Bathing Water Directive, in particular the effect of measures on poor quality waters			

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 96.1 % of all EU bathing waters identified for the 2015 bathing season. Overall, bathing water quality is improving over time due to investment in the sewerage system, better wastewater treatment and the reduction of pollution from farms.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

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 our ecosystems and to support economic activities such as tourism.

Policy targets and progress

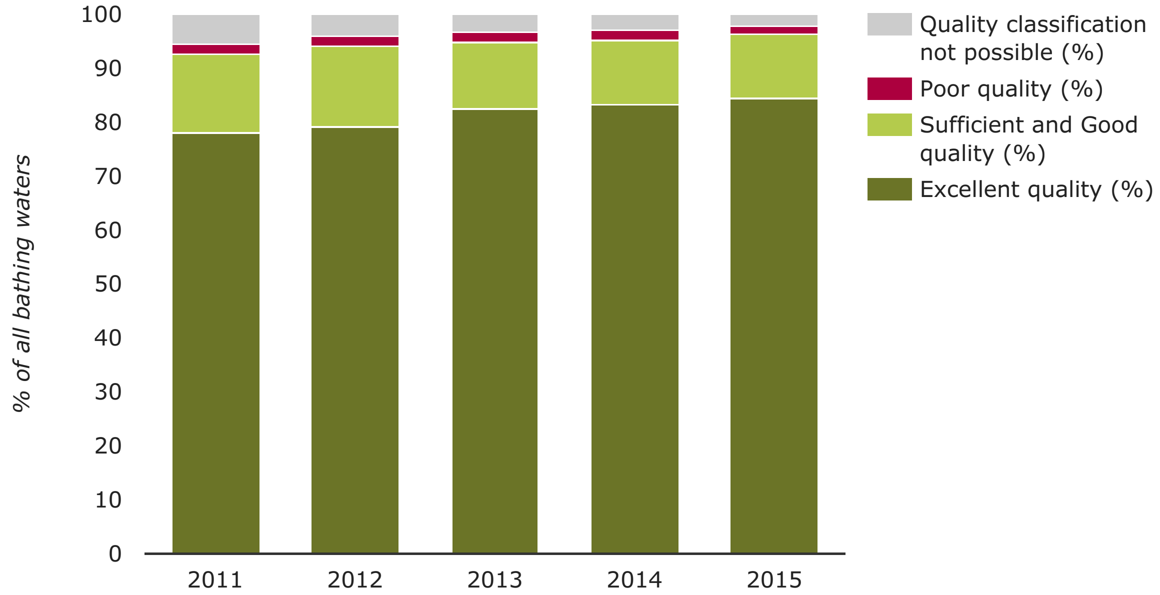
The efforts of the EU to ensure clean and healthy bathing waters started 40 years ago with the original Bathing Water Directive in 1976 (EU, 1976). This was followed by a revised Bathing Water Directive in 2006 (EU, 2006), which updated the measures of the 1976 legislation and simplified its management and surveillance methods. This revised Directive also provides for better and earlier public information about bathing water quality.

The Bathing Water Directive 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.

Minimum water quality standards were met by 96.1 % of all EU bathing waters identified for the 2015 bathing season, which represents an increase of 0.9 percentage points when compared with 2014. In total, 351 EU bathing waters had poor quality in 2015. The proportion of bathing waters with poor quality dropped to 1.6 % in 2015. This represents a 0.3 percentage point decrease compared with the previous season (EEA, 2016).

Figure 1 provides an overview of the classification of EU bathing waters into the categories excellent, sufficient and poor, as well as those bathing waters that could not be classified, from 2011 to 2015.

Figure 1. Overall bathing water quality in the EU, 2011 to 2015



Note:
Quality classification not possible: not enough samples / new bathing waters / bathing waters with changes / closed

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

The share of bathing waters in the EU with excellent status increased from 78.1 % in 2011 to 84.4 % in 2015. The proportion of bathing waters with poor quality remained relatively constant (between 1.6 % and 2.0 %) during the 2011–2015 period (EEA, 2016).

Overall bathing water quality is thus 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. The outlook towards the 2020 goal is therefore positive.

Many years of investment in the sewerage system and better wastewater treatment, and the reduction of pollution from farms have led to Europe's bathing waters being much cleaner today than they were 40 years ago. The implementation of the Urban Waste-water 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, 2016). However, as figure 1 shows, there are still bathing waters with poor quality. The major sources of pollution responsible for faecal bacteria in bathing waters today are still insufficiently treated or untreated wastewater 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.

In wet summers, large amounts of rainwater affect bathing water quality by causing stormwater overflow and the release of diluted sewage into bathing waters or streams discharging close to beaches. Rainwater also washes animal waste from urban and rural areas into surface water drains and rivers.

Poor water quality can also be caused by misconnected plumbing, whereby foul water such as that from bathrooms or from poorly maintained cesspits and septic tanks enters surface water drains. 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.

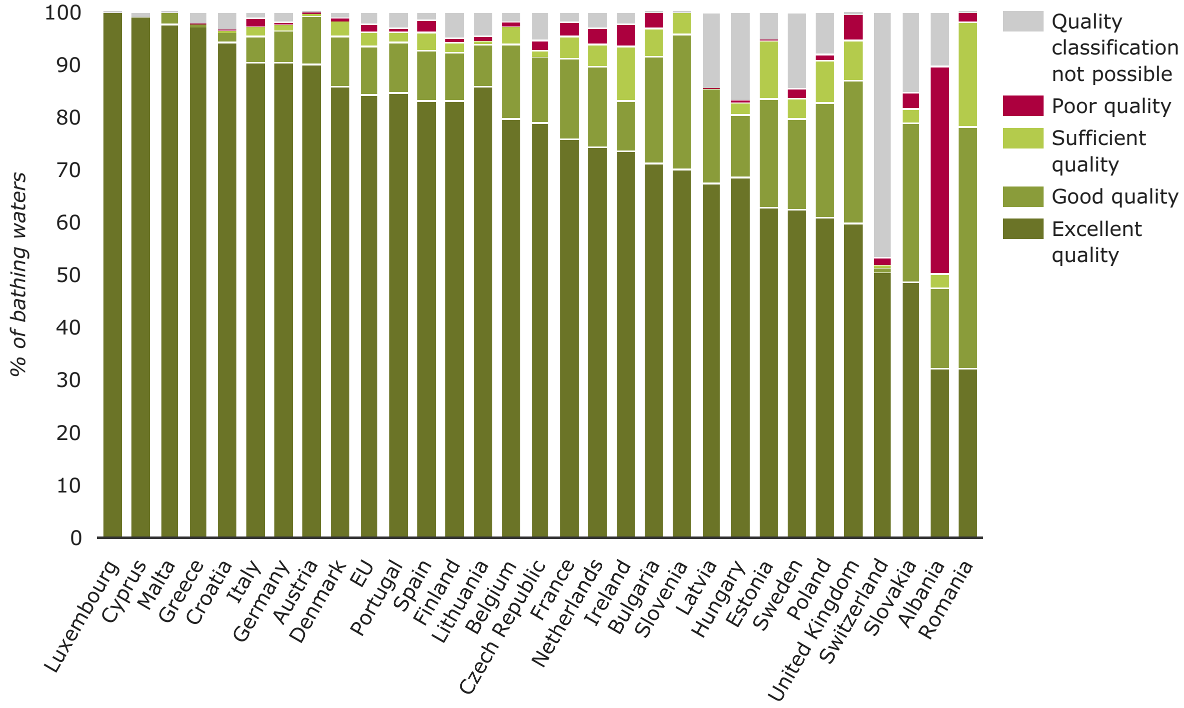
In the case of bathing waters with poor quality, it is imperative that the sources of pollution be assessed. The bathing water profiles prepared under the Bathing Water Directive should provide an indication of pollution sources in the catchment area of the bathing water and, together with historical 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 those bathing waters that have only sufficient or poor water quality.

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

Country-level information

Figure 2 provides the results for bathing water quality in 2015 for the EU Member States and two other countries. In general, bathing water quality was of a high standard across the countries.

Figure 2. Bathing water quality for the EU-28, Albania and Switzerland



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

Note:
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.

All reported bathing water sites in Cyprus, Croatia, Estonia, Greece, Latvia, Luxembourg, Malta and Slovenia achieved at least sufficient quality in 2015 (in accordance with the minimum quality standards set by the Bathing Water Directive). Moreover, in excess of 90 % of bathing water sites were of excellent quality in eight Member States: Luxembourg (all 11 reported bathing water sites), Cyprus (99.1 % of sites), Malta (97.7 %), Greece (97.2 %), Croatia (94.2 %), Italy (90.5 %), Germany (90.3 %) and Austria (90.2 %).

In 2015, there were 383 sites with poor quality bathing water in Europe. Italy (95 bathing water sites or 1.7 %), France (95 sites or 2.8 %) and Spain (58 sites or 2.6 %) were the countries with the highest number of poor bathing water sites.

In some EU Member States, more than 3 % of the bathing water sites had poor quality: 4.9 % or

31 bathing water sites in the United Kingdom, 4.4 % or six sites in Ireland, 3.4 % or 24 sites in the Netherlands and 3.2 % or three sites in Bulgaria (EEA, 2016).

Outlook beyond 2020

Bathing water quality is not only essential for public health reasons, but clean unpolluted water is also 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 2015 at more than 21 000 bathing waters in the Member States of the EU. It also presents the evolution of bathing water quality from 2011 to 2015. 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.

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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 of 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			

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 have many impacts on the environment, human health and the economy. Adaptation of Europe's society to climate change is necessary to address the adverse impacts of climate change and complement efforts to mitigate climate change. Action to mitigate climate change and adapt to it will increase the resilience of the EU's economy and society, while stimulating innovation and protecting the EU's natural resources. To date, 20 EU Member States have adopted a national adaptation strategy (NAS) and nine 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.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

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, 2013). 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, 2012 and 2016; 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, and promotes information sharing through the European Climate Adaptation Platform. In 2017, the European Commission will assess whether or not the action being taken in the Member States is sufficient. If it deems progress to be insufficient, by reference to the coverage and quality of the national strategies, the Commission will consider proposing a legally binding instrument (EC, 2013). That 2017 report will include an adaptation preparedness scoreboard, with key process-based indicators for measuring Member States' levels of readiness.

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.

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.

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. To date, 20 EU Member States and three other EEA member countries have adopted NASs. In addition, nine EU Member States and three other EEA member countries have developed NAPs. Table 1 shows that over the last 5 years there has been a steady increase in the number of NASs and NAPs being adopted by EU Member States and other EEA member countries, and this is expected to continue towards 2020, with additional countries adopting strategies and plans as well as implementing more specific adaptation policies and actions in line with their strategies and plans.

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

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

* Norway had a NAP before a NAS

- National adaptation strategy (NAS) in place
- National adaptation strategy (NAS) and national and/or sectoral adaptation plans (NAP/SAP) in place
- No policy

Source:
EEA, 2014, information reported by EU Member States under the European mechanism for monitoring and reporting information relevant to climate change (Regulation (EU) No 525/2013) and for other EEA Member countries information provided on a voluntary basis to the EEA as of May 2016.

Regarding the implementing of adaptation policies and actions, most progress has been reported for 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 evaluate adaptation policies at national level; there are various reasons, including the fact that implementation of adaptation has only just begun (EEA, 2015). The countries that monitor these use mainly 'process-based' methods, assessing to what extent agreed stages in the process of taking actions have taken place. Very few countries use 'outcome-based' approaches, assessing if and how vulnerability has decreased and/or resilience has increased, because this is methodologically very complex and also resource intensive. It will therefore not be possible to determine with any certainty whether or not decisive progress in adapting to the impact 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 Baltic Sea region strategy, the Danube Commission and the Carpathian and Alpine conventions. Adaptation action is often linked to the sharing of natural resources such as transboundary water catchments (EEA, 2016).

Adaptation policy will receive new EU financial resources in the coming years. Of the EU budget for 2014–2020, 20 % will be used for climate-related actions (i.e. adaptation and climate change mitigation).

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 2013 adaptation strategy, 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, complementary to climate change mitigation action, and the 2015 UN Sendai Framework for Disaster Risk Reduction (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 Member States that have adopted an adaptation strategy and/or plan and indicates how many countries have made progress on adapting to climate change by setting this issue on the policy agenda (through strategies). 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.

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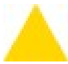
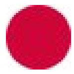
Environmental noise

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of 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			

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 (L_{den}) that measures 'annoyance' and an indicator for night periods (L_{night}) 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 these values. Data reported under the Directive suggest that noise remains a major environmental health problem in Europe. In 2012, at least 125 million people, or one in four Europeans, were exposed to daily road traffic noise levels exceeding the assessment threshold specified in the END. During the more sensitive night period, 8 million people suffered sleep disturbance as a result of environmental noise that exceeds the Directive's night-time noise threshold. As a result, at least 10 000 cases of premature death from noise exposure occur each year, with road traffic as the dominant source. 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 vehicular 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.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

Noise exposure from transport sources and industry can lead to annoyance, stress reactions, sleep disturbance, and increases in the risk of hypertension and cardiovascular disease. Environmental noise causes at least 10 000 cases of premature death in Europe each year, with almost 20 million adults suffering annoyance and a further 8 million suffering sleep disturbance (EEA, 2014). The WHO (2011) identified noise as the second most significant environmental cause of ill health, the first being air pollution (AIRS_PO3.1, 2016).[1] The 7th EAP (EU, 2013) includes an objective to significantly decrease noise pollution by 2020, moving closer to WHO recommended levels.

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. 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 indicators (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', in order to protect the European soundscape.

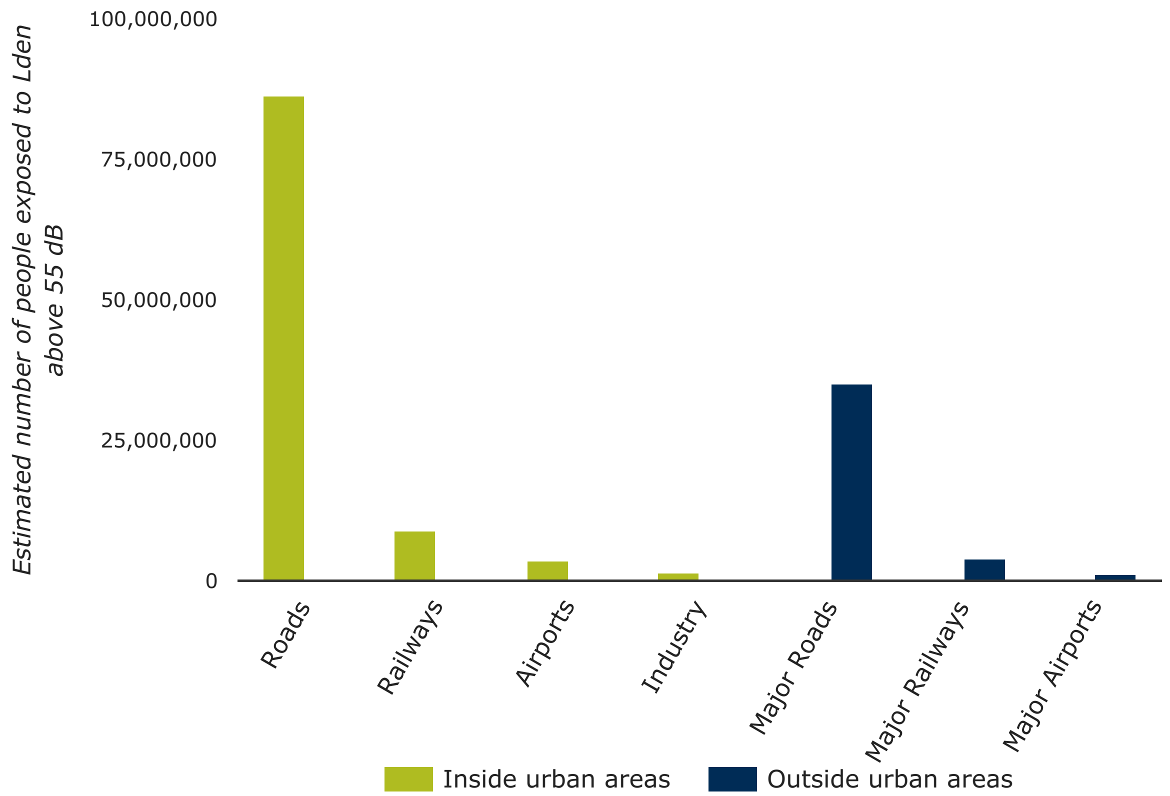
High noise levels are defined in the 7th EAP as noise levels for L_{den} above 55 dB and for L_{night} above 50 dB. During the night, high noise levels can cause sleep disturbance, such as body movements and wakening, starting at L_{night} levels below 40 dB, and with effects on the cardiovascular system that become apparent above 55 dB. All these impacts can contribute to premature mortality (WHO, 2009).

The WHO established a night-time noise guideline for L_{night} of 40 dB for outside noise with the aim of protecting the public, including vulnerable groups such as children, the chronically ill and the elderly. An outside 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 Europe 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 Europe that are above the noise indicators set by the END within and outside urban areas. 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 the major source of localised noise pollution (EEA, 2015).

More specifically, it is estimated that more than 125 million people in the EU are exposed to L_{den} levels from road traffic noise that are above 55 dB. Night-time road traffic is another major source of noise exposure, with over 83 million Europeans exposed to harmful L_{night} levels above 50 dB. In addition, many people are also exposed to rail, aircraft and industrial noise, particularly in towns and cities. While aircraft noise does not affect a wide geographical area, the effects extend beyond health impacts on nearby populations to direct effects on the ability of younger generations to concentrate in schools that are affected by aircraft flight paths.

Figure 1. Estimated number of people exposed in the EU to noise above Lden 55 dB, 2012



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

Note:

1. 'Urban areas are the urban agglomerations defined as such in the Environmental Noise Directive, that is the part of the territory, delimited by the Member State, having a population in excess of 100 000 persons and a population density such that the Member State considers it to be an urbanised area.

2. 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.

3. 55 dB Lden is the EU threshold for excess exposure defined in the Environmental Noise Directive and indicating an average level during the day, evening and night; dB=decibel.

Examples of measures to reduce noise exposure currently being undertaken at the national level include installing road and rail noise barriers and optimising aircraft movements around airports. However, it is widely acknowledged that the most effective actions to reduce exposure tend to be those that reduce noise at source, for example 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.

Efforts to reduce the noise from individual sources tend to be offset by the higher numbers of people being exposed to high noise levels, due to increasing road and aviation traffic and increasing numbers of city inhabitants. Recent trends show a rise in car travel across the EU, with 77 % of passenger-kilometres using car transport in 2013 compared with 65 % in 2000 (EEA, 2015). The construction of new roads can also expose new areas and populations to road traffic noise.

In terms of the availability of data to assess recent trends in noise exposure, data were reported to the EEA in 2007 and in 2012 under two rounds of noise mapping assessments. There are, however, comparability issues between the two reporting rounds, because of a lack of common assessment methods and incomplete reporting of exposure assessments, with as little as 44 – 70 % of the expected amount of data, depending on source, being delivered in the second reporting round. However, the analysis of a sub-set of the reported data that were comparable revealed that exposure to noise has remained broadly constant between 2007 and 2012.

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).

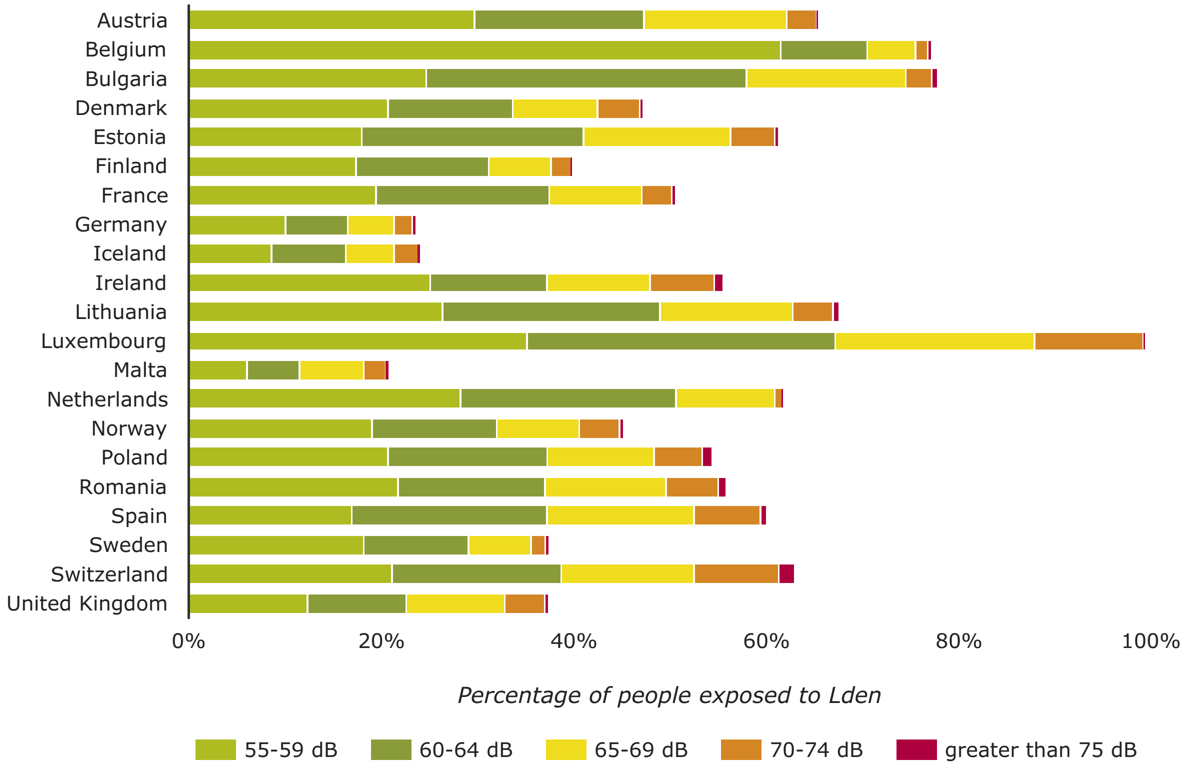
Country level information

Road traffic is the most widespread noise source in Europe and the source that causes the largest number of people to be exposed above the Environmental Noise Directive action 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 and the total number of inhabitants per urban area. 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.

Austria, Estonia, Ireland, Lithuania, the Netherlands, Poland, Romania, Spain and Switzerland reported that more than 50 % of inhabitants in urban areas (an urban agglomeration with more than 100 000 inhabitants) were exposed to road noise L_{den} levels above 55 dB, while Belgium, Bulgaria and Luxembourg reported figures of more than 75 % for the equivalent exposure (Figure 2). At the other end of the scale, the number of inhabitants exposed to road noise L_{den}

levels above 55 dB in Germany, Iceland and Malta remained below 25 %. As mentioned above, however, country-specific data are not immediately comparable.

Figure 2. Percentage of population exposed to road noise within urban areas above Lden 55 dB, by country, 2012



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

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

Outlook beyond 2020

Regarding the long-term outlook for the European soundscape, there are a number of challenges to reducing the exposure of the EU population 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 set to increase (EASA et al, 2016). On the other hand, intelligent transport systems could reduce noise levels from vehicles, in particular road vehicles. 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 conflicting developments.

About the indicator

The Environmental Noise Directive (END) requires two main indicators to be applied in the assessment and management of environmental noise. The first indicator (L_{den}) is the 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 noise level for night-time periods and is designed to assess sleep disturbance. The END defines an L_{night} threshold of 50 dB. These indicators were calculated following the provisions of the END (EU, 2002). 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, industry). The EEA uses these data to create an indicator for environmental noise in Europe. 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, with as little as 44 – 70 % of the expected amount of data, depending on source, being delivered in the second reporting round (EEA, 2014). The gaps in the reported data have been filled with expert estimates from the EEA. The lack of comparable and common assessment methods often causes significant inconsistencies between exposure estimates from different countries, within a single country and across the two main reporting rounds (2007 and 2012).

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Production of hazardous chemicals

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Production 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 production of chemicals that are hazardous to health has declined over the years, it is not possible to equate this to a reduction in the risks to environment and health and the outlook towards 2020 is therefore unclear			

The Seventh Environment Action Programme (7th EAP) includes an objective to assess and minimise risks to the environment and health associated with the use of hazardous substances. The production and subsequent use of chemicals provides benefits to society, but can also entail risks to the environment and human health. Risk is a function of hazard and exposure, and, while the availability of data on the hazardous properties of chemical substances is improving, environmental and human exposure is poorly documented. Tracking the production volumes of industrial chemicals that are hazardous to human health is therefore used as an imperfect proxy for human exposure. From 2005 to 2014, there has been an overall downward trend in EU production of chemicals that are hazardous to health. However, since production volumes are not directly related to actual human and environmental exposure to chemicals, the decline in the production of chemicals that are hazardous to health provides a weak indication of progress towards this objective. Rather, this briefing serves to highlight gaps in the evidence base for assessing risks to the environment and human health associated with the use of hazardous substances.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

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, are assessed and minimised by 2020. Under the Regulation on the classification, labelling and packaging 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 production and subsequent use of chemicals provides benefits to society, exposure to the hazardous chemicals emitted along the chemical life cycle generates significant risks to health and ecosystems. Human exposure to chemicals is associated with a number of disease outcomes (Prüss-Ustün et al., 2011), while chemical pollution degrades air and water quality and can impact negatively on ecosystem services. Hazardous chemicals have been detected in human populations and linked to environmental and dietary exposures (Smolders et al., 2015). Emerging concerns include the health impacts of chemical mixtures, endocrine-disrupting substances and nanomaterials (EEA and JRC, 2013).

Policy targets and progress

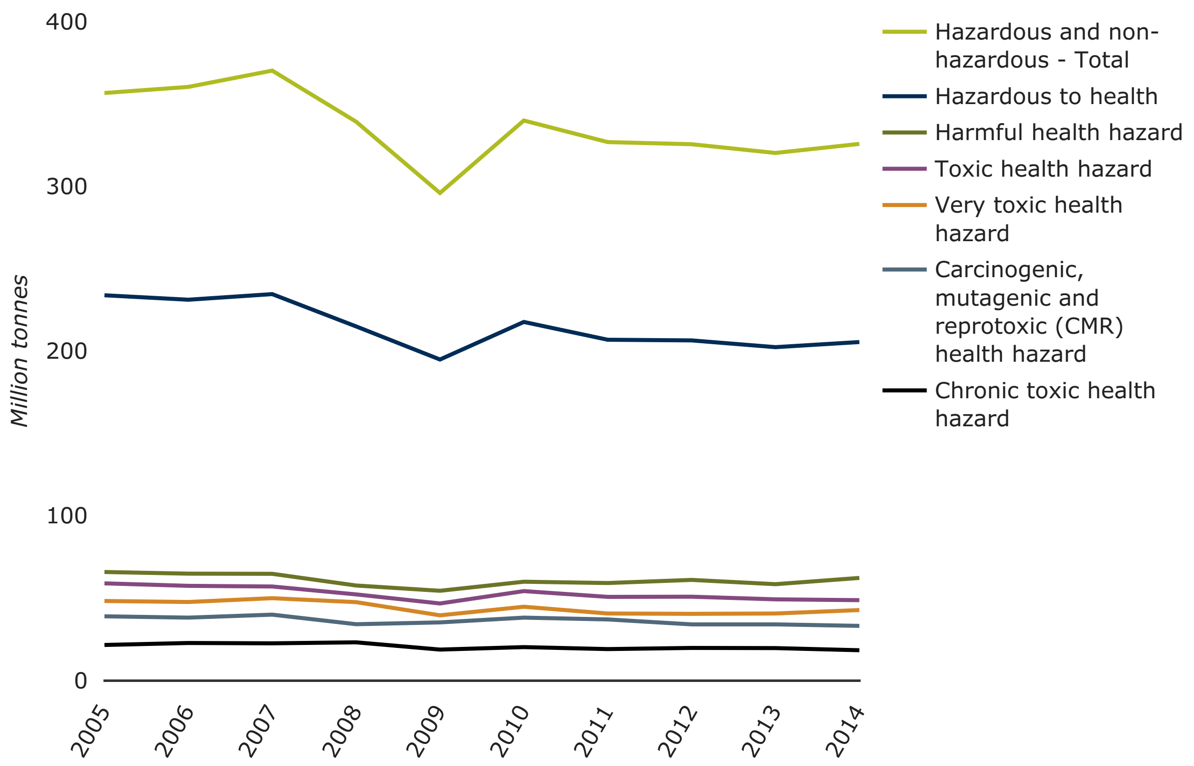
The Regulation on the registration, evaluation, authorisation and restriction of chemicals (REACH) (EU, 2006) aims to improve the protection of human health and the environment from the risks posed by chemicals. REACH also calls for the progressive substitution of the most hazardous chemicals, when suitable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

Eurostat 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). An analysis using these indicators suggests that REACH implementation resulted in better risk control from 2007 to 2011 (Eurostat, 2012).

In making the link between the production of chemicals that are hazardous to human health and resulting risks to human health, the assumption is that reduced production volumes will equate to a reduction in the overall risk profile of chemicals incorporated into products and sold in the EU. The production of chemicals that are hazardous to health in the EU followed a gradual downward trend from 2005 to 2014, with an overall decline of 28 million tonnes in 2014, representing a 12 % drop from 2005 production levels. Within this period, production fell sharply during the economic downturn in 2008 and 2009, and rebounded in 2010, to then decline again more gradually.

Figure 1 provides an overview of the production of chemicals that are hazardous to health by hazard class in the EU from 2005 to 2014, as well as showing total chemical production. The proportion of total EU chemical production that comprises chemicals that are hazardous to human health also followed a gradual downward trend over the 10 years, declining from 66 % in 2005 to 63 % in 2014. The proportion of chemicals that are carcinogenic, mutagenic and toxic for reproduction in total EU-28 chemical production declined from 11 % in 2005 to 10 % in 2014. Such chemicals are considered to pose the most significant risks to human health. These trends may be indicative of a shift in production towards less hazardous chemicals, driven by substitution.

Figure 1. Production of chemicals, by hazard class in the EU-28



Data sources: Eurostat. Production of toxic chemicals, by toxicity class (tsdph320)

However, production volumes for chemicals that are hazardous to health do not provide direct insight into risks, since production is not synonymous with exposure. On the one hand, some chemicals are handled in closed systems, or as intermediate goods in controlled supply chains, implying that no or limited exposure takes place (Eurostat, 2014). On the other hand, it is also possible that reductions in EU production of chemicals that are hazardous to health are being offset by increased imports of products that contain such chemicals, potentially leading to exposures along the product life cycle. In addition, the EU is a net importer of chemicals and in

2015 the volume of chemicals hazardous to health that was consumed in the EU was 7 % higher than the volume produced. EU chemical consumption also saw a downward trend from 2005 to 2014. However, while EU production of chemicals that are hazardous to health declined by 12 % between 2005 and 2014, consumption declined by only 9 % (Eurostat, 2016a).

These factors confound the use of EU production volumes of chemicals that are hazardous to health as a proxy for exposure. 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.

Additional concerns focus on the health impacts of chemicals that affect the human hormone system (known as endocrine disruptors), risks to children's health, nanomaterials and chemical combination effects. The 7th EAP calls for these aspects to be effectively addressed in EU legislation by 2020. The indicator on the production of chemicals that are hazardous to health does not provide specific insight on these concerns.

Outlook beyond 2020

Chemical risk is an area characterised by uncertainties regarding exposure levels, as well as associations between exposure and health outcomes and the causal mechanisms involved. New initiatives to generate data on the exposure of the European population to chemicals using human biomonitoring should serve to improve the knowledge base. This would provide a valuable evidence base for strengthening the protection of human health from chemical risks.

The 7th EAP calls for the development of an EU strategy for a non-toxic environment by 2018, to address the concerns listed above, as well as exposure to chemicals in products, including imported products, with a view to promoting non-toxic material cycles and reducing indoor exposure to harmful substances. This strategy is expected to set a framework for actions to minimise chemical risks beyond 2020.

Current efforts to promote a circular economy also have implications for chemicals in products. The reuse or recycling of products that are contaminated with hazardous chemicals may lead to unforeseen exposures of both humans and the environment. Further research is required to identify those material flows that are likely to be contaminated with hazardous chemicals and to understand the potential exposures that might arise from recycling these materials. Such knowledge might then inform decisions on whether to prioritise increasing the quantity of materials channelled for recycling, or to separate out contaminated materials for management as hazardous waste, so guaranteeing the quality of recycled materials.

At the United Nations level, in 2002, participants at the World Summit of Sustainable Development, including the EU and its Member States, made a commitment to the sound management of chemicals throughout their life cycle, 'aiming 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 Rio+20 (UN, 2012), with the 7th EAP explicitly calling for action to attain this goal at EU level. 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 availability and sustainable management of water and sanitation for all.

About the indicator

The indicator tracks the production of industrial chemicals that are hazardous to human health. It is restricted to chemicals under five toxicity classes, including, and beginning with the most dangerous: chemicals that are carcinogenic, mutagenic and reproductive toxicants; chemicals suspected to be carcinogenic, mutagenic and reproductive toxicants as well as skin and respiratory sensitisers (collectively called chronic toxic chemicals); very toxic chemicals; toxic chemicals; and harmful chemicals (Eurostat, 2016b). Collectively these classes comprise those chemicals deemed hazardous to health. These classes of chemicals exhibit properties that impact on human health, and are derived from the hazard statements described under the Regulation on the classification, labelling and packaging of substances and mixtures (EU, 2008).

The scope of the indicator is limited, since it does not cover all possible impacts on human health, nor does it cover chemicals that impact only on the environment. Taking the production of chemicals that are hazardous to health as an imperfect proxy for exposure, a fall in production may imply a reduction in exposure. However, there are a number of limitations when extrapolating exposure from production. First, exposure depends upon the uses to which synthesised chemicals are put and on safety measures in place to control emissions along the chemical life cycle, including production, use in products, waste and any recycling and/or reuse stages. Second, total production in the EU does not fully reflect total volume of chemicals incorporated into products and sold on the EU market, since it does not account for imports of chemicals and products containing chemicals.

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Pesticide sales

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of 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 selected indicator does not afford for an evaluation of progress towards the 2020 objective. Rather the analysis serves to highlight gaps in the knowledge base for assessing progress towards this objective			

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 such products are used sustainably. Total reported sales of pesticides in the EU increased by just under 4 % from 2011 to 2014. However, the quantity of pesticides sold on the EU market cannot be directly equated to a level of risk to human health and the environment. Other factors — including the hazardous properties of pesticides and associated use patterns — play a significant role in determining these risks. It is therefore not possible to draw a firm conclusion on whether or not the 2020 goal will be reached on the basis of this evidence. Rather, the briefing serves to highlight gaps in the evidence base regarding the harmful effects of plant protection products on human health and the environment.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

Pesticide (or plant protection product) use plays an important role in agricultural production, by keeping plants healthy and preventing their destruction by disease and infestation. However, pesticides applied to crops enter soil and surface waters via leaching and run-off and can enter groundwater, negatively affecting non-target species in both terrestrial and aquatic ecosystems. This can impact on habitat function and contribute to biodiversity loss, as well as reducing the quality of ecosystem services, such as insect-mediated pollination, soil formation and composition and the provision of clean drinking water. Pesticide residues in food can also pose a risk for human health, 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). In June 2016, the European Commission presented scientific criteria to identify endocrine disruptors in plant protection products and in biocides (EC, 2016), with the aim of protecting human health and the environment. The 7th EAP (EU, 2013a) 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 are used sustainably.

Policy targets and progress

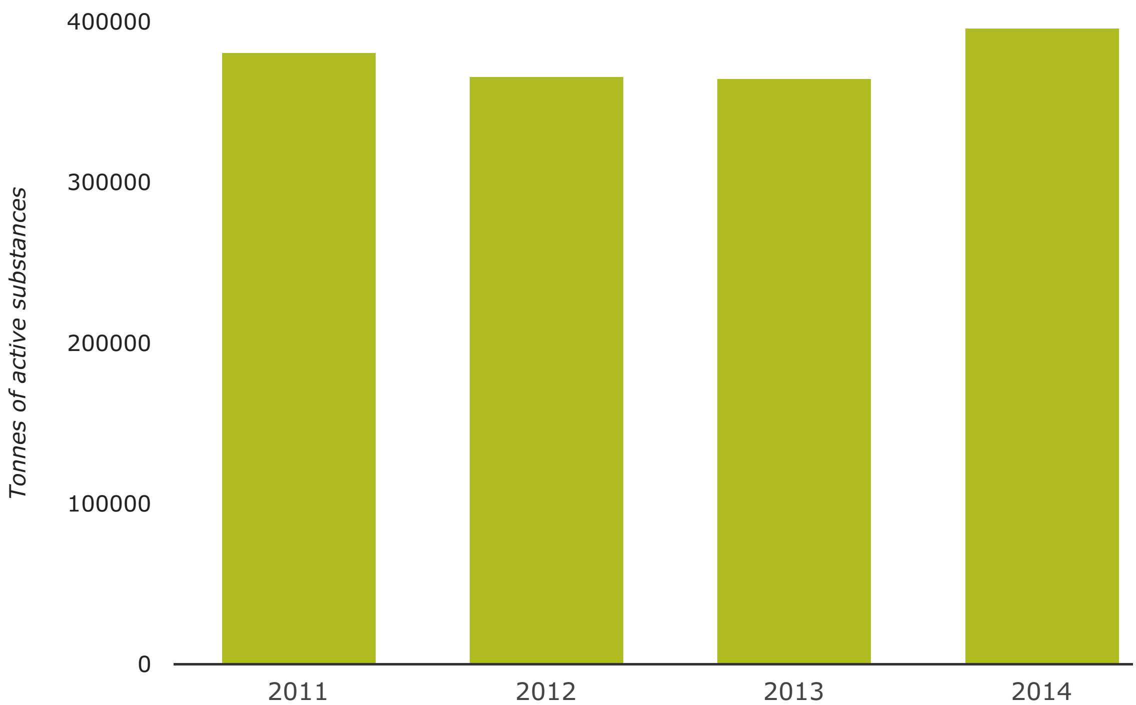
Adopted in 2009, the Directive on the Sustainable Use of Pesticides (EU, 2009a) aims to reduce impacts on human health and the environment. To this end, Member States established National Action Plans, including quantitative objectives, targets, measures and timetables. These plans should promote low pesticide input pest management and non-chemical methods, including both integrated pest management and organic farming. With the aim of protecting the aquatic environment and drinking water, Member States should adopt measures to minimise off-site pollution from spray drift, drain-flow and run-off. These include establishing buffer zones to separate the usage or storage of pesticides from rivers, lakes and waterways, in particular those used for drinking water abstraction. 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 means to achieve the targets set out in the National Action Plans.

Under the Regulation on plant protection products (EU, 2009b), the Commission is required to identify active substances with certain properties as candidates for substitution. Member States will then evaluate whether or not these active substances 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.

Water quality legislation also generates obligations to control environmental exposure to pesticides. 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 those pesticides that have been identified as priority substances or priority hazardous substances under the Priority Substances Directive (EU, 2013b). 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. Thresholds are also applied for pesticide residues in food and feed (EU, 2005), and as undesirable substances in animal feed (EU, 2002).

As shown by Figure 1, total sales of pesticides across the EU as a whole declined from 2011 to 2013, before increasing in 2014 to just under 400 000 tonnes, a level 4 % above that seen in 2011. This suggests that EU demand for pesticides has remained relatively stable, despite implementation of the National Action Plans under the Directive on the Sustainable Use of Pesticides.

Figure 1. Total EU pesticides sales



Note:
2011 data is missing for Bulgaria, Czech Republic, Croatia and Cyprus; 2012 data is missing for Croatia and Cyprus; 2013 data is missing for Cyprus and Luxembourg; and 2014 data is missing for Luxembourg.

Data sources: Eurostat. Pesticide sales statistics (aei_fm_salpest09)

However, this indicator tells us little about the risks associated with pesticide use. It is not possible to directly equate the quantity of pesticides sold with resulting risks to human health and the environment. The risks of pesticide use depend on both the hazard characteristics of the active substances included in the pesticide product and on application methods and use patterns. The climate, landscape, habitat and soil characteristics of the receiving ecosystem, as well as proximity to water bodies, influence how pesticides disperse in the environment. These various aspects strongly influence risk to environment and health, and are not accounted for by measuring the volumes sold on the market.

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 foresees the establishment of harmonised risk indicators. Development of these indicators is dependent on access to data on pesticide use. The Regulation on pesticide statistics (EU, 2009c) is expected to deliver data in 2016 on the agricultural use of pesticides by crop for 5-year periods, which should facilitate a better understanding of the risks to the environment and human health.

Monitoring data on pesticides in the European environment and in the human population would provide a robust basis for assessing exposure that, in combination with (eco)toxicity data, could enhance our understanding of current risks to human health and the environment. Under the Water Framework Directive, Member States have established a comprehensive network of monitoring stations through which to investigate the presence of priority substances and priority hazardous substances in surface waters. Several of these substances are pesticides, with monitoring data due to be reported to the EEA in 2016. With regard to human exposure, efforts are ongoing at European level to establish a European Human Biomonitoring Initiative to deliver data on the exposure of the European population to chemicals, including pesticides. These activities should serve to support a more robust assessment of the risks from pesticides to human health and the environment.

The selected indicator does not enable an evaluation of progress towards the 2020 objective. Rather it serves to highlight current gaps in the knowledge base for assessing progress towards this objective.

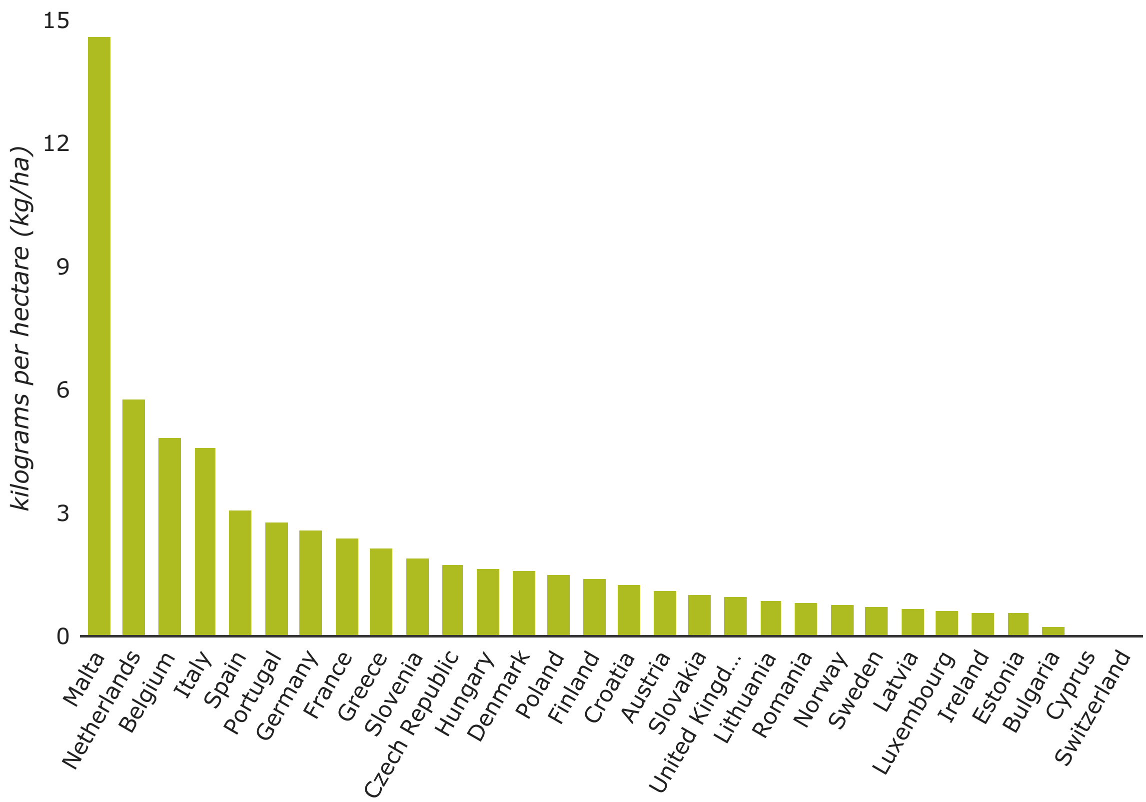
Country level data

In 2014, the countries in which the highest quantities of pesticides were sold were Spain, France, Italy, Germany and Poland, together making up 73 % of the EU-28's pesticide sales. In terms of trends in the sales of pesticides at Member State level, 2011 to 2014 saw reductions in the volumes sold in 13 Member States, with significant reductions in Denmark (63% reduction), Ireland (26% reduction), Malta (16% reduction), Greece (15% reduction) and Romania (12% reduction). Meanwhile, pesticide sales increased in 11 countries, with significant increases in

Estonia (30% increase), Latvia (32% increase) and France (23% increase). Data was not available to assess trends in four Member States. In Norway, pesticide sales increased by 4 % from 2011 to 2014, while in Switzerland sales remained stable (Eurostat, 2016a).

Figure 2 shows the quantities of pesticides sold on the market against the land area that was utilised for agricultural production in 2013 by each Member State. In 2013, Bulgaria had the smallest proportion of pesticide sales per hectare of utilised agricultural area, with 0.22 kg/ha. Ireland, Estonia, Finland, Denmark, Latvia, Romania, Greece, Sweden and Lithuania all had quantities of sold pesticides under 1 kilogram per ha of utilised agricultural area. Slovenia, France, Germany, Spain, Portugal, Italy, Belgium, the Netherlands, Cyprus and Malta all had quantities of pesticides sold per hectare above 2 kg/ha. Malta recorded the highest quantity of pesticides sold per hectare, with a value of 9.97 kg/ha (Eurostat, 2016b).

Figure 2. Pesticide sales per utilised agricultural area, by country for 2013



Note:
Data missing for Cyprus for 2011, for Croatia for 2011, for Bulgaria for 2011 and for Luxembourg for 2014

Data sources: a. Eurostat. Crop statistics (from 2000 onwards) (apro_acs_a)
b. Eurostat. Pesticide sales (aei_fm_salpest09)

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 (i.e. the area fully converted to organic production and the area under conversion) having increased by 21 % from 2010 to 2015 to cover 11.1 million hectares (Eurostat, 2016d). 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 terms of technological developments, precision agriculture offers 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 contained in pesticides. Sales data for active substances are reported by the 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, 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 is a substance or micro-organism, including viruses, that has general or specific action 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, any wastage or the transport of pesticide products across borders. Data on the actual application of pesticides by crop and by region would allow improved understanding of the risks to human health and the environment.

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