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Delegations will find attached document SWD(2026) 232 final - Part 6/27.

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PART 6/27

COMMISSION STAFF WORKING DOCUMENT

**Member State country fiche
on the implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member States reports for the period 2020–2023**

EN EN

Germany

Country staff working document
on the implementation of the Nitrates Directive

Period: 2020-2023

Contents

1. KEY FINDINGS AND RECOMMENDATIONS

Germany submitted its report under the Nitrates Directive for the period 2020-2023 in July 2024 ([1]) via electronic reporting on Reportnet 3 portal ([2]).

This country staff working document is presented in line with the reporting guidelines and it is based on the data reported by the Member State ([3]), Eurostat and other EU official data sources. The German authorities were consulted for factual correctness. There may be differences with the information presented in their national report ([4]).

The numbers presented below are indicators of the situation in the Member State but need further interpretation to draw specific conclusions. In some cases, changes in the monitoring networks and in methodology for assessing trophic status may complicate comparisons between reporting periods.

1.1. Key findings

Pressures from agriculture

In Germany, the utilised agricultural area (UAA) accounts for 47% of the country's total land area, which is higher than the EU average (38%). The livestock density is 0.9 livestock units per hectare (LSU/ha) of UAA, which is higher than the EU average of 0.7 LSU/ha, and there are regional variations with livestock densities above 3 LSU/ha UAA in some regions. The gross nitrogen balance is 41 kg/ha UAA and the gross phosphorus balance is -5 kg/ha UAA ([5]).

Monitoring network

For groundwater, the density of the monitoring network is around 2 stations per 1 000 km^2, which is lower than the EU average (8 stations). Compared to the previous reporting period, the density decreased by 2%. However, the plan of Germany is to significantly extend the number of monitoring points in the next reporting cycle.

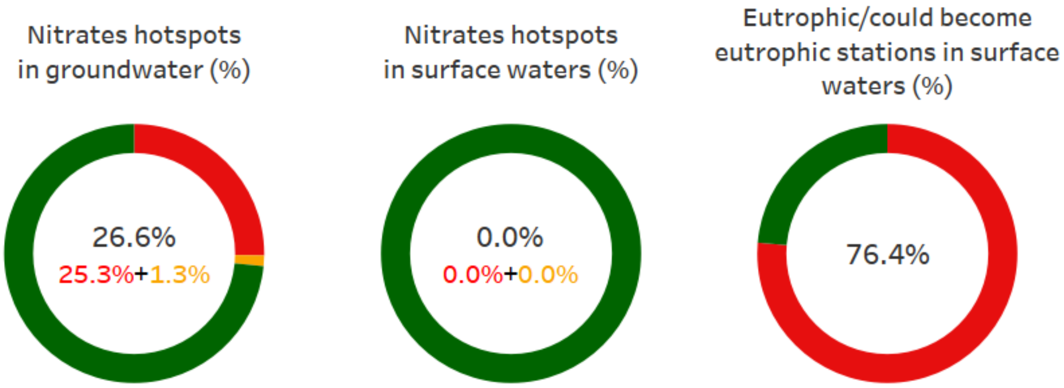
For surface freshwater, the density of the monitoring network density is around 1 station per 1 000 km^2, which is below the EU average (7 stations). Compared to the previous reporting period, the density remained stable. The monitoring network includes river and lake/water reservoir stations.

For surface saline waters, the monitoring network includes transitional ([6]), coastal and marine waters.

([1]) Final version was received in December 2024.
([2]) Reportnet 3 is an e-Reporting platform for reporting environmental and climate data to the European Environment Agency (EEA).
([3]) Only monitoring points electronically reported with nitrate concentration or tropic status, which were not removed from the monitoring network were considered for this assessment.
([4]) A uniform data-processing approach is applied to all Member States. In some instances this may not fully correspond to the specific methodology used in the Member State.
([5]) The EU average is not available due to data gaps.
([6]) Germany assesses the transitional waters alongside rivers and lakes/water reservoirs.

Water quality (7)

Figure 1 – Share of monitoring points showing pollution in groundwater and surface waters



Note: The percentage share of **nitrate hotspots** refers to monitoring points with average annual nitrate concentrations ≥ 50 mg/l (red), or between 37.5 and 49.99 mg/l with an increasing trend (orange). This is calculated relative to the total number of points with measurements. The percentage share of monitoring points classified as **eutrophic or could become eutrophic** (red) is calculated relative to the total number of points with trophic status reported.

In **groundwater**, 74.7% of monitoring points show nitrate concentrations below 50 mg/l.

Overall, 26.6% of monitoring points fall in two categories illustrated in Figure 1, i.e. they show nitrate concentrations ≥ 50 mg/l (25.3%) or between 37.5 and 49.99 mg/l with an increasing trend (1.3%). Compared to the data reported in the previous reporting period, this represents a decrease of 4.1 percentage points (from 30.7% to 26.6%). The regions (8) with the highest share are Rheinhessen-Pfalz (62.5%), Düsseldorf (57.1%), as well as Trier and Bremen (both 50.0%).

Compared to the previous reporting period, nitrate concentrations decreased in 34.6% of groundwater monitoring points and increased in 23.0%. Among points with nitrate concentration ≥ 50 mg/l, increases (47.8%) were more frequent than decreases (42.2%).

In **surface water**, 100% of monitoring points show nitrate concentrations below 50 mg/l and 23.6% are classified as non-eutrophic.

No monitoring points show nitrate concentrations ≥ 50 mg/l, or between 37.5 and 49.99 mg/l with an increasing trend as illustrated in Figure 1. Compared to the data reported in the previous period, there has been no change. 49% of surface water monitoring stations show nitrate concentrations ≥ 10 mg/l, which is relevant for eutrophication.

Compared to the previous reporting period, nitrate concentrations decreased in 24.5% of surface water monitoring points and increased in 8.9%.

(7) The water quality data reported by Germany cover 2020-2022 and all figures shown in this staff working document therefore refer to this period. Likewise, all reference to the previous reporting period refer to 2016-2018. Therefore, assessment in this document can differ from the German National Report.

(8) Regions here refer to NUTS 2 regions under the EU nomenclature of territorial units for statistics.

The share of monitoring points reported as **eutrophic/could become eutrophic** is 76.4 % as illustrated in Figure 1. This represents a minor decrease of 0.2 percentage points (from 76.6% to 76.4%) when compared to the data reported in the previous reporting period. The highest share is 100%, which is reached in 17 regions in central and northern Germany.

Nitrate Vulnerable Zones

In line with Article 3 paragraph 5, Germany applies an action programme with mandatory measures throughout the entire national territory.

Action Programme

Germany modified its action programme during the reporting period. Amendments concerned the determination of fertiliser requirements, the application of fertilisers near watercourses and on sloping areas near watercourses, the limit of 170 kg N/ha for organic fertilisers, prohibition periods, recording obligations and application techniques. Additionally, Germany designated nitrate-polluted and phosphorus-polluted areas. In those areas, stricter measures apply than in other areas.

Enforcement action

In 2013, the Commission opened an infringement procedure and sent Germany a letter of formal notice, raising concerns about a failure to meet various obligations under the Nitrates Directive. Specifically, it highlighted the obligation of taking additional measures and reinforced actions when existing measures appear insufficient to achieve the directive's objective. On June 2018, the European Court of Justice ruled that Germany was in breach of its obligations by failing to revise an action programme whose measures had proved insufficient (Commission vs Germany, C-543/16). As Germany was still in breach of the Nitrates Directive as declared by the Court, the Commission sent a letter of formal notice on July 2019, urging Germany to comply with the judgment. After taking additional measures, notably the designation of zones of high concern (Nitrates polluted areas so-called “red zones” and Phosphorus polluted areas so called “yellow zones”), the Commission closed the infringement case in June 2023.

1.2. Recommendations

- Review and where necessary reinforce measures to improve water quality, notably with a view to addressing:
    - high or increasing nitrate concentrations in groundwater
    - high or increasing nitrate concentrations in surface waters
    - eutrophication of surface water bodies including coastal and marine waters
- When preparing the Nitrates Action Programme:
    - take into account objectives and deadlines of the Water Framework Directive, ensuring coherence with the 4th RBMP
    - consider introducing limitations on phosphorus fertilisation, if not yet implemented

  - ensure the cooperation between competent authorities in different sectors, such as agriculture and water, and with stakeholders
  - consider where measures could be simplified without compromising on results, working with the Commission and the other member States in the light of the findings of the evaluation of the Nitrates Directive
- Promote the dissemination of best practice, scientific knowledge and innovation to:
  - improve the analysis of expected future evolution in water quality and develop gap assessments for the nutrient load reductions required to reach water quality objectives
  - accelerate preparedness and resilience of action programmes and measures in the context of climate change

2. PRESSURES FROM AGRICULTURE

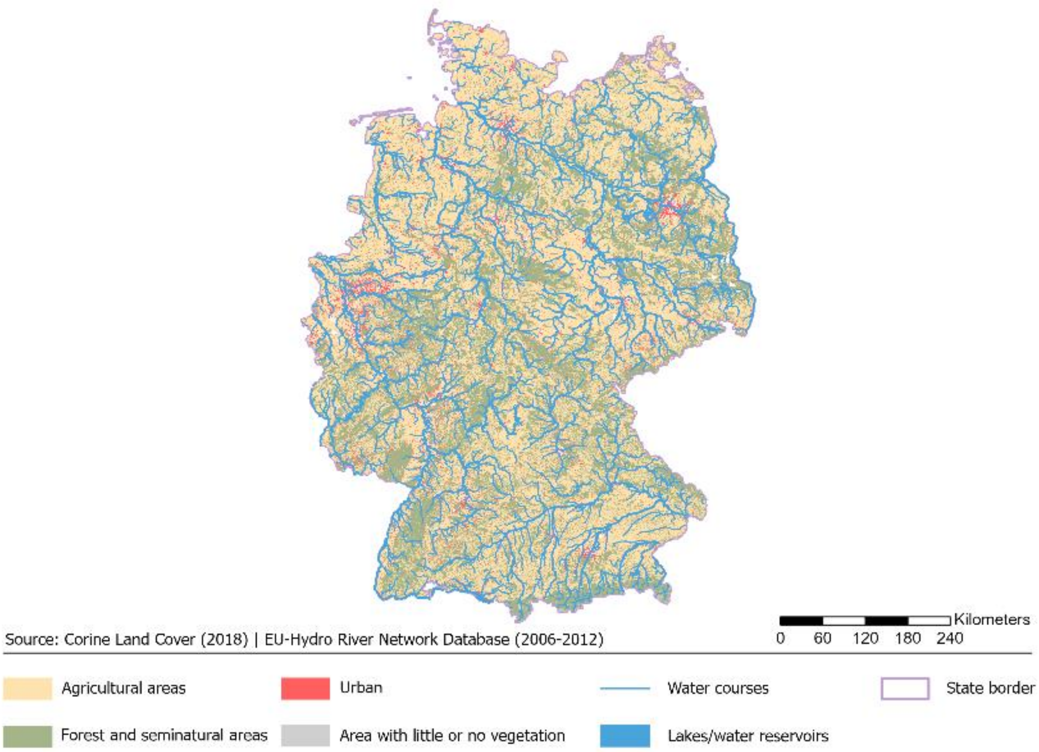
In Germany, crop production accounted for the largest portion of the agricultural sector's output value with 47.3% in the reporting period 2020-2023. Animal production followed with 45.8%, and other outputs made up 6.9% ([9]). The share of agricultural land used for organic farming increased from 7.2% in the reporting period 2016-2019 to 10.1% in the reporting period 2020-2023. ([10])

The risk of diffuse pollution of waters by nutrients from agriculture is primarily dependent on the agricultural pressures in the Member State, expressed in terms of utilised agricultural area (UAA), livestock density, the use of mineral and manure fertilisers, as well as the nitrogen and phosphorus balance. This section describes the evolution of these indicators.

2.1. Land use

The map below presents the distribution of land use in Germany along with watercourses and lakes/water reservoirs.

Figure 2 – Land use distribution in Germany



([9]) Source: Eurostat (aact_eaa01)
([10]) Source: Eurostat (ef_m_org)

The utilised agricultural area (UAA) in Germany covered 16.6 million hectares in 2023, making up 46.9% of the country's total land area. Arable land accounts for 70.4% of UAA, followed by permanent grassland at 28.4% and permanent crops at 1.2%.

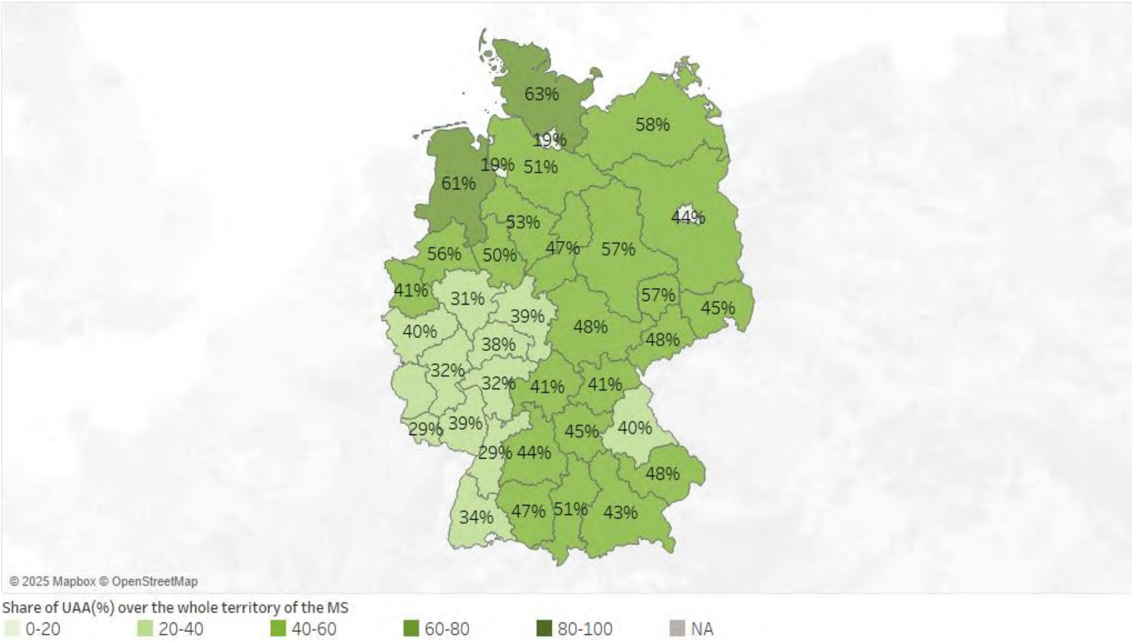
Table 1 – Evolution of the utilised agricultural area

	2010	2013	2016	2020	2023
utilised agricultural area (1000 ha)	16,704	16,700	16,715	16,595	16,586
arable land (1000 ha)	11,847	11,876	11,819	11,664	11,681
permanent grassland (1000 ha)	4,655	4,621	4,692	4,730	4,704
permanent crops (1000 ha)	199	200	202	198	200
kitchen gardens (1000 ha)	4	3	2	3	0

Source: Eurostat (ef_lus_main)

In 2020, the share of the UAA ranged from 63% of UAA in Schleswig-Holstein, to 29% in Saarland.

Figure 3 – Share of utilised agricultural area (UAA) at NUTS2 level in 2020 (11)



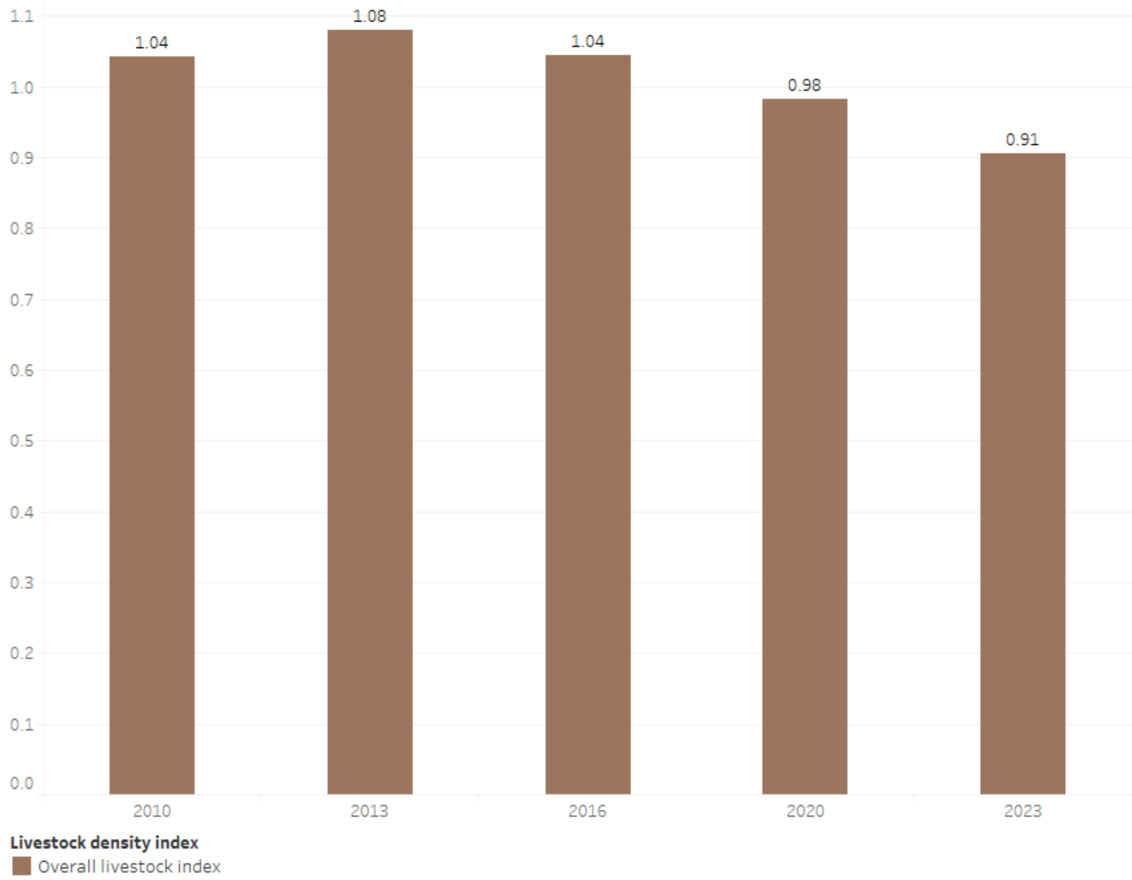
Source: Eurostat (ef_lus_main)

(11) Latest available data.

2.2. Livestock density

In Germany the livestock density was 0.91 livestock units per hectare (LSU/ha) of UAA in 2023. It has been decreasing in recent years.

Figure 4 – Evolution of the livestock density by animal type (LSU/ha UAA)



Source: Eurostat (ef_fsi_lskds)

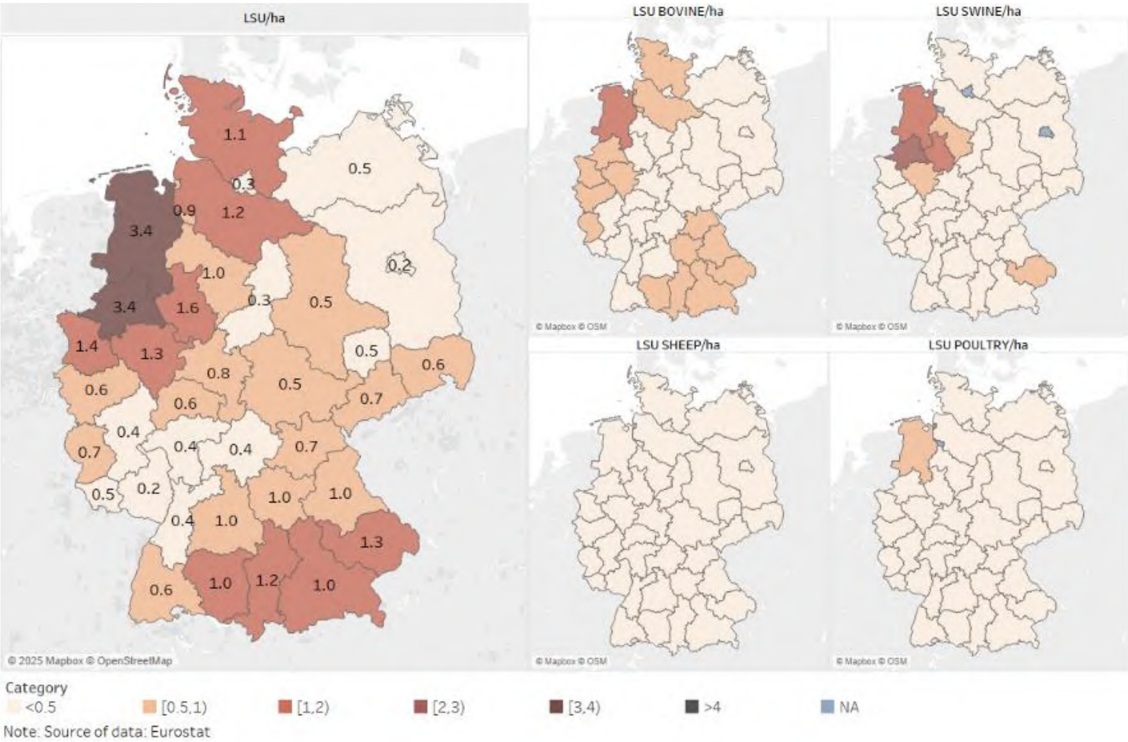
Table 2 – Evolution of the livestock numbers by animal type

	2007	2010	2013	2016	2020	2023
live bovines (Million heads)	12.71	12.71	12.69	12.47	11.30	10.84
of which dairy cows (Million heads)	4.09	4.18	4.27	4.22	3.92	3.71
live pigs (Million heads)	27.11	26.90	28.13	27.38	26.07	21.22
live poultry (Million heads)		128.90	177.33	169.72	173.15	156.30
live sheep (Million heads)		2.09	1.57	1.57	1.48	1.56
live goats (Million heads)	0.18	0.15	0.13	0.14	0.16	0.16

Source: Eurostat, for live poultry and live sheep data complemented with FAOSTAT

Livestock densities vary between regions with values of up to 3.4 LSU/ha UAA in Weser-Ems and Münster.

Figure 5 – Livestock density distribution by animal type (LSU/ha UAA) at NUTS2 level in 2020 ([12])



Source: Eurostat (Livestock units: ef_lsk_main; Utilised agricultural area: ef_lus_main)

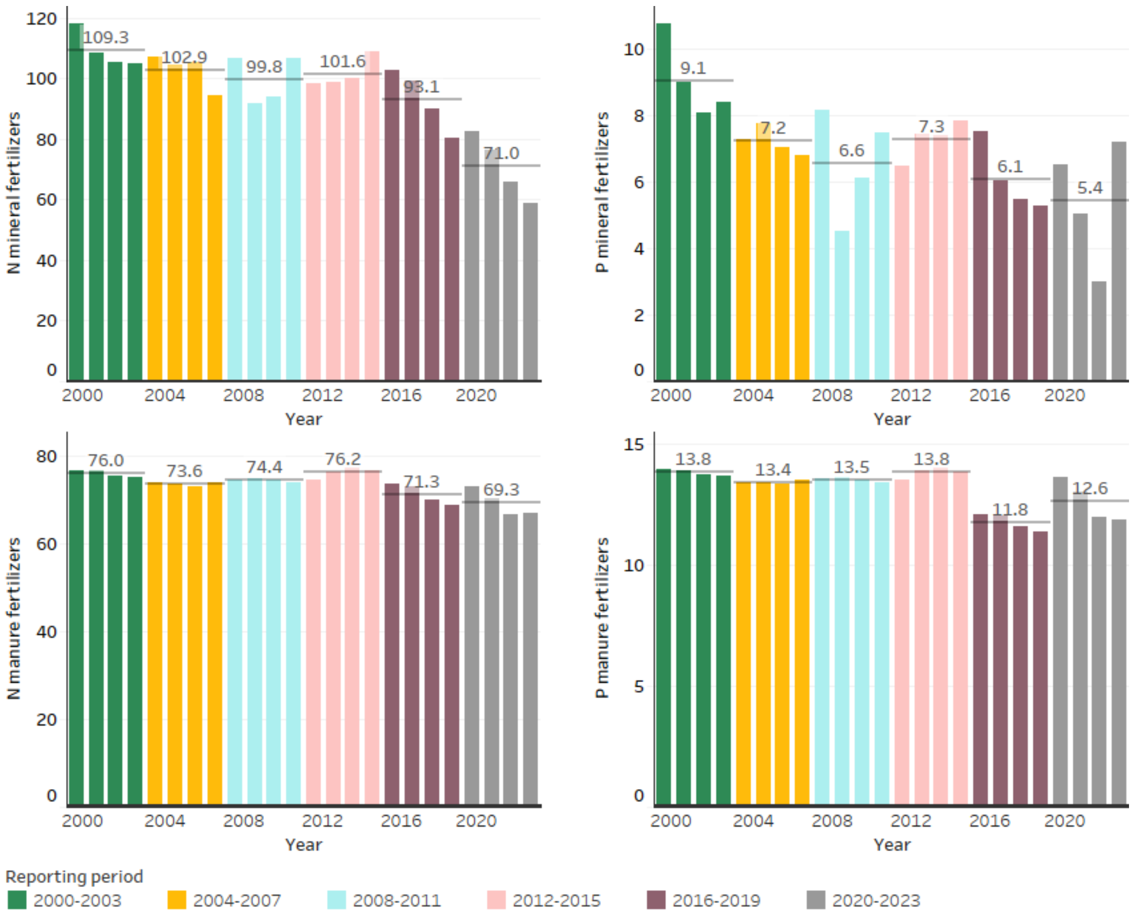
([12]) Latest available data.

2.3. Nitrogen and phosphorus fertiliser use

In Germany, the **use of nitrogen (N) fertilisers** was 71.0 kg/ha UAA for mineral fertilisers and 69.3 kg/ha UAA for manure fertilisers in 2020-2023. The use of N mineral fertilisers has decreased by 22.1 kg/ha UAA and the use of N manure fertilisers has decreased by 2.0 kg/ha UAA since the last reporting period.

The **use of phosphorus (P) fertilisers** was 5.4 kg/ha UAA for mineral fertilisers and 12.6 kg/ha UAA for manure fertilisers in 2020-2023. The use of P mineral fertilisers decreased by 0.7 kg/ha UAA and the use of P manure fertilisers increased by 0.8 kg/ha UAA since the last reporting period.

Figure 6 – Evolution of nitrogen and phosphorus fertiliser use (kg/ha UAA)



Source: Eurostat (aei_pr_gnb)

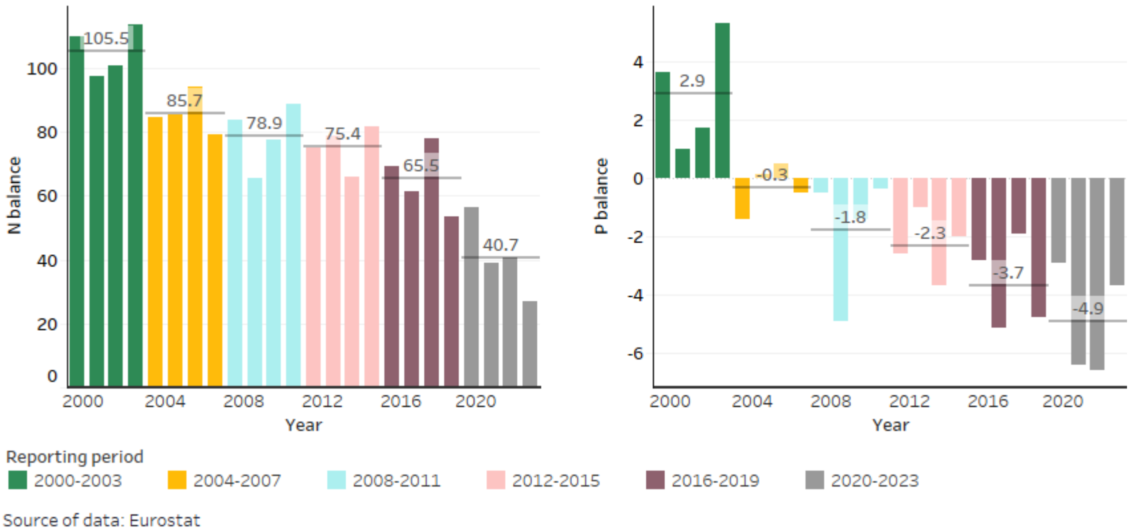
2.4. Nitrogen and phosphorus balance

The nutrient balance ([13]) per hectare of agricultural land (kg/ha UAA) is an indicator of the success that farmers have had in implementing balanced fertilisation and of the resulting nutrient pressure from agriculture. A high surplus (positive balance) indicates a risk of emissions into water and air.

In Germany, the **gross nitrogen (N) balance** was 40.7 kg/ha UAA in 2020-2023. The nitrogen balance decreased by 24.8 kg/ha UAA since the previous reporting period.

The **gross phosphorus (P) balance** was -4.9 kg/ha UAA in 2020-2023. The phosphorus balance decreased by 1.2 kg/ha UAA since the previous reporting period.

Figure 7 – Evolution of gross nitrogen and phosphorus balance (kg/ha UAA)



Source: Eurostat (aei_pr_gnb

2.5. Nitrogen discharge to the environment

Germany did not provide recent numerical information on nitrogen discharge from agriculture to the environment in their national report. In 2016-2018 agriculture contributed to more than 70% of nitrogen losses to the environment.

([13]) Gross nutrient balance (aei_pr_gnb)

3. NITRATE VULNERABLE ZONES

In line with Article 3 paragraph 5, Germany applies an action programme with mandatory measures throughout the entire national territory (whole country approach) since 1994 and is thus exempted from designating NVZ.

4. NITRATES IN GROUNDWATER

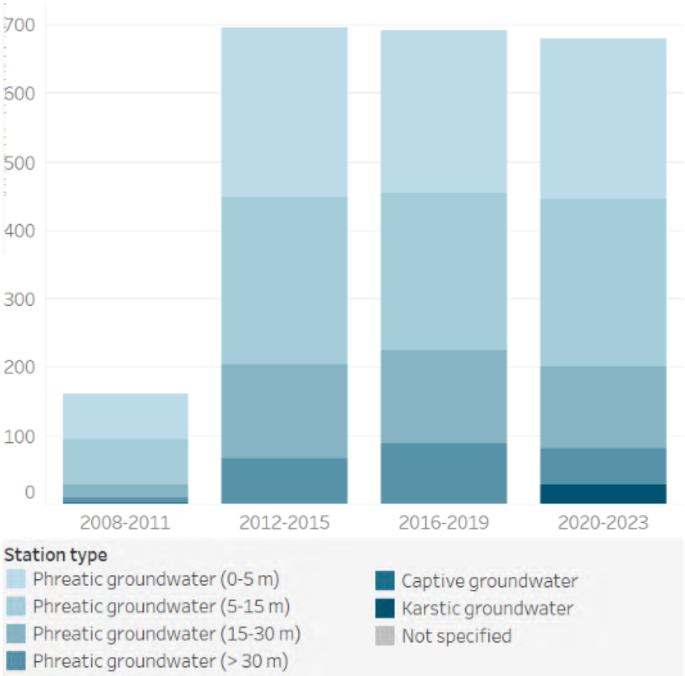
4.1. Monitoring of nitrate concentrations in groundwater

Groundwater monitoring is conducted using two monitoring networks: the EU nitrate monitoring network and the more extensive AVV designated monitoring network. The nationwide EU nitrate monitoring network is focused on agricultural sources of nitrate pollution, while the AVV network includes measuring points influenced by both agricultural and non-agricultural sources. As only data from the EU nitrate monitoring network were reported electronically, those are presented in this document. The intention of Germany is to report selected AVV monitoring points in the next reporting cycle. The current assessment period covers only the years 2020-2022, because the 2023 measurement results were not available at the time the report was compiled.

During the reporting period 2020-2023 nitrate concentrations were reported at 681 groundwater monitoring points. The station density was 1.9 stations per 1,000 km^2. The EU station density was 7.4 stations per 1 000 km^2.

The overall number of monitoring points decreased by 11 (1.6%) compared to the previous reporting period. While stations for phreatic groundwater (from 15-30 m and >30 m) decreased by 53, 13 stations for phreatic groundwater 5-15 m and 30 stations for karstic groundwater were added. The graph below presents changes in the monitoring network over the last four reporting periods.

Figure 8 – Evolution of groundwater monitoring network (monitoring points with measurements of nitrates)



In this reporting period, changes in nitrate concentrations compared to the previous monitoring period (trends) were assessed for 626 monitoring points, accounting for 91.9% of all points with measurements. The share of monitoring points with trends decreased compared to the previous reporting period, which was 99.6% in reporting period 2016-2019. The table below presents the number of monitoring points with measurements and trends in the last four reporting periods. ([14])

Table 3 – Number of groundwater monitoring points with measurements of nitrates and trends by station type ([15])

	Stations with measurements				Stations with trends			
Station type	2008-2011	2012-2015	2016-2019	2020-2023	2008-2011	2012-2015	2016-2019	2020-2023
Phreatic groundwater (0-5 m)	66	247	236	235	66	247	236	208
Phreatic groundwater (5-15 m)	66	246	232	245	66	244	230	226
Phreatic groundwater (15-30 m)	21	137	135	120	21	136	135	115
Phreatic groundwater (> 30 m)	7	67	89	51	7	65	88	50
Captive groundwater	2				2			
Karstic groundwater				30				27
Total	162	697	692	681	162	692	689	626

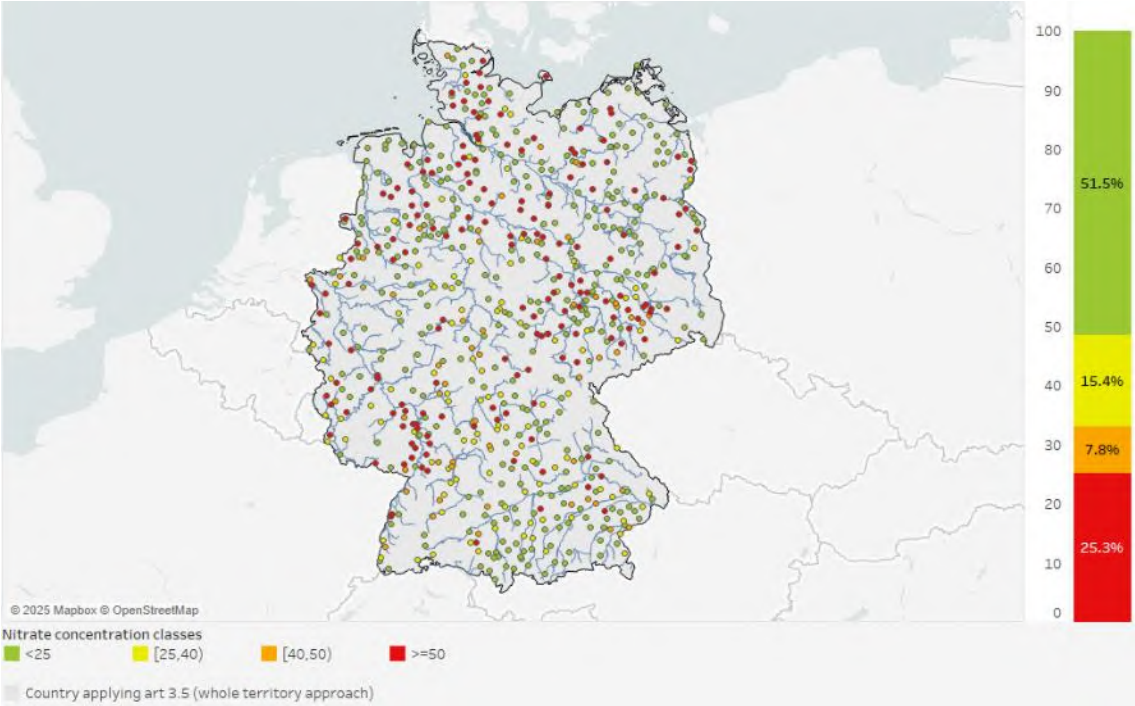
([14]) The Member State can report a monitoring point with trends that was monitored but not reported in the previous reporting period.

([15]) Germany reported that monitoring was discontinued in 191 monitoring points relative to the previous reporting period. Discontinuation may be due to nitrate concentrations below 25 mg/l, change in station code or type, or other specific reasons.

4.2. Nitrate concentrations in groundwater

In Germany, 25.3% of groundwater monitoring points showed average nitrate concentrations equal to or above the drinking water threshold of 50 mg/l, whereas 7.8% had concentrations between 40-49.99 mg/l, 15.4% showed concentrations between 25-39.99 mg/ and 51.5% below 25 mg/l. The figure below shows the spatial distribution of the average nitrate concentrations and the shares in corresponding nitrate concentration classes.

Figure 9 – Map of average annual mean nitrate concentrations in groundwater and share of monitoring points by nitrate concentration class in the reporting period 2020-2023



Note: In the map, monitoring points with higher values are plotted on top.

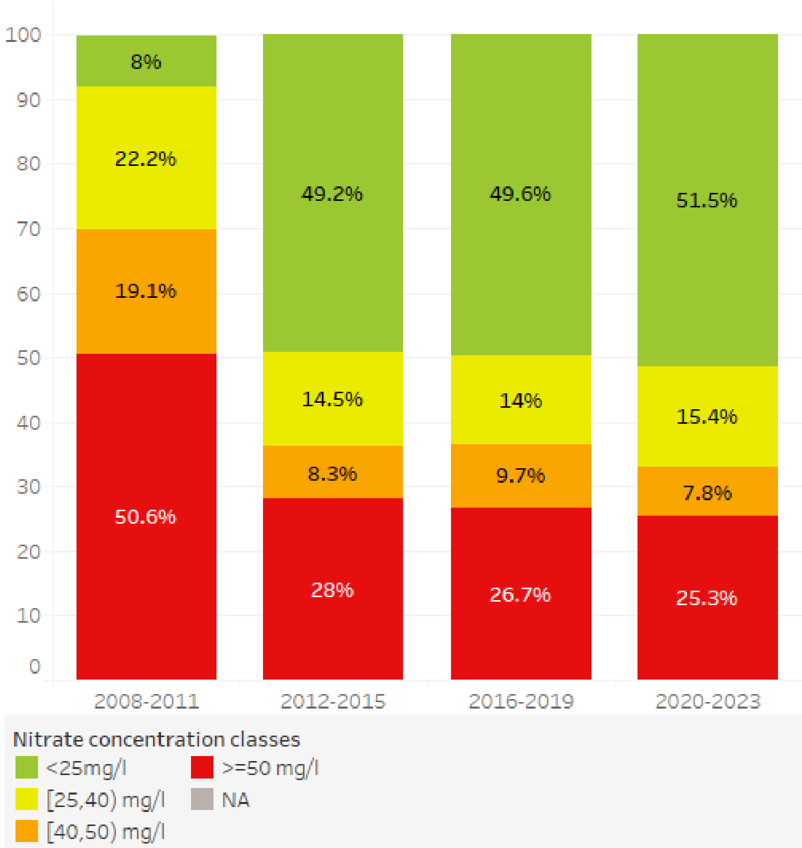
The station type category with the highest share of points with nitrate concentrations equal or above threshold 50 mg/l was phreatic groundwaters at depth 5-15m with a share of 30.6%, followed by phreatic groundwaters at depth 0-5m with a share of 26.8%, as shown in table below.

Table 4 – Share of groundwater monitoring points by nitrate concentration class (mg/l) in the reporting period 2020-2023, categorised by station type

	Number of stations	% of Total	<25	[25,40)	[40,50)	>=50
Phreatic groundwater (0-5 m)	235	34.5%	45.5%	16.6%	11.1%	26.8%
Phreatic groundwater (5-15 m)	245	36.0%	51.4%	11.8%	6.1%	30.6%
Phreatic groundwater (15-30 m)	120	17.6%	63.3%	12.5%	5.0%	19.2%
Phreatic groundwater (> 30 m)	51	7.5%	64.7%	13.7%	7.8%	13.7%
Captive groundwater						
Karstic groundwater	30	4.4%	30.0%	50.0%	6.7%	13.3%
Not specified						
Total	681	100.0%	51.5%	15.4%	7.8%	25.3%

Compared to the previous reporting period, the share of monitoring points with concentration ≥ 50 mg/l decreased from 26.7% to 25.3%. The graph below presents the share of monitoring points per classes of nitrate concentrations in the last four reporting periods. The significant change in the share of points with high nitrate concentrations between the reporting periods 2008-2011 and 2012-2015 is a consequence of a change in the monitoring network.

Figure 10 – Share of monitoring points in groundwater by class of nitrate concentration ([16])in the current and previous reporting periods

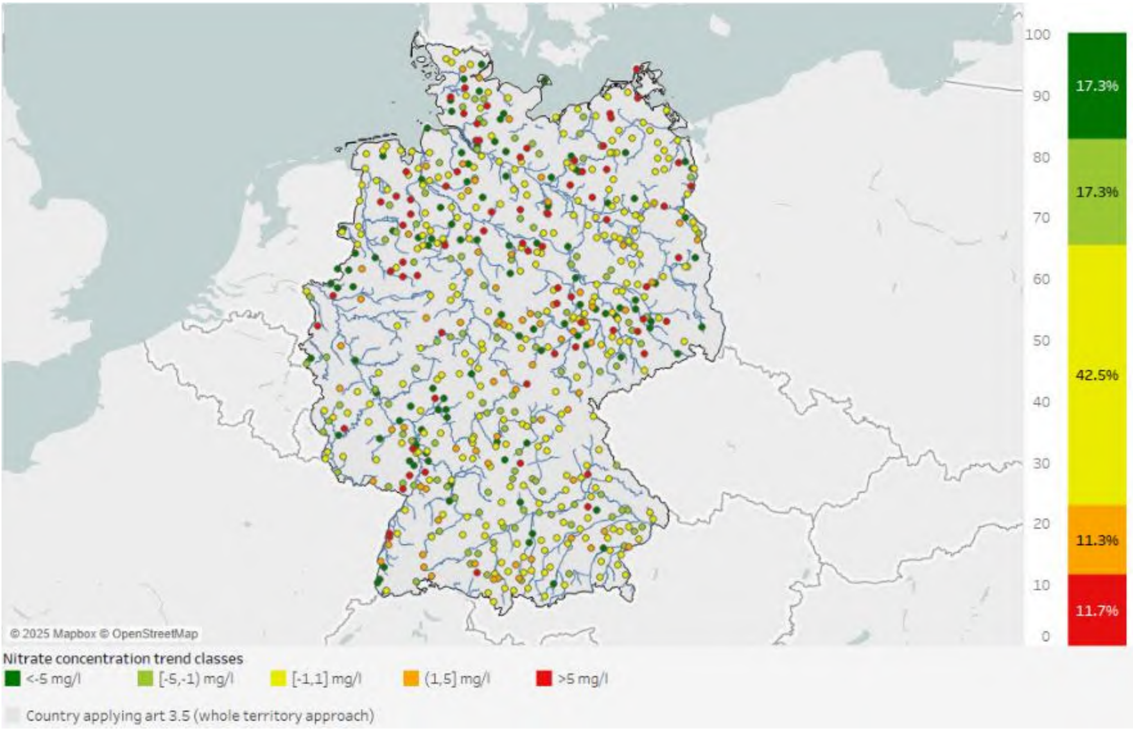


([16]) Average of annual mean values over the reporting period.

4.3. Trends in nitrate concentrations in groundwater

Compared to the last reporting period, there has been a decrease of nitrate concentrations in 34.6% of monitoring points and an increase in 23%. For the remaining 42.5% there was no significant change. The increase or decrease can be categorised as weak if it is between 1 and 5 mg/l, and as strong if it is above 5mg/l.

Figure 11 – Map of trends in average annual mean nitrate concentrations ([17]) in groundwater between the periods 2016-2019 and 2020-2023 and share of monitoring points by trend class



Note: In the map, monitoring points with higher values are plotted on top.

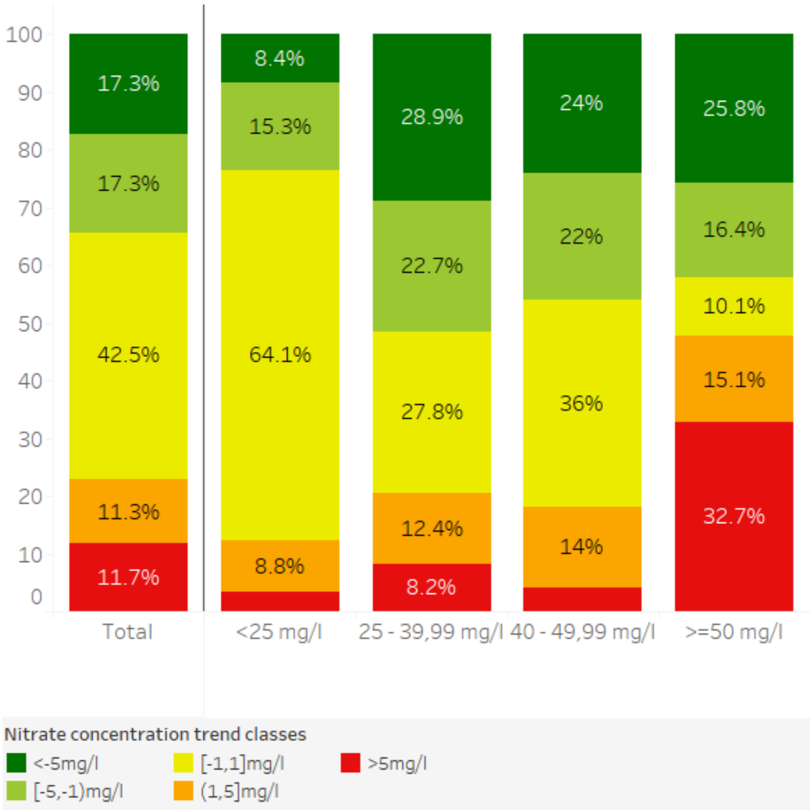
Table 5 – Share of groundwater monitoring points by trend class (mg/l), between the periods 2016-2019 and 2020-2023, categorised by station type

	Total Number of Stations	% Total Number of Stations	<-5	[-5,-1)	[-1,1]	(1,5]	>5
Phreatic groundwater (0-5 m)	208	33.2%	18.3%	22.6%	34.6%	11.5%	13%
Phreatic groundwater (5-15 m)	226	36.1%	19.5%	14.2%	39.8%	12.8%	13.7%
Phreatic groundwater (15-30 m)	115	18.4%	13.9%	15.7%	54.8%	7.8%	7.8%
Phreatic groundwater (>30 m)	50	8.0%	16%	10%	62%	6%	6%
Captive groundwater							
Karstic groundwater	27	4.3%	7.4%	22.2%	37%	22.2%	11.1%
Not specified							
Total	626	100.0%	17.3%	17.3%	42.5%	11.3%	11.7%

([17]) The average of annual mean values of nitrate concentrations over the reporting period 2020-2023 compared to the average for the reporting period 2016-2019.

When looking at the trend for waters that are polluted in the current reporting period (above 50 mg/l), there has been an increase of nitrate concentration for 47.8% and a decrease for 42.2% between the previous and the current reporting periods. The graph below shows the increase (in red and orange) and decreases (in green) per nitrate concentration class.

Figure 12 – Share of groundwater monitoring points by classes of trend between the periods 2016-2019 and 2020-2023, across different nitrate concentration classes (<24.99 mg/l, 25-39.99 mg/l, 40-49.99 mg/l and ≥50mg/l) ([18])

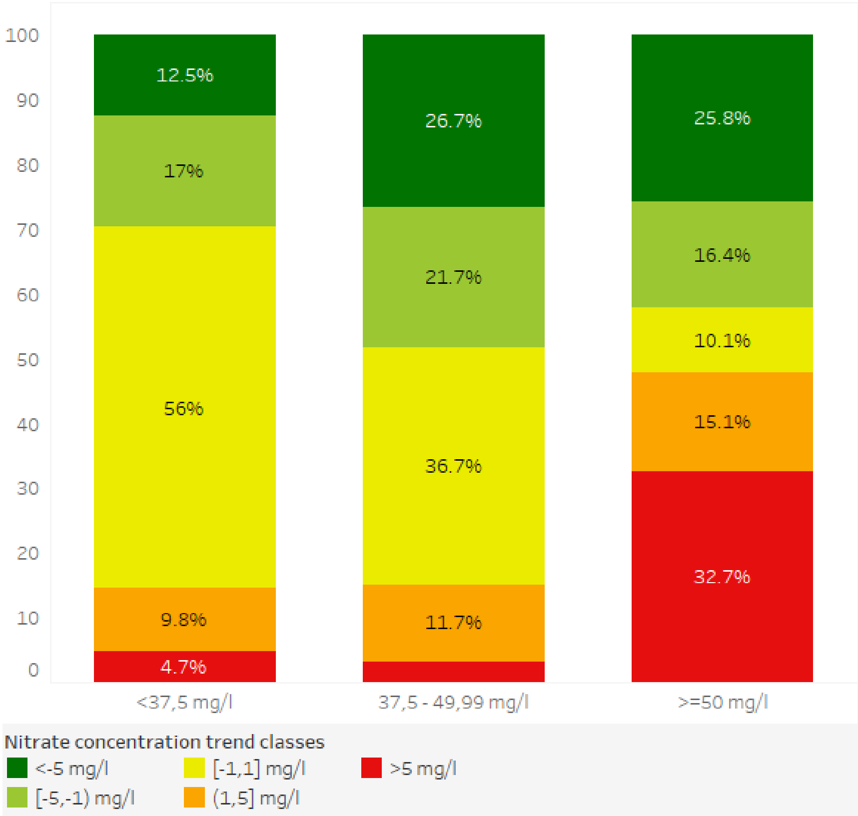


Note: The percentages below 5% are not labelled.

([18]) Nitrate concentration classes as per the Nitrates Directive report.

To better align the water quality assessment with the thresholds defined under the Groundwater Directive, trends were also calculated for the water quality class with nitrate concentrations between 37.5-49.99 mg/l. When looking at trends in this concentration category, there has been an increase of nitrate concentration for 15.0% and a decrease for 48.4% of monitoring points.

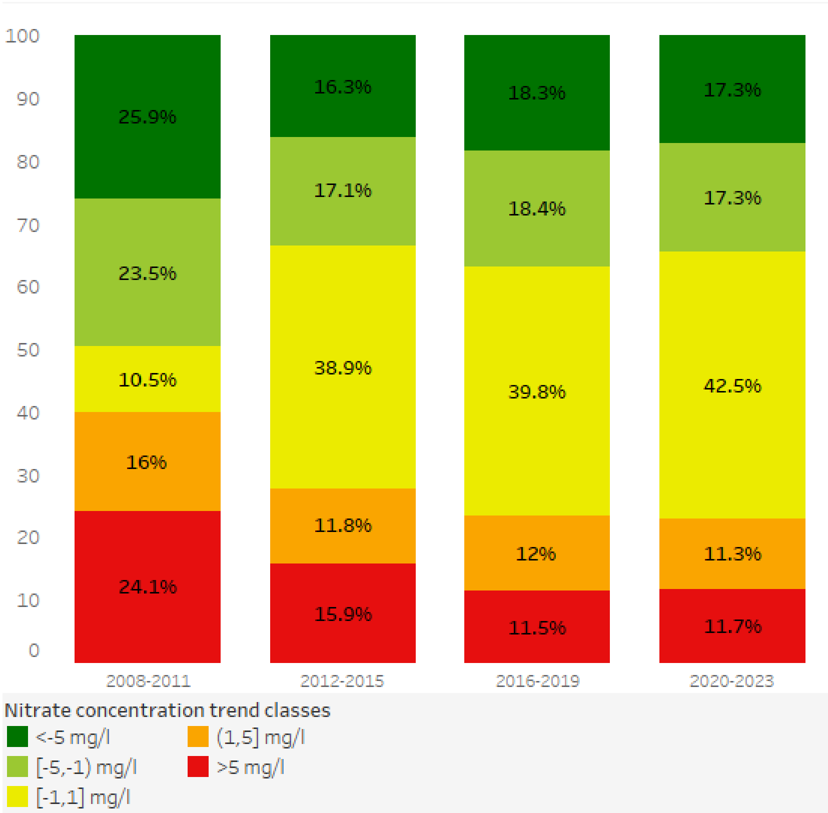
Figure 13 – Share of groundwater monitoring points by classes of trend between the periods 2016-2019 and 2020-2023, in different nitrate concentration classes (<37.5 mg/l, 37.5-49.99 mg/l and ≥50mg/l) ([19])



([19]) Nitrate concentration classes as in the Water Framework Directive guidance on GW status and trend assessment as division of nitrates quality standard (50mg/l and 75 % of this value [37.5 mg/l]).

Compared to the previous reporting period, there is a lower share of monitoring points with decreasing nitrate concentrations (34.6% in the current reporting period compared to 35.7% in the previous reporting period) but also a lower share of monitoring points with increasing nitrate concentrations (23.0% compared to 23.5%). The graph below shows the share of monitoring points with increases (in red and orange), decreases (in green) and without significant change (in yellow) in nitrate concentrations between reporting periods.

Figure 14 – Share of groundwater monitoring points by class of nitrate concentration trend ([20]) in the current and previous reporting periods



([20]) Change in average annual mean nitrate concentrations to previous reporting period.

4.4. Nitrate pollution hotspots in groundwater

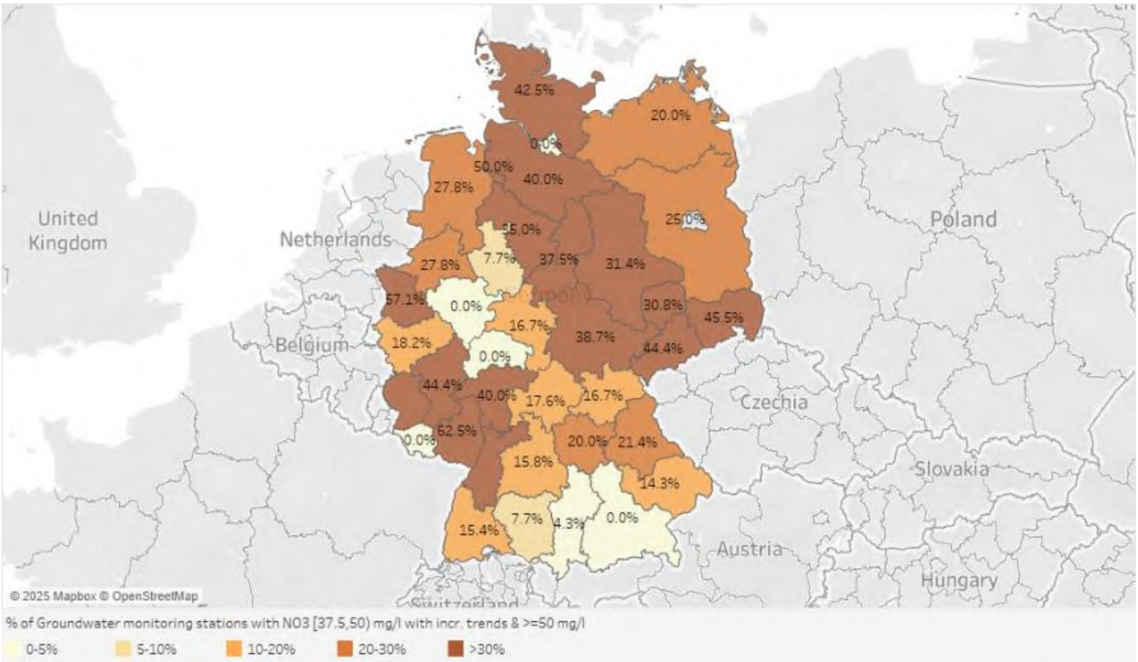
A nitrate pollution hotspot in groundwater is defined here as a monitoring point where the average annual nitrate concentration is either ≥ 50 mg/l or between 37.5 and 49.99 mg/l with an increasing trend. In Germany there are 181 groundwater nitrate pollution hotspots.

Figure 15 – Groundwater nitrate pollution hotspots

		inside NVZ	outside NVZ	Total
Groundwater	[37.5,50) with incr. trend	9		9
	>=50	172		172
Total		181		181

The regions with the highest share of hotspots are Rheinhessen-Pfalz (62.5%), Düsseldorf (57.1%) as well as Trier and Bremen (both 50.0%).

Figure 16 – Share of groundwater nitrate pollution hotspots at NUTS2 level



5. NITRATES IN SURFACE WATERS

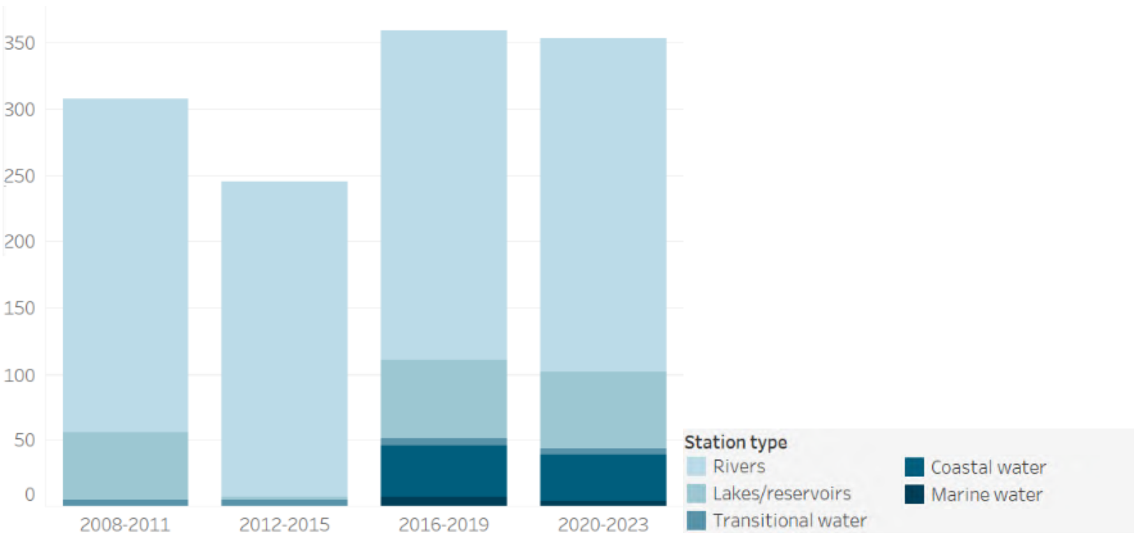
5.1. Monitoring of nitrate concentrations in surface waters

The monitoring of nitrates in rivers, lakes and transitional waters is conducted through the LAWA (Federal/State Working Group on Water) surveillance network. The monitoring of rivers and transitional waters is supplemented by a small number of measuring points of the operational monitoring network. The nitrate classification assessment for lakes considered exclusively data sampled during the vegetation period despite monthly sampling throughout the year. The competent German federal authorities carry out joint monitoring programmes with the Länder in coastal and marine waters. The data are mainly from the period 2020-2022 as measurements in 2023 were not yet available when the German report was prepared with exception for those in the Baltic Sea. As the year 2019 was not included in the previous official electronic data delivery and report in 2020, the data in this document may differ from the German National Report.

During the reporting period 2020-2023 nitrate concentrations were reported at 353 surface water monitoring points. Among these, 71.1% were in rivers, 16.4% were in lakes or reservoirs, and 12.4% were in saline waters. The freshwater monitoring points density was 0.9 stations per 1 000 km^2.

The overall number of monitoring points decreased by 7 (-1.9%) compared to the previous reporting period but remain higher than in the periods 2008-2011 and 2012-2015 when no monitoring points on coastal and marine waters were reported electronically. The graph below presents changes in the electronically reported monitoring network over the last four reporting periods.

Figure 17 – Evolution of electronically reported surface water monitoring network (monitoring points with measurements of nitrates)



In this reporting period, changes in nitrate concentrations compared to the previous monitoring period (trends) were assessed for 314 monitoring points, accounting for 89% of all points with measurements. The share of monitoring points with trends decreased compared to the previous reporting period (82.8% in reporting period 2016-2019). The table below presents the number of monitoring points and the number of monitoring points with trends in the last four reporting periods. ([21])

Table 6 – Number of surface water monitoring points with measurements of nitrates and trends per type ([22])

Station type	Stations with measurements				Stations with trends			
	2008-2011	2012-2015	2016-2019	2020-2023	2008-2011	2012-2015	2016-2019	2020-2023
Rivers	251	239	249	251			249	251
Lakes/reservoirs	52	2	60	58			44	58
Transitional water	5	5	5	5			5	5
Coastal water			39	35				
Marine water			7	4				
Total	308	246	360	353			298	314

([21]) The Member State can report a monitoring point with trends that was monitored but not reported in the previous reporting period.

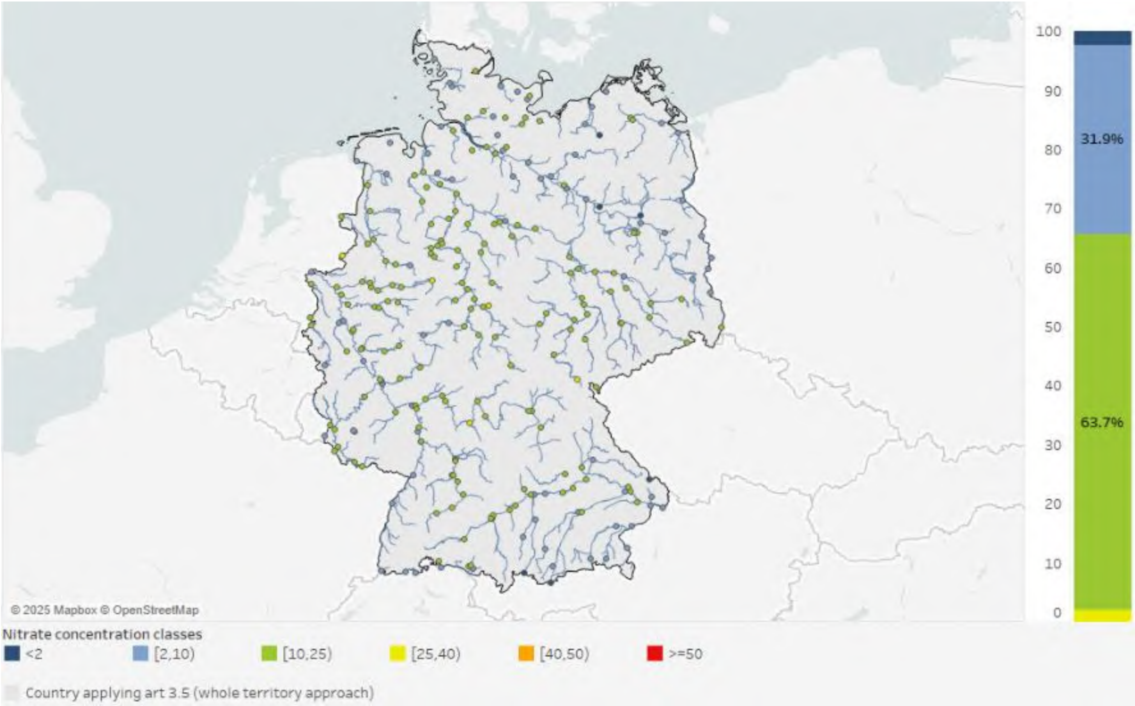
([22]) Germany reported that monitoring was discontinued in 14 monitoring points relative to the previous reporting period. Discontinuation may be due to nitrate concentrations below 25 mg/l, change in station code or type, or other specific reasons.

5.2. Nitrate concentrations in surface waters

Rivers

In Germany, no monitoring points in rivers showed average nitrate concentrations equal to or above the drinking water threshold of 50 mg/l and between 40-49.99 mg/l, whereas 2.0% showed concentrations between 25-39.99 mg/, 63.7% in the class 10-24.99 mg/l, 31.9% in the class 2-9.99 mg/l and 2.4% below 2 mg/l.
It is relevant to look at the distribution in nitrate concentration classes below 25 mg/l for surface water as there can be a risk of eutrophication in lower concentration classes.

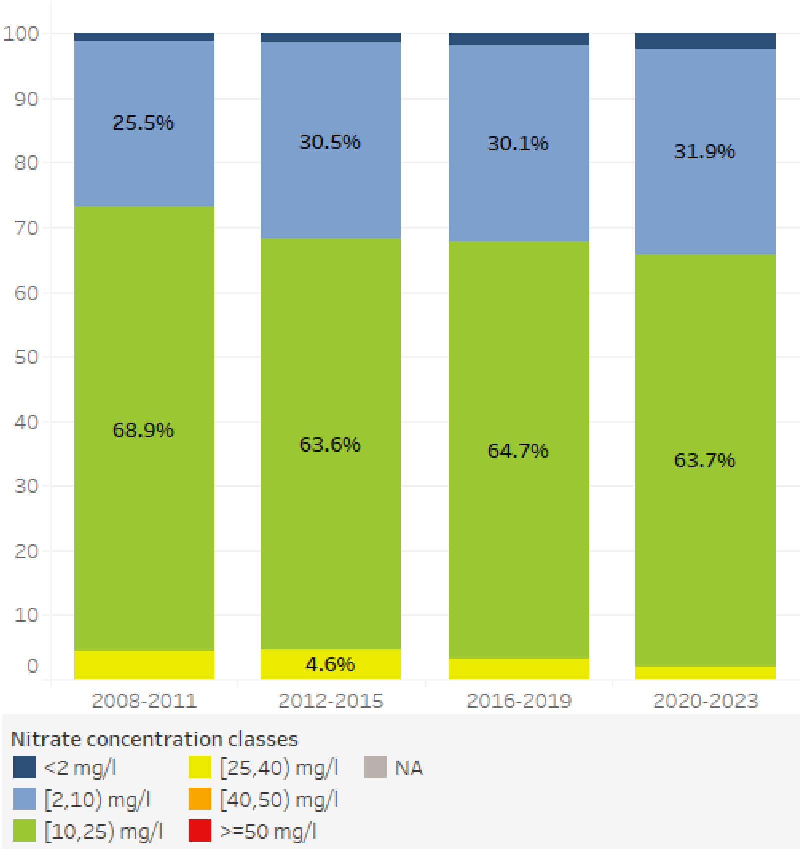
Figure 18 – Map of average annual mean nitrate concentrations in rivers and share of monitoring points by concentration class in the reporting period 2020-2023



Note: In the map, monitoring points with higher values are plotted on top. In the graph, the percentages below 5% are not labelled.

Compared to the previous reporting period, the share of monitoring points in rivers with concentration ≥ 50 mg/l remained at zero percent. The graph below presents the shares of monitoring points per class of nitrate concentration in the last four reporting periods.

Figure 19 – Share of monitoring points in rivers by class of nitrate concentration ([23]) in the current and previous reporting periods



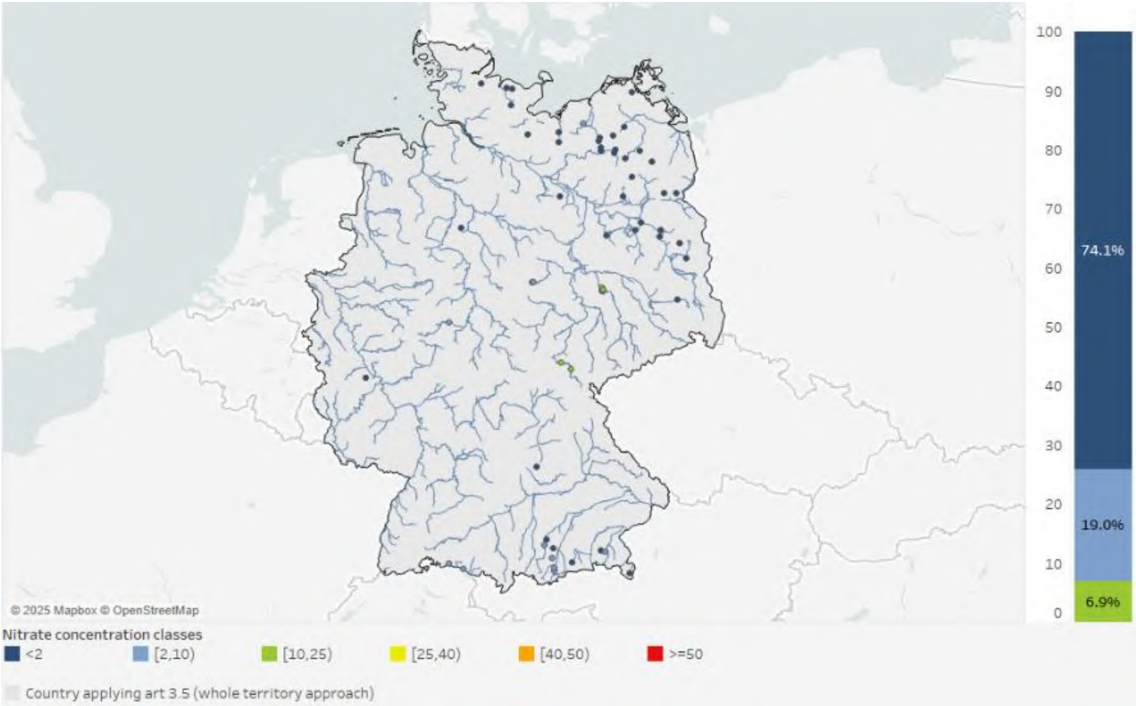
([23]) Average of annual mean values over the reporting period.

Lakes/water reservoirs

In Germany, no monitoring points in lakes/water reservoirs showed average nitrate concentration above the drinking water threshold of 50 mg/l as well as between 40-49.99 mg/l and between 25-39.99 mg/l, whereas 6.9% had concentrations in the class 10-24.99 mg/l, 19.0% in the class 2-9.99 mg/l and 74.1% below 2 mg/l.

It is relevant to look at the distribution in nitrate concentration classes below 25 mg/l for surface water as there can be a risk of eutrophication in lower concentration classes.

Figure 20 – Map of average annual mean nitrate concentrations in lakes/water reservoirs and share of monitoring points by concentration class in the reporting period 2020-2023



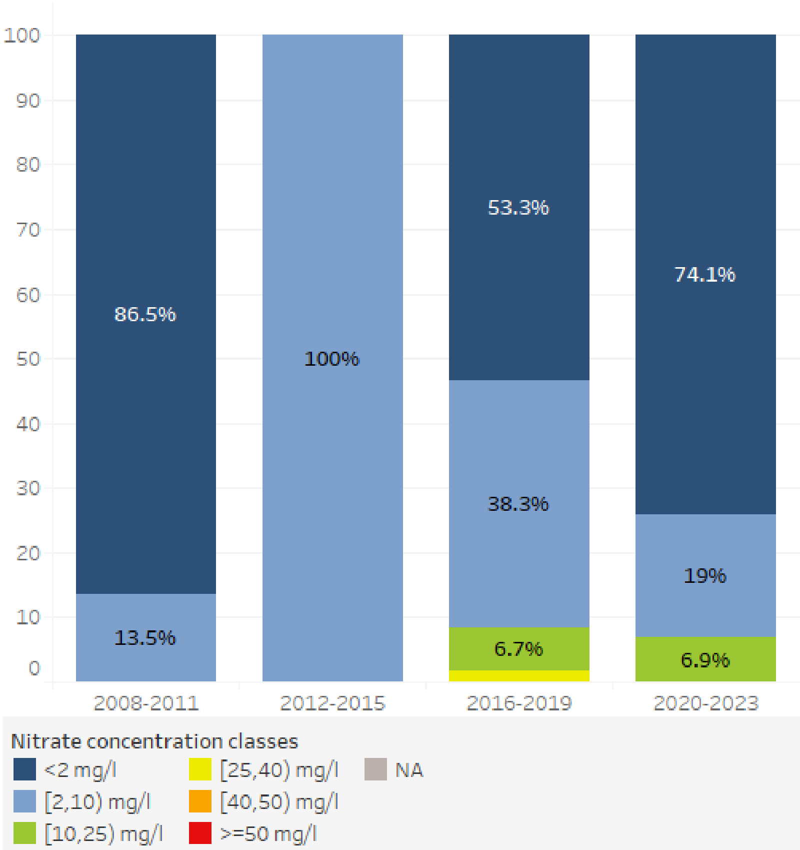
Note: In the map, monitoring points with higher values are plotted on top.

Table 7 – Share of freshwater monitoring points by nitrate concentration class (mg/l) in reporting period 2020-2023, categorised by station type

	Number of stations	% of Total	<2	[2,10)	[10,25)	[25,40)	[40,50)	>=50
Rivers	251	81.2%	2.4%	31.9%	63.7%	2.0%		
Lakes/reservoirs	58	18.8%	74.1%	19.0%	6.9%			
Total	309	100.0%	15.9%	29.4%	53.1%	1.6%		

Compared to the previous reporting period, the share of monitoring points in lakes/water reservoirs with concentration ≥ 50 mg/l remained at zero percent. The graph below presents the shares of monitoring points per classes of nitrate concentration in the last four reporting periods.

Figure 21 – Share of monitoring points in lakes/water reservoirs by class of nitrate concentration ([24]) in the current and previous reporting periods



Note: The percentages below 5% are not labelled.

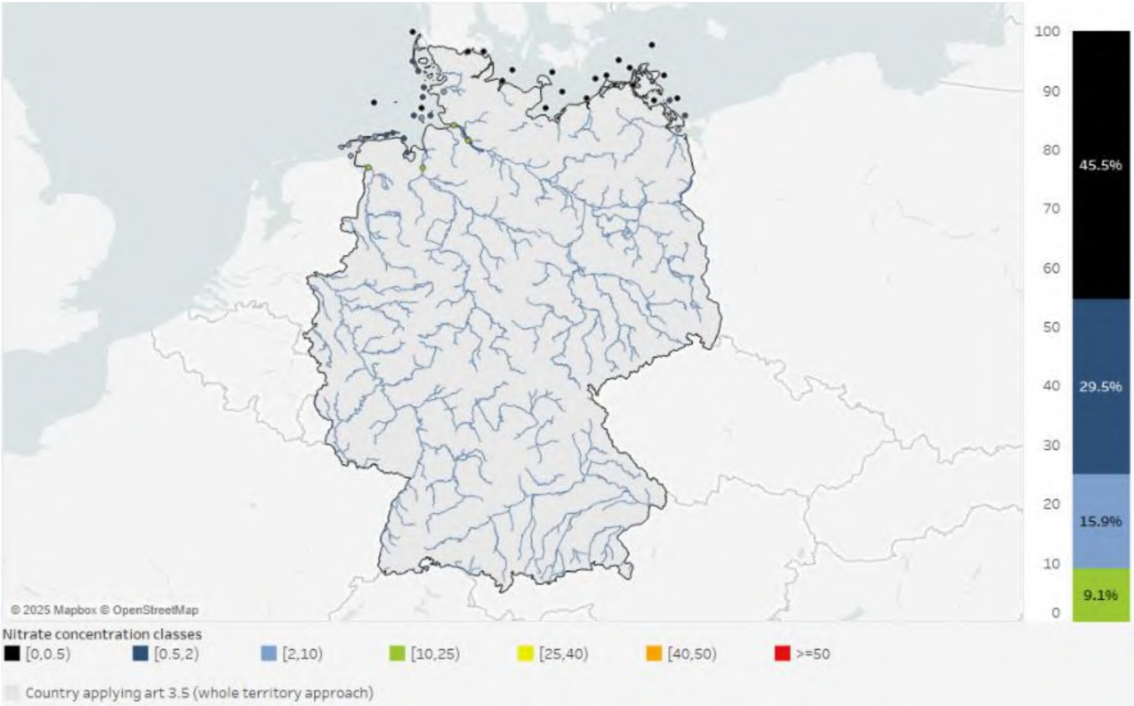
([24]) Average of annual mean values over the reporting period.

Saline waters (25)

No saline waters monitoring points showed average nitrate concentrations ≥ 25 mg/l, 9.1% showed average nitrate concentrations in the class 10-24.99 mg/l, 15.9% in the class 2-9.99 mg/l, 29.5% between 0.5-2 mg/l and 45.5% below 0.5 mg/l.

It is relevant to also take into account very low nitrate concentrations, even below 0.5 mg/l and between 0.5 mg/l and 2 mg/l, because saline waters tend to have very low concentrations and some saline waters can become eutrophic even at concentrations below 2 mg/l.

Figure 22 – Map of average annual mean nitrate concentrations in saline waters and share of monitoring points by concentration class in reporting period 2020-2023



Note: In the map, monitoring points with higher values are plotted on top.

It is important to examine transitional waters separately, as they often exhibit higher nitrate concentrations. In Germany, 80.0% of monitoring points showed average annual mean nitrate concentrations at or above 10 mg/l and 20.0% in the class 2-9.99 mg/l, as shown in the table below.

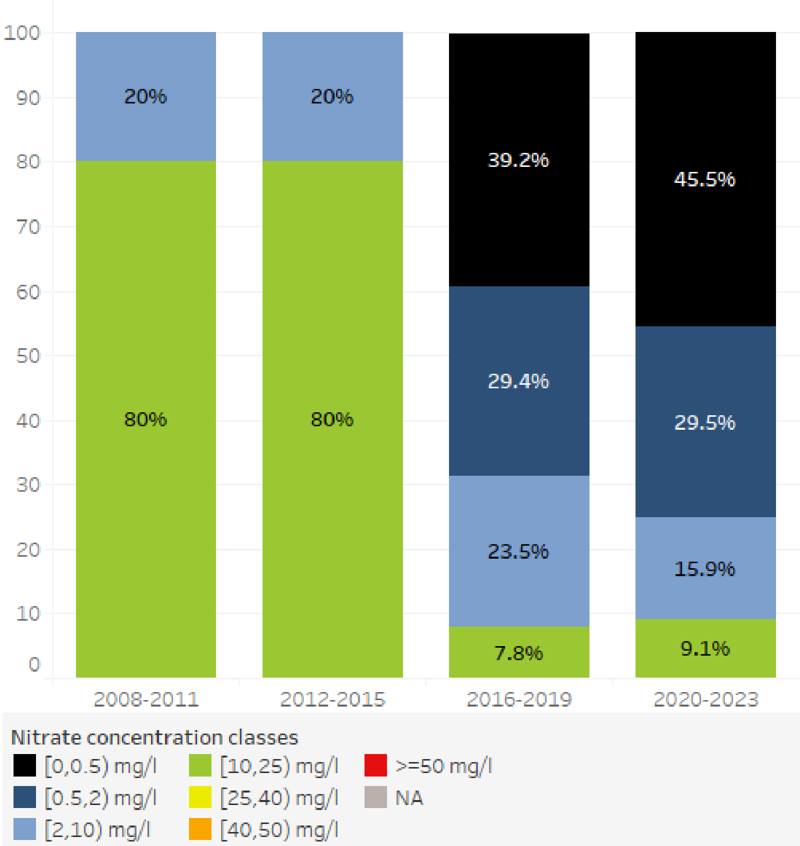
Table 8 – Share of saline water monitoring points by nitrate concentration class (mg/l) in the reporting period 2020-2023, categorised by station type

	Number of stations	% of Total	<0.5	[0.5,2)	[2,10)	[10,25)	[25,40)	[40,50)	>=50
Transitional water	5	11.4%			20.0%	80.0%			
Coastal water	35	79.5%	45.7%	37.1%	17.1%				
Marine water	4	9.1%	100.0%						
Total	44	100.0%	45.5%	29.5%	15.9%	9.1%			

(25) This includes coastal, marine and transitional waters.

The graph below presents the shares of monitoring points per classes of nitrate concentration in the last four reporting periods.

Figure 23 – Share of monitoring points in saline waters by class of nitrate concentration ([26]) in the current and previous reporting periods



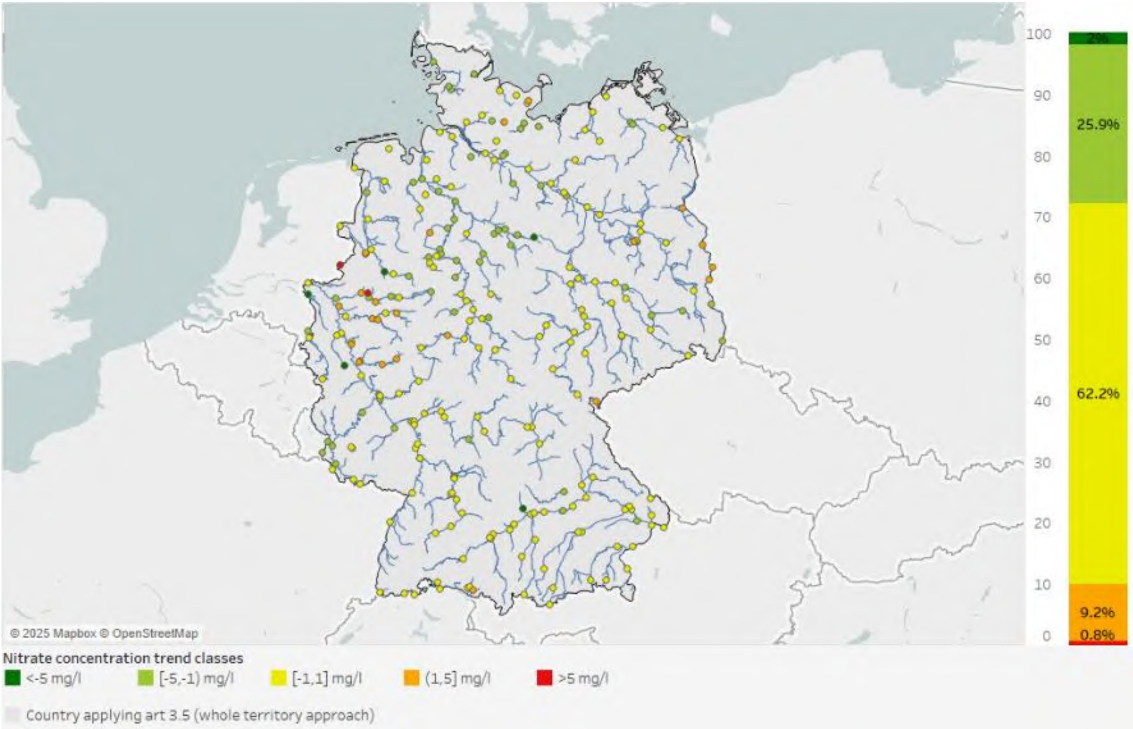
([26]) Average of annual mean values over the reporting period.

5.3. Trends in nitrate concentrations in surface waters

Rivers

Compared to the last reporting period, there has been a decrease of nitrate concentrations in 27.9% of monitoring points and an increase in 10.0%. For the remaining 62.2% there was no significant change. The increase or decrease can be categorised as weak if it is between 1 and 5 mg/l, and as strong if it is above 5 mg/l.

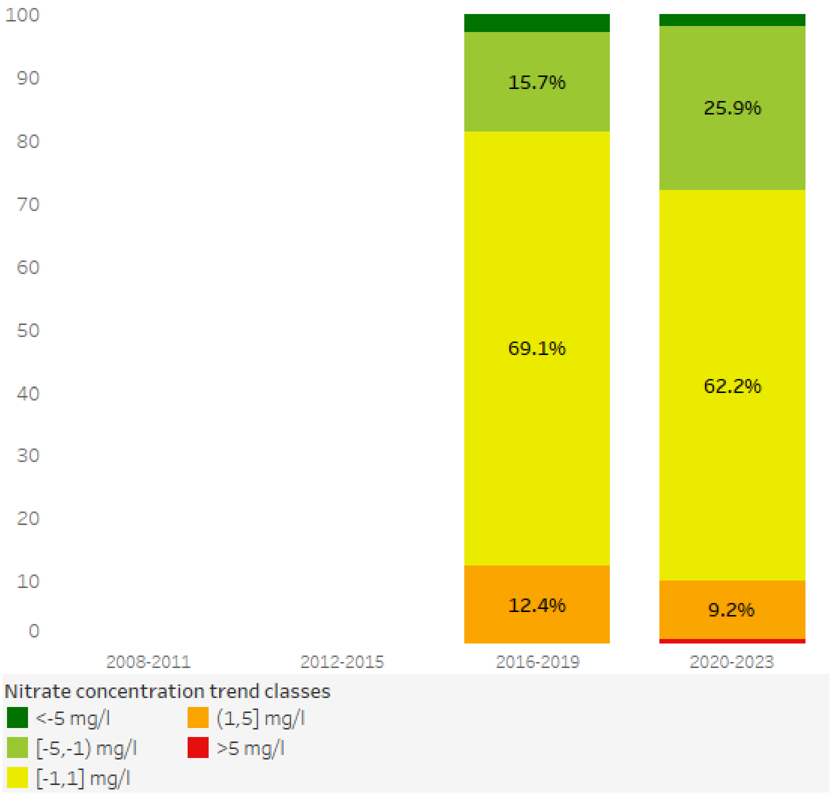
Figure 24 – Map of trends in average annual mean nitrate concentrations in rivers between the periods 2016-2019 and 2020-2023 and share of monitoring points by trend class



Note: In the map, monitoring points with higher values are plotted on top.

Compared to the previous reporting period, there is a higher share of monitoring points with decreasing nitrate concentrations (27.9% in the current reporting period compared to 18.5% in the previous reporting period compared) and a lower share of monitoring points with increasing nitrate concentrations (10.0% compared to 12.4%). The graph below shows the share of monitoring points with increases (in red and orange), decreases (in green) and without significant change (in yellow) in nitrate concentrations between reporting periods.

Figure 25 – Share of monitoring points in rivers by class of nitrate concentration trend ([27]) in the current and previous reporting periods



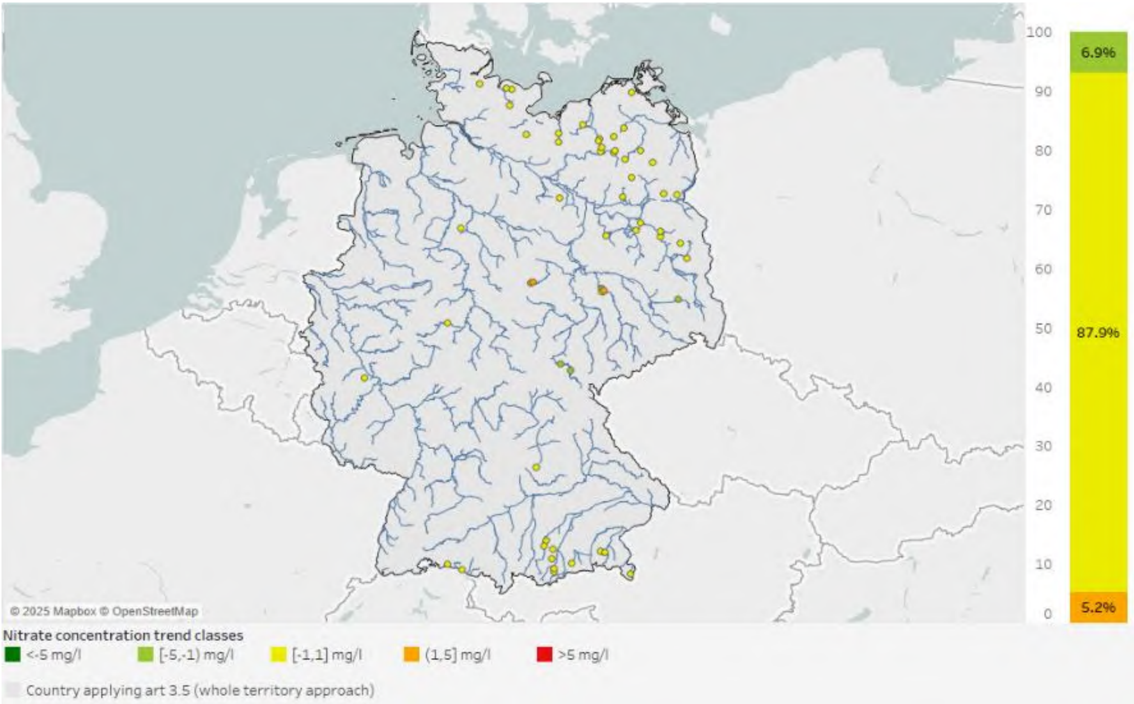
Note: The percentages below 5% are not labelled.

([27]) Change in average annual mean nitrate concentrations to previous reporting period.

Lakes and water reservoirs

Compared to the last reporting period, there has been a decrease of nitrate concentrations in 6.9% of monitoring points and an increase in 5.2%. For the remaining 87.9% there was no significant change. The increase or decrease can be categorised as weak if it is between 1 and 5 mg/l, and as strong if its above 5 mg/l.

Figure 26 – Map of trends in average annual mean nitrate concentrations in lakes/water reservoirs between the periods 2016-2019 and 2020-2023 and share of monitoring points by trend class



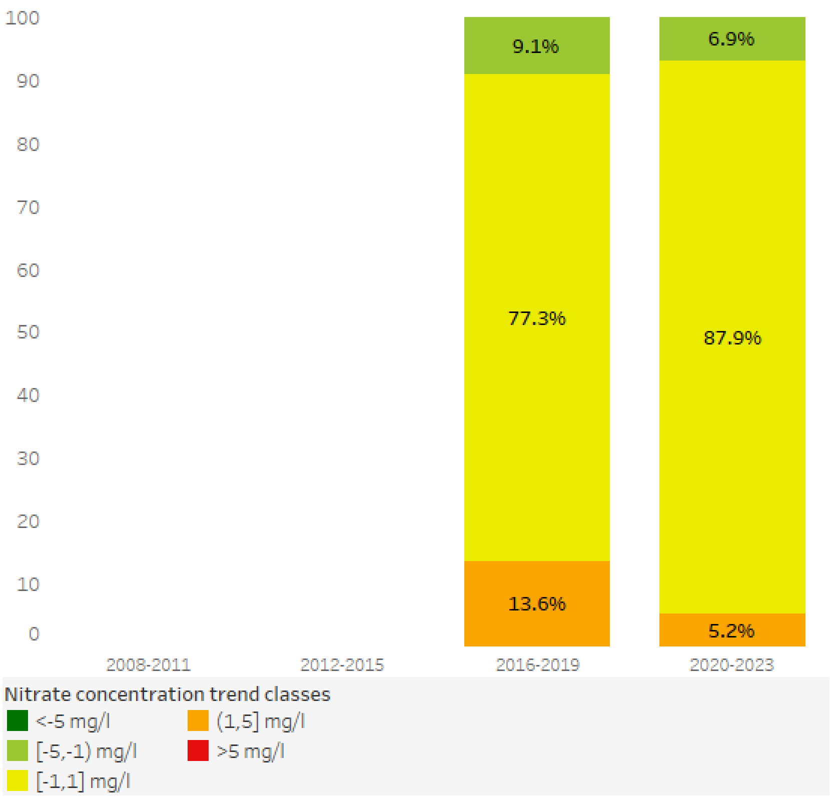
Note: In the map, monitoring points with higher values are plotted on top.

Table 9 – Share of freshwater monitoring points by trend class (mg/l), categorised by station type

	Total Number of Stations	% Total Number of Stations	<-5	[-5,-1)	[-1,1]	(1,5]	>5
River	251	81.2%	2%	25.9%	62.2%	9.2%	0.8%
Lake/Reservoir	58	18.8%		6.9%	87.9%	5.2%	
Total	309	100.0%	1.6%	22.3%	67%	8.4%	0.6%

Compared to the previous reporting period, there is a lower share of monitoring points with decreasing nitrate concentrations (6.9% in the current reporting period compared to 9.1% in the previous reporting period) but also a lower share of monitoring points with increasing nitrate concentrations (5.2% compared to 13.6%). The graph below shows the share of monitoring points with increases (in red and orange), decreases (in green) and without significant change (in yellow) in nitrate concentrations between reporting periods.

Figure 27 – Share of monitoring points in lakes/water reservoirs by class of nitrate concentration trend ([28]) in the current and previous reporting periods

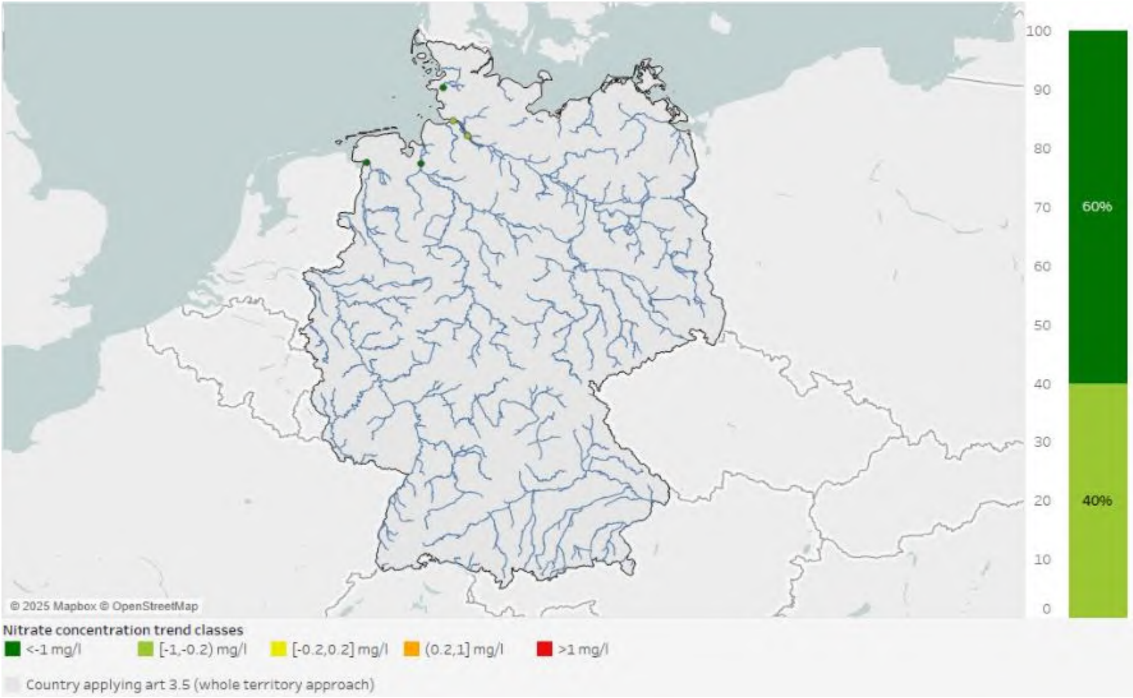


([28]) Change in average annual mean nitrate concentrations to previous reporting period.

Saline waters

In Germany only trends for transitional waters were provided in the electronic reporting ([29]). Compared to the last reporting period, there has been a decrease of nitrate concentrations in all monitoring points and no increase. The decrease can be categorised as weak if it is between 0.2 and 1 mg/l, and as strong if its above 1 mg/l.

Figure 28 – Map of trends in average annual mean nitrate concentrations in saline waters between periods 2016-2019 and 2020-2023 and share of monitoring points by trend class



Note: In the map, monitoring points with higher values are plotted on top.

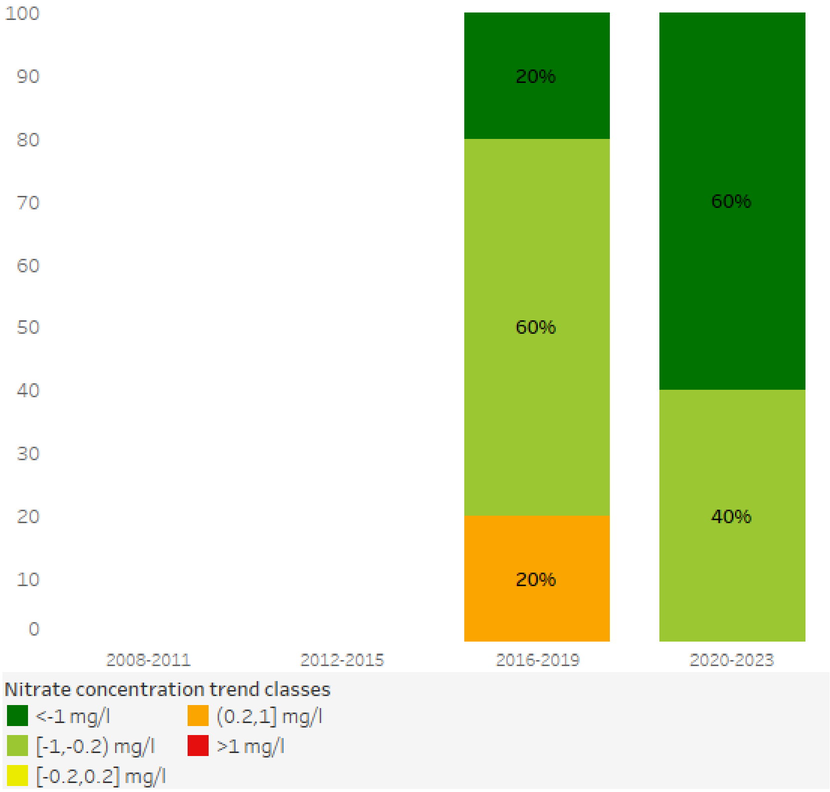
Table 10 – Share of saline water monitoring points by trend class (mg/l), categorised by station type

	Total Number of Stations	% Total Number of Stations	<-1	[-1,-0.2)	[-0.2,0.2]	(0.2,1]	>1
Transitional water	5	100.0%	60%	40%			
Coastal water							
Marine water							
Total	5	100.0%	60%	40%			

([29]) Germany does provide trends for winter averages in their national report.

The graph below shows the share of monitoring points with increases (in red and orange), decreases (in green) and without significant change (in yellow) in nitrate concentrations between reporting periods. However, the data for the different reporting periods cannot be compared as in this reporting period only transitional waters were taken into account, whereas previously all types of saline waters were included.

Figure 29 – Share of monitoring points in saline waters by classes of nitrate concentrations ([30]) in the current and previous reporting periods



([30]) Change in average annual mean nitrate concentrations to previous reporting period.

5.4. Nitrate pollution hotspots in surface waters

A nitrate pollution hotspot is defined here as a monitoring point where the average annual nitrate concentration is either ≥ 50 mg/l or between 37.5 and 49.99 mg/l with an increasing trend. There are no such surface water nitrate pollution hotspots in Germany for this reporting period.

6. EUTROPHICATION OF SURFACE WATERS

6.1. Monitoring of trophic status in surface waters

The monitoring of eutrophication in rivers, lakes, and transitional waters is conducted through the LAWA (Federal/State Working Group on Water) monitoring network.

During the reporting period 2020-2023, trophic status was reported at 351 monitoring points. Among these, 71.2% were in rivers, 17.4% were in lakes or reservoirs, and 11.4% were in saline waters. The station density of monitoring points, where trophic status was assessed equals to 0.9 stations per 1 000 km^2.

The overall number of points reporting trophic status increased by 10 (2.9%), and the number of saline water monitoring points increased by 3 (8.1%) compared to the previous reporting period. In 2012-2015 no monitoring points with trophic state were reported and in 2008-2011 only 17 such river monitoring points were reported.

Figure 30 – Evolution in surface water monitoring network (number of points with trophic status reported)

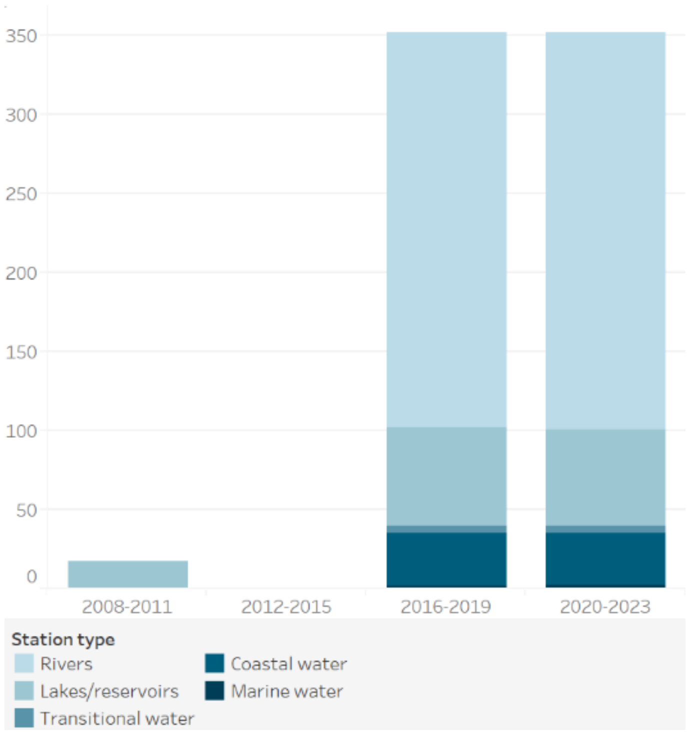


Table 11 – Number of monitoring points with trophic status by station type ([31])

Station type	Stations with trophic status 2008-2011	2012-2015	2016-2019	2020-2023
Rivers			249	250
Lakes/reservoirs	17		62	61
Transitional water			5	5
Coastal water			33	32
Marine water			2	3
Total	17		351	351

6.2. Methodology for the assessment of trophic status

Eutrophication is assessed in accordance with the AVV-GeA (Guideline for the Designation of Eutrophication Zones). Under this framework, orthophosphate-phosphorus levels in rivers and total phosphorus concentrations in lakes must exceed predefined thresholds before additional measures are required.

Only when these thresholds are surpassed, biological elements - such as macrophytes, phytoplankton, and phytobenthos - are evaluated for the respective water bodies. If both phosphorus levels and biological indicators fail to meet the good ecological status criteria, an investigation is conducted to determine whether agricultural sources are a significant contributor. Based on this assessment, eutrophication zones are designated to implement targeted protective measures.

In coastal and marine waters of the Baltic Sea, the HELCOM Eutrophication Assessment Tool HEAT HOLAS 3 was used to assess the current eutrophication status. For the North Sea, Germany assesses eutrophication in transitional and coastal waters using national evaluations based on the Water Framework Directive's biological quality elements (phytoplankton, macrophytes, macrozoobenthos) and physicochemical parameters (TN, TP, DIN), though OSPAR's COMPEAT tool has not yet been implemented for transitional and coastal waters. For marine waters, the OSPAR Common Procedure and the COMPEAT tool were used for the assessment.

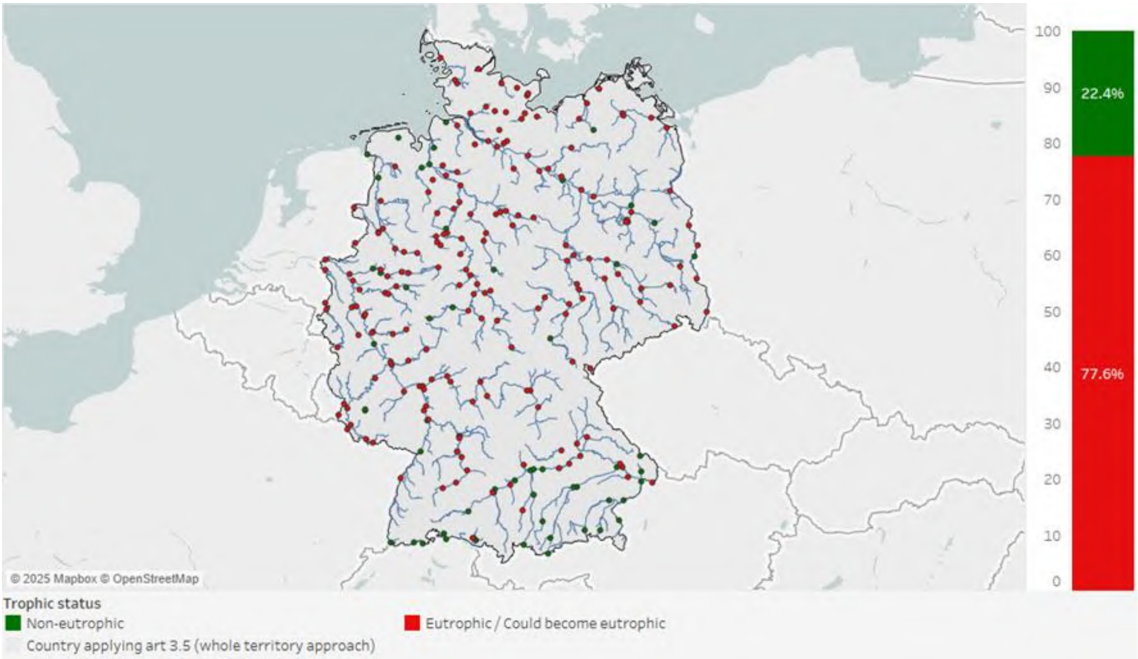
([31]) Germany reported that monitoring was discontinued in 13 monitoring points relative to the previous reporting period. Discontinuation may be due to nitrate concentrations below 25 mg/l, change in station code or type, or other specific reasons.

6.3. Eutrophication of surface waters

Rivers

77.6% of monitoring points in rivers were eutrophic/could become eutrophic. The figure below shows the shares in respective classes in a graph and spatial distribution in the map.

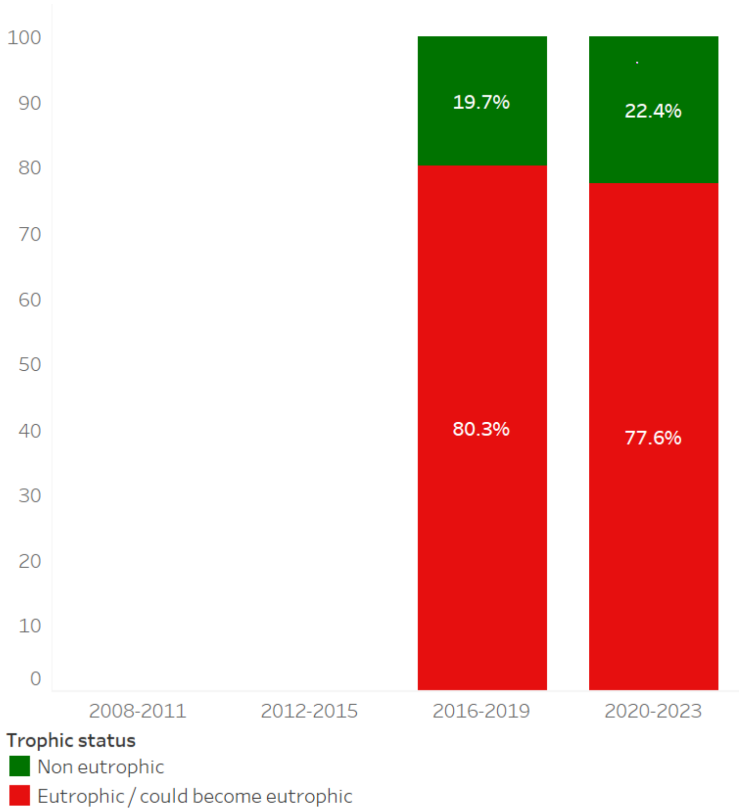
Figure 31 – Map of trophic status in rivers and share of monitoring points by trophic class in the reporting period 2020-2023



Note: In the map, eutrophic/could become eutrophic monitoring points are plotted on top.

Compared to the previous reporting period, the share of eutrophic/could become eutrophic monitoring points decreased from 80.3% to 77.6%. The graph below displays the shares of monitoring points monitoring points according to their trophic status in the last four reporting periods. There is no trophic status available for the reporting periods 2008-2011 and 2012-2015.

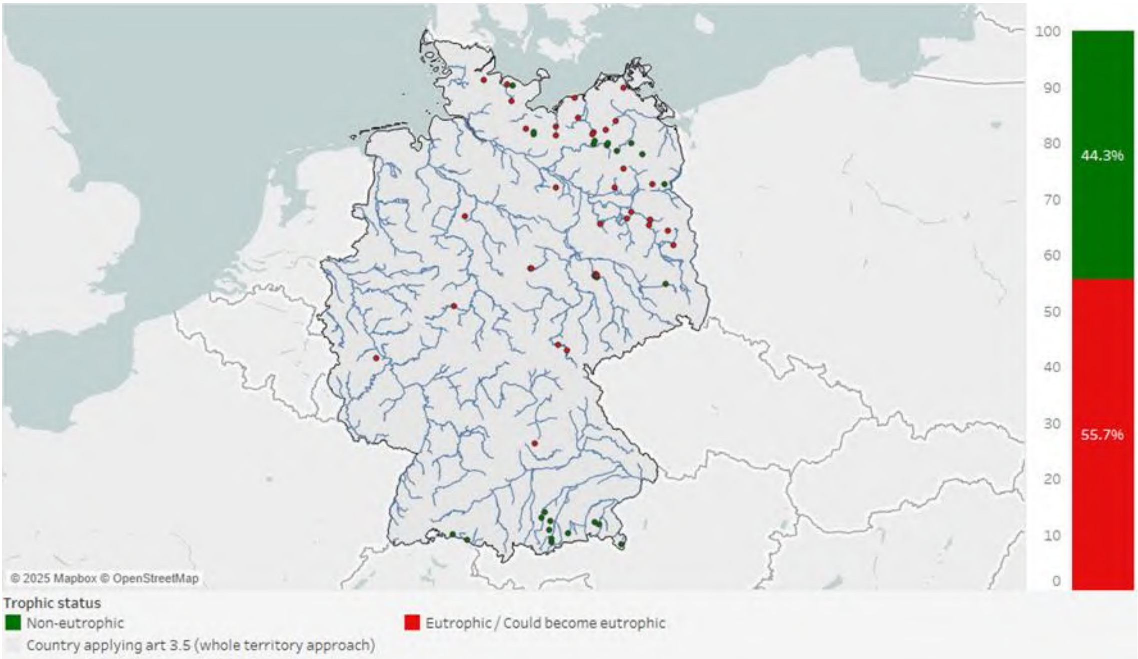
Figure 32 – Share of monitoring points in rivers by class of trophic status in the current and previous reporting periods



Lakes and water reservoirs

55.7% of monitoring points in lakes/water reservoirs were eutrophic/could become eutrophic. The figure below shows the shares in respective classes in a graph and spatial distribution in the map.

Figure 33 – Map of trophic status in lakes/water reservoirs and share of monitoring points by trophic class in the reporting period 2020-2023



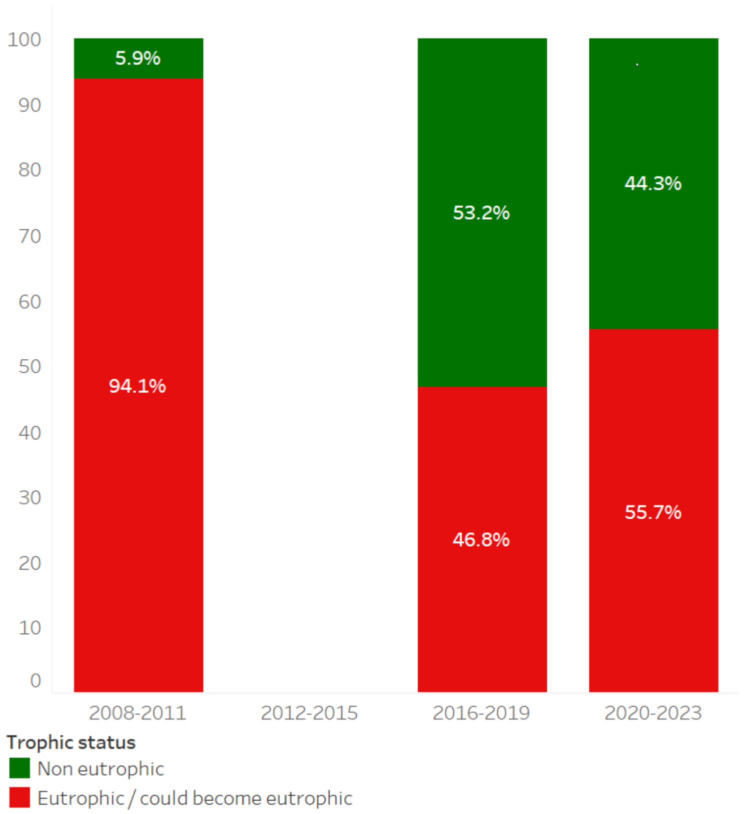
Note: In the map, eutrophic/could become eutrophic monitoring points are plotted on top.

Table 12 – Share of freshwater monitoring points by class of trophic status, categorised by station type

Station type	Number of Stations	% of Total	Non-eutrophic	Eutrophic/could become eutrophic
Rivers	250	80.4%	22.4%	77.6%
Lakes/reservoirs	61	19.6%	44.3%	55.7%
Total	311	100.0%	26.7%	73.3%

Compared to the previous reporting period, the share of eutrophic/could become eutrophic monitoring points increased from 46.8% to 55.7%. The graph below displays the shares of monitoring points according to their trophic status in the last two reporting periods. Compared to 2008-2011 the number of monitoring points with eutrophic/could become eutrophic dropped from 94.1% to 55.7%. However, the 2008-2011 assessment was based on only 17 points compared to 61 in the current period. No trophic status data for lakes/reservoirs was available for 2012-2015.

Figure 34 – Share of monitoring points in lakes/water reservoirs by class of trophic status in the current and previous reporting periods



Saline waters

All saline water monitoring points were eutrophic/could become eutrophic. The figure below shows the shares in respective classes in a graph and spatial distribution in the map.

Figure 35 – Map of trophic status in saline waters and share of monitoring points by trophic class in the reporting period 2020-2023

Note: In the map, eutrophic/could become eutrophic monitoring points are plotted on top.

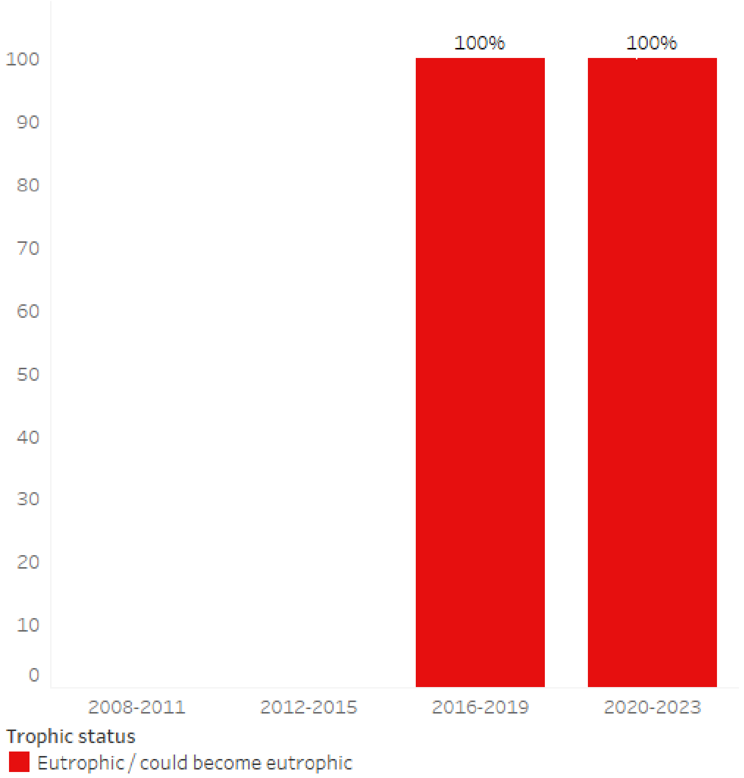
It is important to examine different types of saline waters (transitional, coastal and marine) separately. However, in Germany, all transitional, coastal and marine water monitoring points were eutrophic/could become eutrophic, as shown in table below.

Table 13 – Share of saline water monitoring points by class of trophic status, categorised by station type

Station type	Number of Stations	% of Total	Non-eutrophic	Eutrophic/could become eutrophic
Transitional water	5	12.5%		100.0%
Coastal water	32	80.0%		100.0%
Marine water	3	7.5%		100.0%
Total	40	100.0%		100.0%

In both the current and the previous reporting period, all monitoring points in saline waters were eutrophic/could become eutrophic. No trophic states were reported for saline surface waters in 2008-2011 and 2012-2015.

Figure 36 – Share of monitoring points in saline waters by class of trophic status in the current and previous reporting periods



6.4. Eutrophication hotspots in surface waters

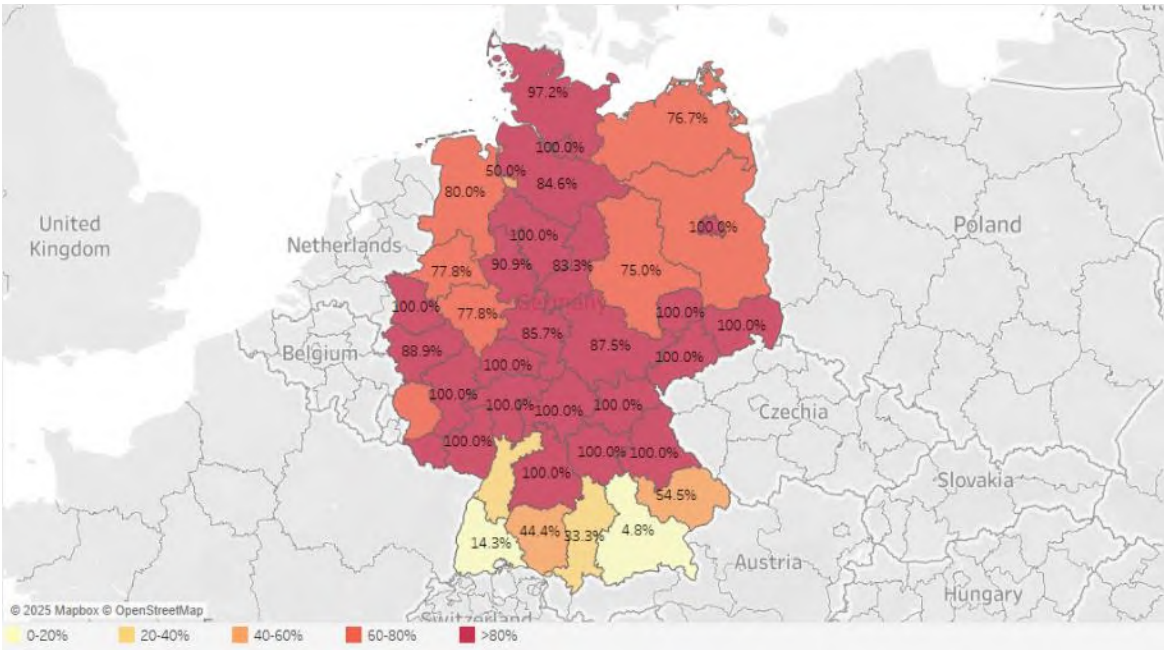
A eutrophication hotspot in surface waters is defined here as a monitoring point with trophic status evaluated as “eutrophic” or “could become eutrophic”. Overall, there are 268 surface water monitoring points which were reported to be eutrophic/could become eutrophic.

Figure 37 – Eutrophic/could become eutrophic monitoring points

	inside NVZ	Total
Rivers	194	194
Lakes	34	34
Transitional water	5	5
Coastal water	32	32
Marine water	3	3
Total	268	268

In 17 regions across central and northern Germany the share of these hotspots reaches 100 %.

Figure 38 – Share of eutrophic/could become eutrophic monitoring points at NUTS2 level



7. NITRATES ACTION PROGRAMME

The Nitrates Directive mandates the establishment of a code of good agricultural practice that shall be implemented by farmers on a voluntary basis, and promoted through training and information for farmers. Action programmes with mandatory requirements for farms should be established and enforced in NVZ or across the entire territory with mandatory measures applicable to all farms in those areas. These requirements primarily focus on implementing good practices for the handling of fertilisers and manure on farms to minimise the risk of nutrient leaching and run-off from fields. Annex II and III of the Directive set the types of measures to be included. The directive leaves wide discretion to Member States to design the measures in line with local circumstances. Compliance with the action programme measures is monitored by public authorities.

The action programmes contain measures concerning fertiliser application (periods when land application of different types of fertilisers is prohibited, land application on steeply sloping ground, prohibition of land application on water-saturated, flooded, frozen or snow-covered ground, the conditions for land application of fertiliser near watercourses, balanced fertilisation and the amount of livestock manure that can be applied to the land), and the capacity of storage vessels for livestock manure. They may also include additional measures in relation to fertilizer planning and record keeping, land use management, including the use of crop rotation systems, minimum vegetation cover during sensitive periods, irrigation systems and other relevant measures complementing the nitrates action programme.

7.1. Measures in the action programme and code of good agricultural practices

The Düngegesetz (DüG), Germany's federal Fertiliser Law, contains the fundamental legal basis for the nitrates action programme and states that fertilisers may only be used in accordance with good agricultural practice. The first action programme was published in 1996 and subsequently amended in 2006, 2007, 2017, and 2020.

The Düngeverordnung (DüV; federal Fertiliser Application Ordinance) set out the details of the nitrates action programme. The federal states (Länder) are required to designate areas that are nitrate-polluted or eutrophic and in these areas reinforced measures are applied.

The requirements for constructing storage facilities for manure and other organic fertilisers fall under a separate national regulation, the Ordinance on Installations for Handling Substances Hazardous to Water (AwSV), dated 1.8.2017.

Since the 2016-2019 reporting period, the nitrates action programme was amended in 2020, introducing changes applicable both to the entire territory and to designated nitrate-polluted and eutrophic areas. At national level, the amendments addressed the determination of fertiliser requirements, rules for fertiliser application near watercourses and on sloping land adjacent to watercourses, the 170 kg N/ha limit for organic fertilisers, closed periods for fertiliser application, record-keeping obligations, and requirements on application techniques. In the nitrate-polluted areas, stricter provisions apply regarding to the fertiliser application rates and closed periods for fertiliser use.

A consolidated overview of the action programme currently in force is provided in a separate document ([32]).

7.2. Controls

Compliance with the Nitrates Directive is systematically monitored at farms receiving EU funding through conditionality inspections. These controls verify compliance with the relevant provisions of the DüV and the AwSV. Inspections are conducted by the competent Länder authorities.

Between 2019 and 2022, a total of 10 538 farms, representing approximately 3.6% of all farms, were subject to cross compliance inspections. Non-compliance, whether minor or more significant, were identified on 2 182 farms (20.7% of those inspected). The national report does not provide further information on the underlying causes of these non-compliances or on the key challenges encountered in implementing the action programme measures.

([32]) https://environment.ec.europa.eu/publications/summaries-national-nitrates-action-programmes_en

8. WATER QUALITY OUTLOOK

During the reporting period 2020-2023, no data or models were used to forecast future nitrate concentration developments in water bodies. Nevertheless, the report announced that an advanced forecast model, "AGRUM-DE" would be implemented in upcoming reporting periods. This model incorporates various pollution sources, in addition to agricultural sources, into its calculations. It aims to integrate data from different models to project future water quality prospects in Germany. Additionally, another project, "MoNi2" seeks to evaluate agricultural nitrate inputs to assess and predict potential threats to groundwater bodies caused by elevated nitrate concentrations in leachate within certain model regions.

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