

# Pesticides in rivers, lakes and groundwater in Europe

Last update 05/07/2024 – next update 05/07/2024

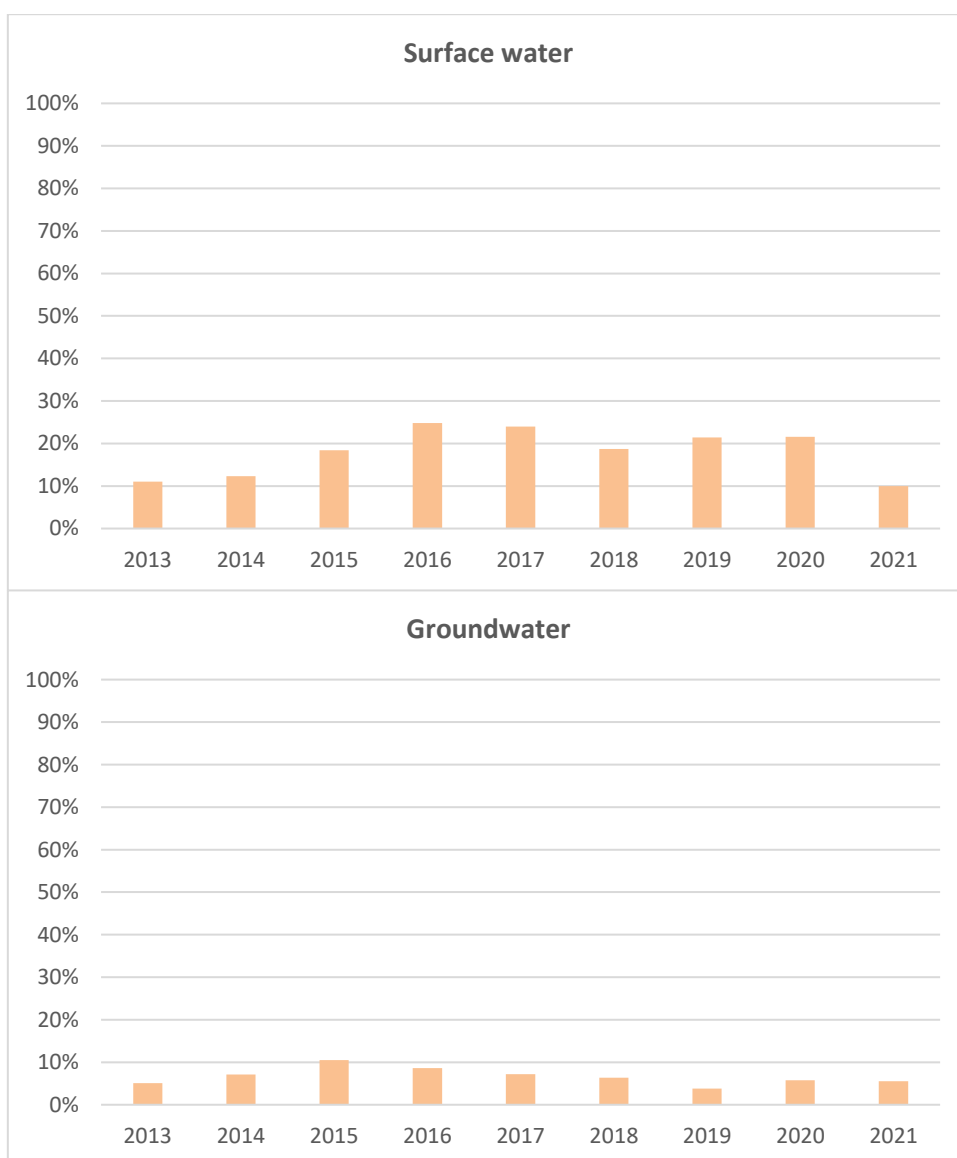
## EU level

### Summary (Hard maximum of 500 characters without spaces)

Pesticides<sup>1</sup> were assessed against effect or quality thresholds between 2013 and 2021. One or more pesticides were detected above their effect threshold at 10% - 25% of surface water monitoring sites each year. Between 2013-21, exceedances in surface waters were mainly caused by the insecticide imidacloprid<sup>2</sup> and herbicides metolachlor<sup>3</sup> and metazachlor; exceedances of one or more pesticides were detected at between 4% - 11% of groundwater monitoring sites, mainly by atrazine and its metabolites.

Owing to differences in weather, crop type and reporting, between-year changes may not be significant.

Figure 1. Percentage of reported monitoring sites with pesticides exceeding thresholds in a) surface waters and b) groundwater in Europe, weighted by country area.



<sup>1</sup> Pesticides include both active substances from plant protection products and biocides as well as their relevant metabolites.

<sup>2</sup> Approved for use in plant protection products during the monitoring period, though no longer approved.

<sup>3</sup> In Waterbase - Water Quality, the results of metolachlor and S-metolachlor are approved until 31/07/2022. Metolachlor was not approved for use during the period.

## Aggregate level assessment (Hard max. 2 000 characters without spaces)

Pesticides can contaminate surface waters and groundwater and if their concentrations are above critical thresholds, they can be harmful to the environment.

The European Green Deal<sup>4</sup> sets targets to reduce the use of and risks from chemical pesticides by 50% by 2030 in the zero pollution action plan<sup>5</sup>, farm to fork strategy<sup>6</sup> and biodiversity strategy<sup>7</sup>, with a focus on protecting ecosystems and improving biodiversity.

The Water Framework Directive (WFD)<sup>8</sup> sets environmental quality standards for pesticides in surface water. To assess the chemical status of groundwater, a precautionary quality standard of 0.1 µg/L is set for pesticides according to the Groundwater Directive<sup>9</sup>, reflecting the desire to keep pesticide concentrations in groundwater at low levels. Figure 1 shows that in 10% to 25% of all surface water monitoring sites, one or more pesticides were detected above effect threshold each year between 2013 and 2021. Exceedances of one or more pesticides were detected at between 4% and 11% of groundwater monitoring sites.

Pesticides most often causing exceedance in surface waters are the insecticide imidacloprid, which has not been approved for use as pesticide since 1 December 2020, and the herbicides metolachlor and metazachlor, all of which were approved for use in plant protection products during the monitoring period, though some are no longer approved.<sup>10</sup> The proportion of exceedances in Figure 1 from 2020 to 2021 has decreased by more than half. Reporting from countries with few monitoring sites and which reported fewer exceedances in 2021 may explain some of this decrease, owing to the country weighting factor aimed at avoiding the indicator being skewed to countries reporting many records.

In groundwater, the herbicide atrazine and its metabolites cause most exceedances. Atrazine was not approved for use in plant protection products during the monitoring period. Despite restrictions on atrazine since 2007, it continues to be found in groundwater because it is very persistent.

Losses from the application of pesticides may vary considerably between years, depending upon, for example, crop type and the weather, while the frequency of monitoring of pesticides in surface waters can be limited to one year out of three. Changes to the approval status of pesticides influence their use and presence in water, which can also lead to difficulties in interpreting trends over time. For these reasons, between-year changes may not be significant.

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<sup>4</sup> EC, 2019, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'The European Green Deal', COM(2019) 640 final, Brussels, 11.12.2019.

<sup>5</sup> EC, 2021, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Pathway to a Healthy Planet for All — EU Action plan towards zero pollution for air, water and soil', COM(2021) 400 final, Brussels, 12.5.2021.

<sup>6</sup> EC, 2020, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'A farm to fork strategy for a fair, healthy and environmentally friendly food system', COM(2020) 381 final, Brussels, 20.5.2020.

<sup>7</sup> EC, 2020, Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions 'EU Biodiversity Strategy for 2030. Bringing nature back into our lives', COM(2020)380 final, Brussels, 20.5.2020.

<sup>8</sup> EU, 2000, Directive (EC) 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1–73.

<sup>9</sup> EU, 2006, Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration, OJ L 372, 27.12. 2006, p. 19-31., 32006L0118.

<sup>10</sup> In Waterbase – Water Quality, the results of S-metolachlor are approved until 31/07/2023. Metolachlor was not approved for use during the period.

## Country level

Figure 2. Percentage of reported monitoring sites with pesticides exceeding thresholds in surface waters, different sized rivers, lakes and groundwater in European countries in the time period 2013 –2021.

Country	Surface waters	Rivers, large	Rivers, medium	Rivers, small	Lakes	Groundwater
AT	38% (32)	0% (2)	38% (16)	55% (11)	n.d.	6% (2070)
BE	52% (103)	50% (2)	47% (71)	64% (22)	n.d.	11% (396)
BG	1% (94)	n.d.	0% (64)	6% (17)	0% (2)	2% (133)
CH	0% (1)	n.d.	0% (1)	n.d.	n.d.	8% (51)
CY	2% (54)	n.d.	2% (50)	n.d.	0% (4)	0% (83)
CZ	53% (757)	n.d.	54% (646)	44% (103)	88% (8)	10% (667)
DE	35% (275)	51% (43)	35% (185)	44% (18)	9% (23)	4% (1150)
DK	5% (22)	n.d.	0% (5)	25% (4)	n.d.	5% (1115)
EE	17% (97)	0% (3)	21% (47)	30% (10)	8% (37)	0% (173)
EL	15% (296)	36% (11)	12% (207)	14% (28)	12% (33)	n.d.
ES	22% (2907)	n.d.	24% (1369)	19% (939)	22% (143)	12% (1505)
FI	18% (22)	0% (5)	25% (12)	50% (2)	0% (2)	n.d.
FR	29% (1774)	37% (109)	28% (1070)	31% (314)	12% (150)	24% (1795)
HR	55% (49)	86% (14)	48% (23)	43% (7)	0% (4)	19% (59)
HU	60% (5)	0% (1)	75% (4)	n.d.	n.d.	n.d.
IE	10% (287)	n.d.	8% (100)	24% (38)	5% (118)	0% (222)
IS	0% (2)	n.d.	n.d.	n.d.	0% (1)	n.d.
IT	40% (2180)	n.d.	44% (828)	37% (811)	14% (178)	16% (3714)
LT	17% (52)	n.d.	25% (32)	0% (19)	100% (1)	4% (54)
LU	50% (2)	n.d.	50% (2)	n.d.	n.d.	n.d.
LV	44% (34)	n.d.	47% (15)	33% (6)	33% (9)	9% (173)
NL	57% (322)	36% (11)	44% (16)	56% (54)	60% (208)	n.d.
NO	5% (21)	0% (4)	0% (11)	20% (5)	0% (1)	n.d.
PL	1% (905)	7% (42)	2% (271)	0% (632)	0% (376)	1% (323)
PT	14% (106)	33% (6)	18% (67)	0% (15)	n.d.	6% (204)
RO	n.d.	n.d.	n.d.	n.d.	n.d.	1% (139)
RS	18% (79)	0% (1)	23% (13)	30% (10)	7% (41)	2% (53)
SE	22% (23)	n.d.	25% (16)	14% (7)	n.d.	n.d.
SI	12% (25)	0% (1)	14% (22)	0% (2)	n.d.	7% (54)
SK	14% (36)	50% (4)	9% (32)	n.d.	n.d.	45% (219)
<b>Total</b>	<b>26% (10562)</b>	<b>43% (261)</b>	<b>30% (5195)</b>	<b>34% (3074)</b>	<b>31% (1339)</b>	<b>10% (14352)</b>

### Country level assessment (Hard max. 1 000 characters without spaces)

Between 2013 and 2021, pesticides were reported from a total of 11 014 monitoring sites for surface waters and 14 352 sites for groundwater. The number of monitoring sites reporting data for surface waters varies by country from less than 10 sites (Hungary, Iceland, Luxembourg, Switzerland) to more than 1,000 sites (France, Italy, Poland, Spain). There is similar variation in groundwater monitoring sites: numbers range from 51 sites in Switzerland to more than 3,000 sites in Italy (and more than 1,000 sites in Austria, Denmark, France, Germany, Spain).

The number of pesticides reported in surface waters ranges from fewer than 10 substances (Iceland, Luxembourg, Norway, Switzerland) to more than 100 substances (Czechia, France, Germany, Italy, Netherlands, Spain). For groundwater, the lowest number of pesticides was reported from Austria (6) and the highest number from France (215). For further information, see table A1 in supporting information.

Exceedance rates of more than 30% were reported in 10 out of 29 countries for surface waters and in one out of 22 countries for groundwater. High exceedance rates were mainly reported at monitoring sites in large and medium-sized rivers.

## Supporting information

### Definition –

The indicator ‘Pesticides in rivers, lakes and groundwater in Europe’ shows:

- the percentage of reported monitoring sites with pesticides exceeding thresholds in surface waters and groundwater in Europe weighted by country area;
- the percentage of reported monitoring sites with pesticides exceeding thresholds in surface waters, different sized rivers, lakes and groundwater in European countries, 2013-2021.

### Unit of measure –

The indicator is expressed as percentages of monitoring sites where one or more pesticides exceed the effect threshold for surface waters or the quality standard for groundwater. To reduce the impact of uneven spatial and temporal data reporting, we used a country area weighting factor:

$\sum \text{Share of monitoring sites with exceedances per country (\%)} \times \text{country area (km}^2\text{)} /$

$\text{Area of countries with reported monitoring sites per year (km}^2\text{)}$

The country weighting factor was not used for Figure 2 in the indicator.

### Policy/environmental relevance –

The Water Framework Directive (WFD)<sup>8</sup> and its daughter directives on environmental quality standards in water policy<sup>11</sup>, as amended in 2013<sup>12</sup>, and quality standards for groundwater<sup>9</sup> set quality objectives and targets for pesticides in surface waters and groundwater and should protect water quality from pesticide pollution.

According to the WFD, pesticide concentrations above critical threshold levels lead to surface waters failing to achieve ‘good chemical status’, based on pesticides listed as priority substances, and ‘good ecological status’, based on pesticides listed as river basin-specific pollutants. The WFD also lists pesticides that are groundwater pollutants to assess the chemical status of groundwaters. For each pesticide, a quality standard of 0.1 µg/L was set in the Groundwater Directive<sup>9</sup>, which is not a health-based, but a general precautionary limit value.

Failure to achieve effect thresholds and quality standards in water means failure to achieve the environmental objectives of the WFD.

The European Green Deal<sup>4</sup> and its associated strategies and actions — the farm to fork strategy<sup>6</sup>, biodiversity strategy<sup>7</sup>, chemicals strategy for sustainability<sup>13</sup> and zero pollution action plan<sup>5</sup> — brings renewed ambition to significantly reduce the use of and risk from pesticides and improve the risk assessment of chemicals.

EU policies aimed at reducing the potential risk from pesticides are also supported by the Plant Protection Products Regulation<sup>14</sup>, the Sustainable Use of Pesticides Directive<sup>15</sup> and the Biocidal Products Regulation<sup>16</sup>.

- The Plant Protection Products Regulation sets out rules for the authorisation of plant protection products and their marketing, use and control. Based on this regulation, the Seventh Environment

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<sup>11</sup> EU, 2008, Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council, OJ L 348, 24.12.2008, p. 84-97.

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

<sup>13</sup> EC, 2020, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions ‘Chemicals strategy for sustainability towards a toxic-free environment’, COM(2020) 667 final, Brussels, 14.10.2020.

<sup>14</sup> EU, 2009, Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC, OJ L 309, 24.11.2009, p. 1-50.

<sup>15</sup> EU, 2009, Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides, OJ L 309, 24.11.2009, p. 71-86.

<sup>16</sup> EU, 2012, Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, OJ L 167, 27.6.2012, p. 1-123.

Action Programme<sup>17</sup> set the objective that, by 2020, the use of plant protection products should not have any harmful effects on human health, or unacceptable influence on the environment, and that such products should be used sustainably.

- The Sustainable Use of Pesticides Directive aims to reduce the risks and impacts of pesticide use on human health and the environment and to promote the use of integrated pest management and alternatives such as non-chemical approaches.

The Biocidal Products Regulation focuses on the marketing and use of biocidal products.

**EEA topics** - <https://www.eea.europa.eu/themes>

Water and marine environment

**DPSIR –**

Pressure

**Typology –**

Descriptive indicators (type A)

**Methodology –**

For surface waters, effects thresholds could be identified for only 49% of the pesticides reported; 51% of all pesticides reported could not be considered in the assessment.

The calculation method used to determine exceedance rates with country weightings reduces any imbalance in the data reported with respect to the numbers of monitoring sites and pesticides reported. This reduces the impact of high levels of reporting by a few countries on the overall percentage of monitoring sites with exceedances.

This country weighting means that unusually high or low exceedance rates within a country may affect the overall indicator. This can also occur if data for only a few monitoring sites are reported but a relatively high or low proportion of these are exceedances. A minimum number of monitoring sites reported per country and year would be needed to reduce this imbalance.

There is a lack of a consistent time series of comparable data. Instead, the data for many monitoring sites were not reported for more than a few years, which disperses the spatial and temporal coverage of the data set.

**Data sources & providers –**

[Area by NUTS 3 region](#)

**Geographic coverage –**

- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czechia
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary

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<sup>17</sup> EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', OJ L 354, 28.12.2013, p. 171-200.

- Iceland
- Ireland
- Italy
- Latvia
- Lithuania
- Luxembourg
- Netherlands
- Norway
- Poland
- Portugal
- Romania
- Serbia
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland

**Time coverage –**  
2013-2021

**Frequency of dissemination -**  
'every year'

**References -**

**Contact -** [info@eea.europa.eu](mailto:info@eea.europa.eu)

**UN SDGs -** 17 goals from <https://w3.unece.org/SDG/Home>

**Accuracy and uncertainties –**

In surface waters, ecotoxicologically-based effect thresholds were determined to assess exceedance rates at monitoring sites. Those thresholds indicate potential pollution by pesticides affecting communities in aquatic ecosystems. Using the lowest ecotoxicologically-based effect threshold is the most conservative criterion. The EQS have not necessarily been defined in each country with the same criteria as used here, which makes comparisons with this indicator difficult.

In groundwater, exceedances were assessed against the 0.1µg/L quality standard set out in the Groundwater Directive. No regulated quality standards for non-relevant metabolites are available and so they were excluded from the assessment.

The indicator demonstrates a need to harmonise limit values (including nationally set river basin-specific pollutant EQS values).

Table A1: numbers of pesticides reported by each country in surface and groundwaters, 2013-21

country	No. of pesticide substances 2013-21	
	Surface Water	Groundwater
Austria	10	6
Belgium	99	68
Bulgaria	53	39
Croatia	66	43
Cyprus	65	37
Czechia	129	88
Denmark	10	184
Estonia	94	73
Finland	128	*
France	159	233
Germany	115	18
Greece	50	*
Hungary	10	*
Ireland	30	61
Iceland	7	
Italy	191	175
Latvia	50	27
Lithuania	47	39
Luxembourg	10	*
Netherlands	180	*
Norway	10	*
Poland	35	62
Portugal	28	14
Romania	*	18
Serbia	46	44
Slovakia	46	50
Slovenia	37	30
Spain	107	106
Sweden	76	*
Switzerland	6	20