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COMMISSION STAFF WORKING DOCUMENT

Accompanying the document

REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

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 State reports for the period 2016–2019

{COM(2021) 1000 final}

Pressure from Agriculture



Bulgaria's utilized agricultural area amounts to 5.0 Mha, representing 46% of the total land area and has remained stable since 2007. The major outputs of the agricultural industry include in a decreasing order cereal (33.4%), industrial crops (21.6%) and animals (13%).

Eurostat

Major land use statistics for Bulgaria

Table 1.Utilized agricultural area (abbreviated as UAA)

Bulgaria	2005	2007	2010	2013	2016
Utilised agricultural area UAA (1000 ha)	NA	5116	5052	4995	5021
arable land (1000 ha)	NA	3058	3163	3462	3481
permanent grass (1000 ha)	NA	1835	1702	1381	1384
permanent crops (1000 ha)	NA	195	164	135	140
kitchen gardens (1000 ha)	NA	26	22	17	15

Note:

Eurostat (FSS)

Bulgaria's arable land has increased by 13.8% since 2007. The permanent grass and crops areas have remained stable since 2013.

Animal distribution in Bulgaria

Bulgaria's live bovines remained stable since 2013. The livestock density index has remained stable since 2010 and it is significantly lower than the EU average of 0.8.

Table 2. Livestock statistics

Bulgaria	2005	2007	2010	2013	2016
Livestock index	0.49	0.41	0.26	0.22	0.24
dairy cows (10^6 heads)	0.35	0.34	0.31	0.31	0.28
live bovines (10^6 heads)	0.63	0.61	0.55	0.59	0.57
live pigs (10^6 heads)	0.93	0.89	0.66	0.59	0.62
live poultry (10^6 heads)	NA	NA	17.49	14.29	16.61

Note:

Eurostat (FSS)

Nitrogen and phosphorus fertilizers and surplus (kg/ha UAA)

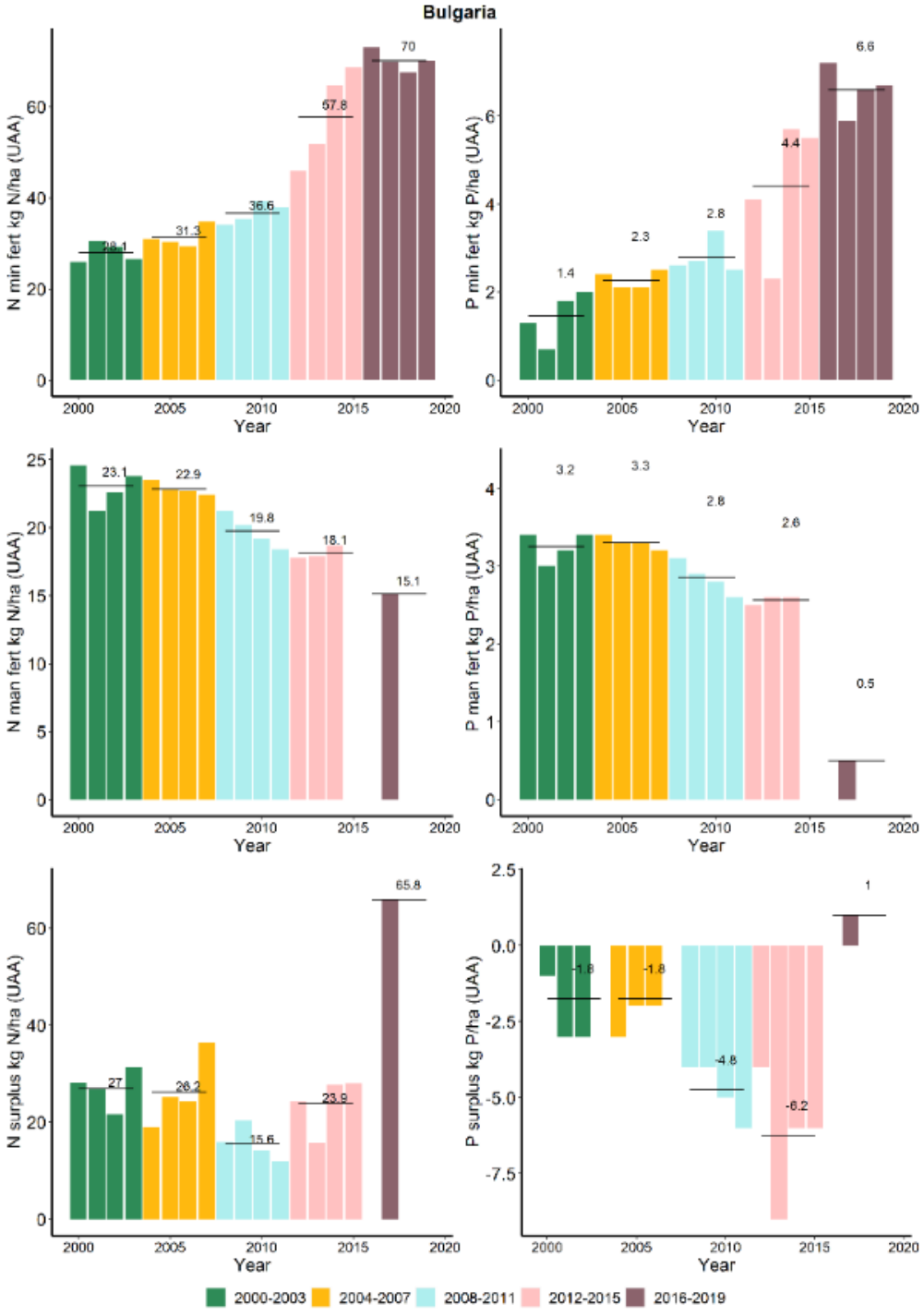


Figure 1. N and P fertilizers and gross surplus (kg/ha)

The N and P fertilizers and gross surpluses originate from EUROSTAT data for the years 2000-2014 and 2017. Data provided by Bulgaria have been used to complete the N and P mineral fertilizer trend for the period 2015-2019 (excluding 2017) because of correspondence, for the previous years, with Eurostat statistics. As regard to N and P manure values, they were comparable only for year 2014 and a difference by 52% and 9% was found, respectively

The mineral fertilizers increased significantly from 2000-2003. Both manure nitrogen and phosphorus have decreased from 2004. The nitrogen and phosphorus surpluses have increased in year 2017 with respect to the period 2012-2015. In the plots: N/P min and N/P man are respectively the N/P mineral fertilizers and N/P manure.

Livestock unit - LSU /ha



Figure 2. Map of livestock unit distribution, year 2016 (Source: Eurostat, February 2021)

Animal production is concentrated in the south-central part of the Bulgaria (total LSU and LSU by animal type were retrieved individually from EUROSTAT).
In this document, the NUTS-2013 version is used.
(https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/administrative-units-statistical-units/nuts)

Water Quality Monitoring

The total number of groundwater monitoring points for the current period is 496 (406 points for the previous period). Total number of points common to both periods is 375 (76.6 %). The total number of surface water monitoring points for the current period is 326 (324 points for the previous period). The total number of points common to both periods is 318.

For groundwater measurements, some stations have same coordinates due to different depths. In this case, the average values cover different measurements in time, but also location. In maps providing the spatial distribution of monitoring points, it is not possible to distinguish stations with the same coordinates: for NO3 concentration, the average value is shown; for trends and trophic status the worst case was considered.

It is noteworthy that in some cases in the bar charts the total value can differ from 100% due to rounding errors.

Groundwater quality monitoring network

Table 3. Number of GW stations with measurements and trends per type

		Number of stations with measurements			Number of stations with Trends		
Station Type	Description	2008-2011	2012-2015	2016-2019	2008-2011	2012-2015	2016-2019
0	Phreatic groundwater (shallow): 0-5 m	36	30	40	8	26	27
1a	Phreatic groundwater (deep) 5-15 m	91	83	92	31	76	74
1b	Phreatic groundwater (deep) 15-30 m	62	68	83	15	56	62
1c	Phreatic groundwater (deep) >30 m	76	71	83	24	57	63
2	Captive groundwater	23	27	23	6	24	20
3	Karstic groundwater	138	127	167	31	120	122
9	Not specified	0	0	0	0	0	0
	Total	**426**	**406**	**488**	**115**	**359**	**368**

Surface water quality monitoring network

Table 4. Number of SW stations with measurements, trends and trophic status per type

		Number of stations with measurements			Number of stations with Trends			Number of stations with Trophic status		
Station Type	Description	2008-2011	2012-2015	2016-2019	2008-2011	2012-2015	2016-2019	2008-2011	2012-2015	2016-2019
4	River water	264	267	268	81	242	261	264	267	268
5	Lake/reservoir water	41	51	52	5	47	51	41	51	52
6	Transitional water	0	0	0	0	0	0	0	0	0
7	Coastal water	7	6	6	3	3	6	7	6	6
8	Marine water	0	0	0	0	0	0	0	0	0
9	Not specified	0	0	0	0	0	0	0	0	0
	Total	**312**	**324**	**326**	**89**	**292**	**318**	**312**	**324**	**326**

Groundwater Quality

Groundwater average annual nitrate concentration

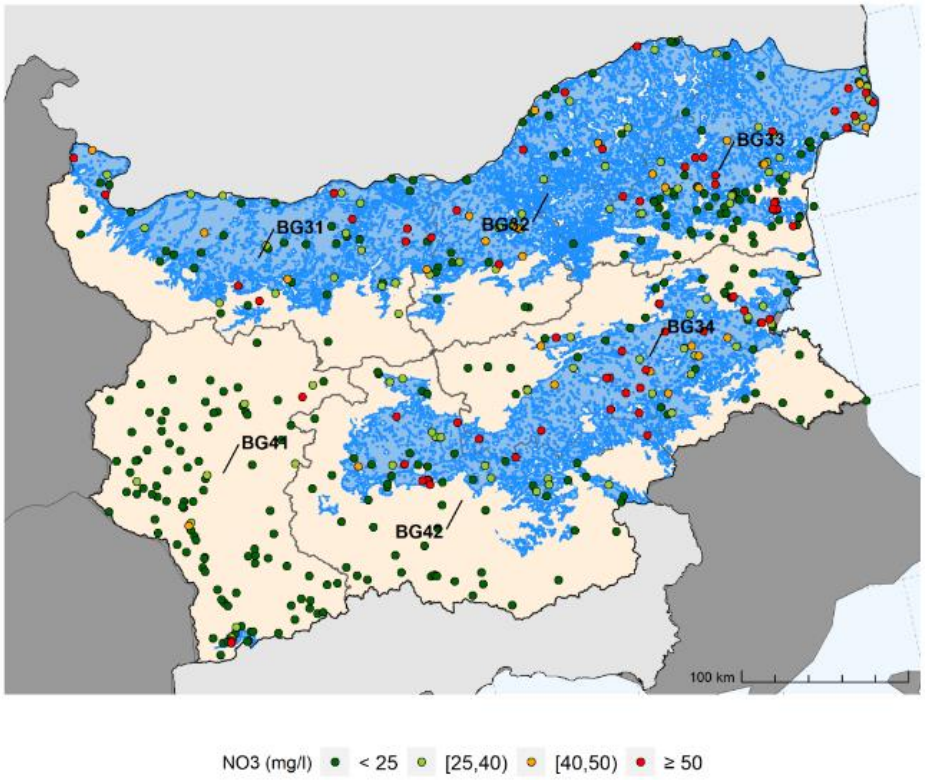


Figure 3. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ.

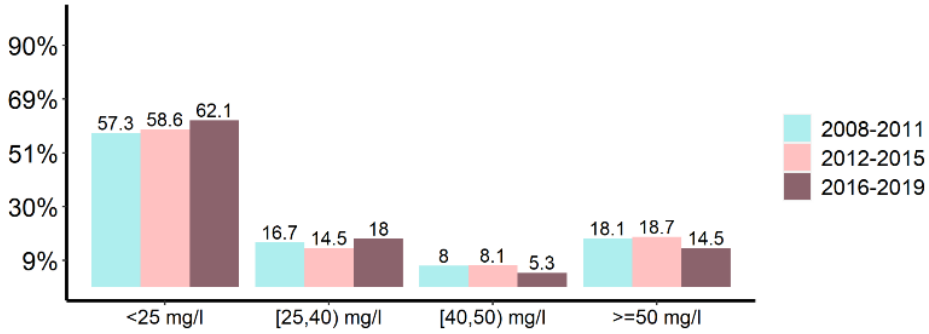


Figure 4. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Groundwater average annual nitrate concentration trend

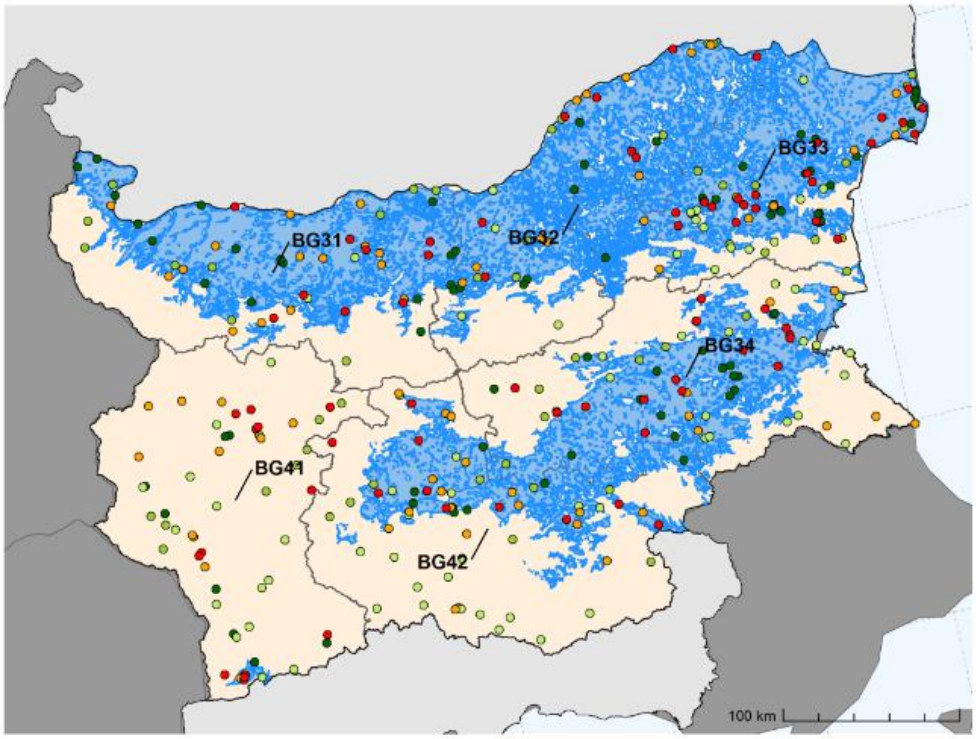


Figure 5. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). In the map in blue the NVZ.

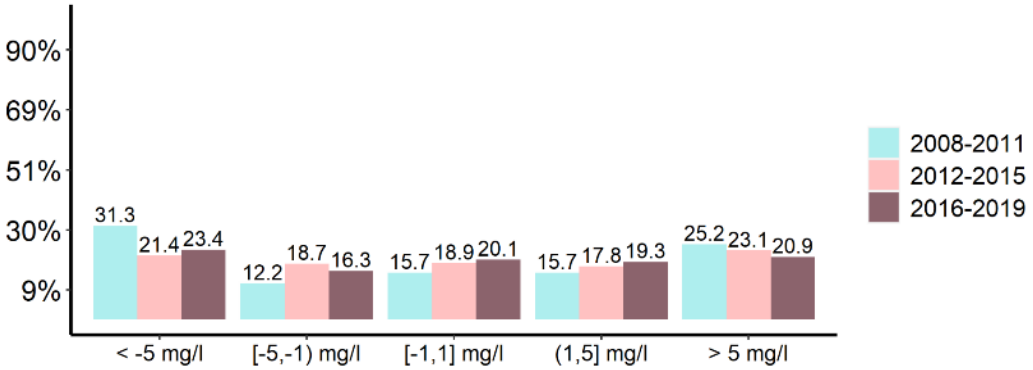
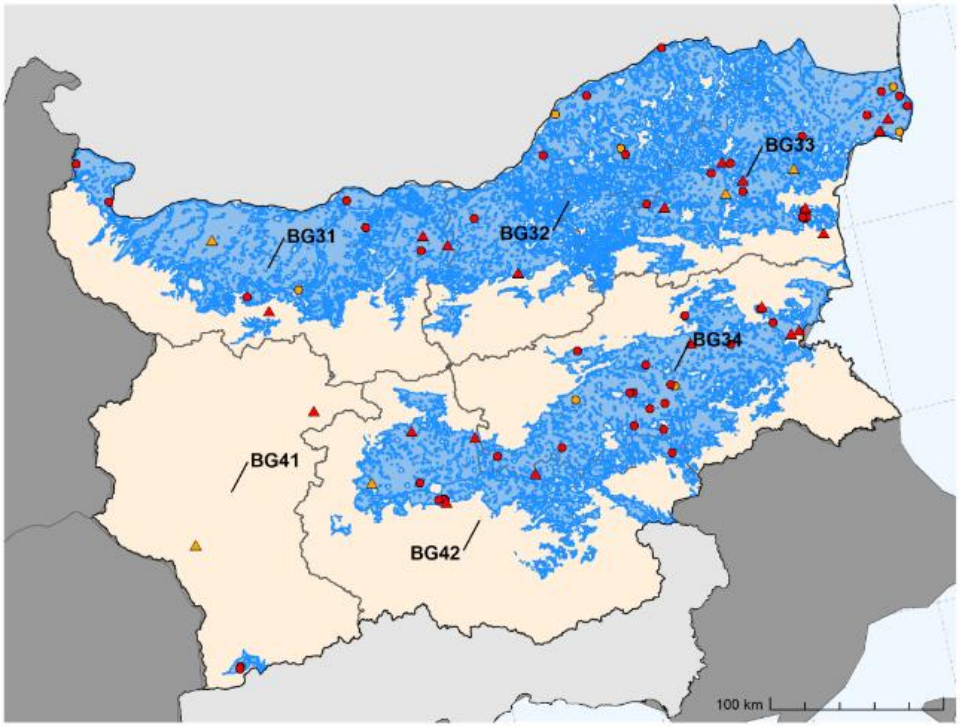


Figure 6. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Groundwater hotspot

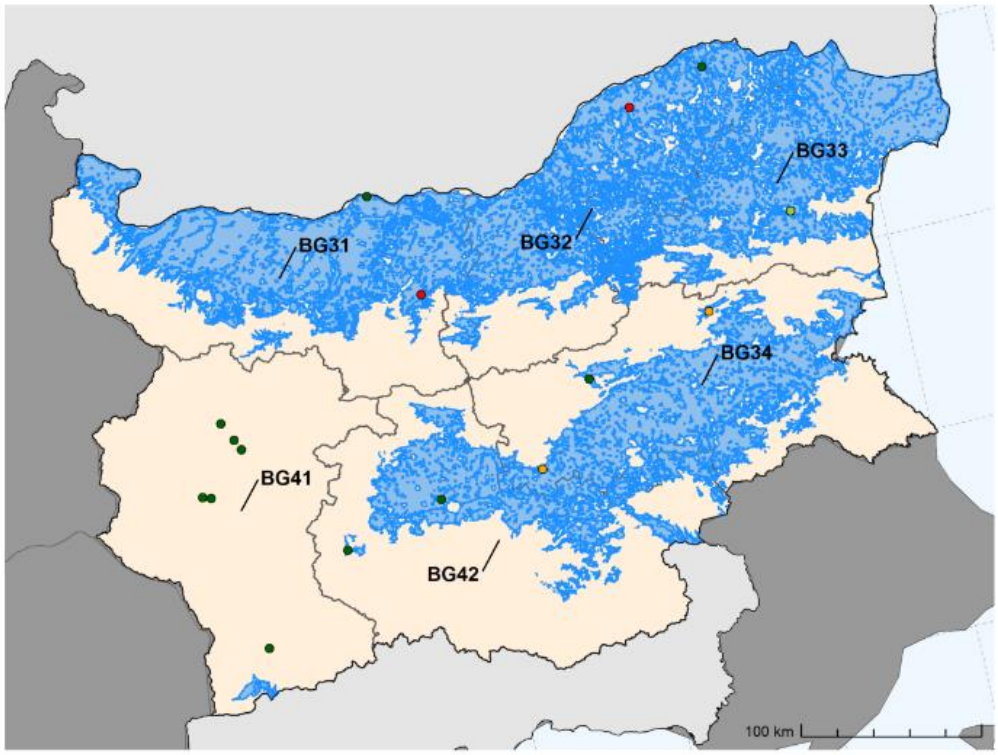


		>=40 and < 50 mg/l incr.trend		>=50 mg/l	
NUTS ID	NUTS NAME	InNVZ	OutNVZ	InNVZ	OutNVZ
BG31	Severozapaden	1	1	6	3
BG32	Severen tsentralen	2	0	6	1
BG33	Severoiztochen	2	2	13	9
BG34	Yugoiztochen	2	0	15	5
BG41	Yugozapaden	0	1	3	1
BG42	Yuzhen tsentralen	0	1	5	4
	Total	**7**	**5**	**48**	**23**

Figure 7. GW hotspot analysis map (top graph) and distribution by NUTS2 (lower graph) of average NO3 annual concentration greater than 40 mg/l. In the map in blue the NVZ.

The hotspot analysis identifies all the GW monitoring stations that have NO3 concentration in the range of 40-50 mg/l with increasing trends and above 50 mg/l. The map shows the spatial distribution of these points, and the table reports the number of stations by NUTS inside and outside NVZ.
Only the NUTS of interest are reported.

Groundwater stations removed



Station Type	Description	Number of removed stations		
		total removed	with measurements	with trends
0	Phreatic groundwater (shallow): 0-5 m	2	2	1
1a	Phreatic groundwater (deep) 5-15 m	5	5	3
1b	Phreatic groundwater (deep) 15-30 m	3	3	2
1c	Phreatic groundwater (deep) >30 m	2	2	2
2	Captive groundwater	1	1	1
3	Karstic groundwater	3	3	3
9	Not specified	0	0	0
	Total	**16**	**16**	**12**

Figure 8. GW removed stations map (top graph) and distribution by groundwater type (lower graph). In the map in blue the NVZ.

The removed stations analysis identifies all the GW monitoring stations that were removed in the current reporting period. The map shows the spatial distribution of these points with the concentrations of the previous reporting period, and the table reports the number of stations with measurements and trends per type.

Surface Water Quality

Surface water average annual nitrate concentration

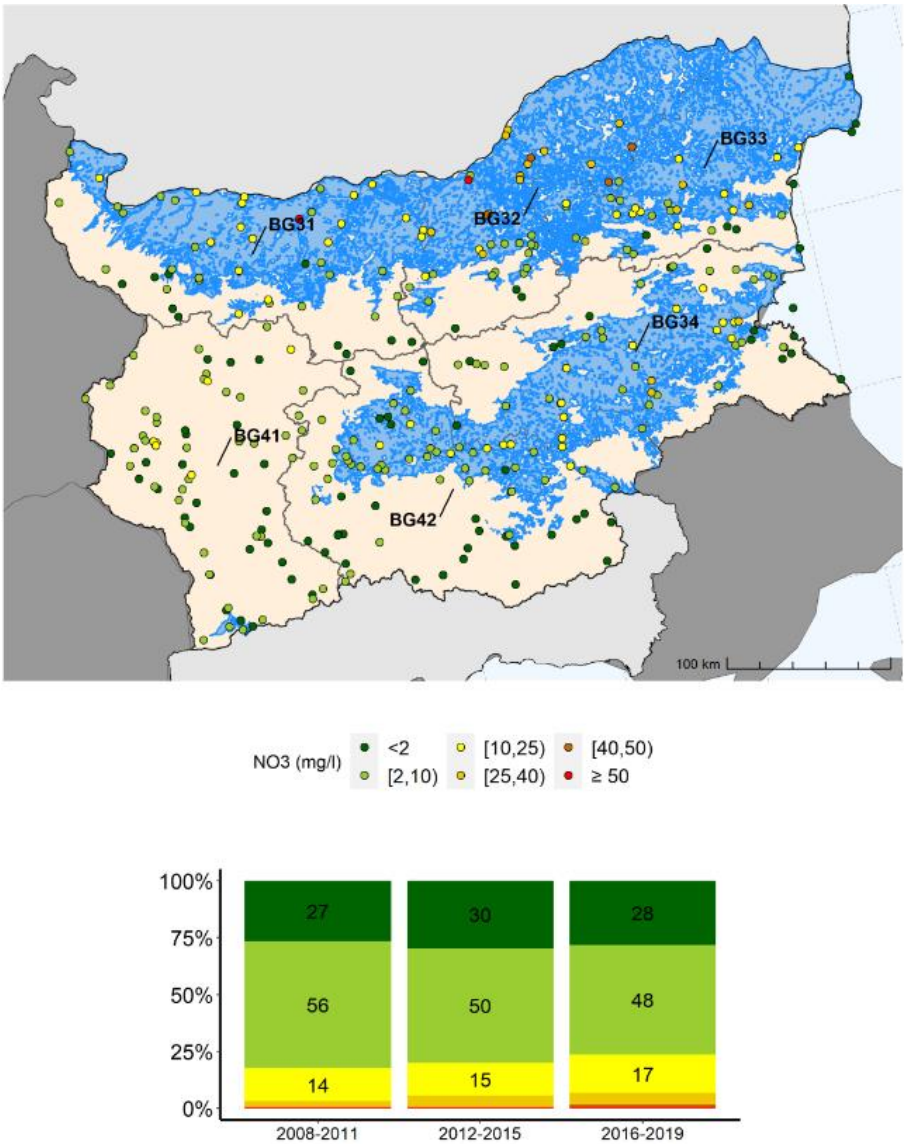


Figure 9. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ.

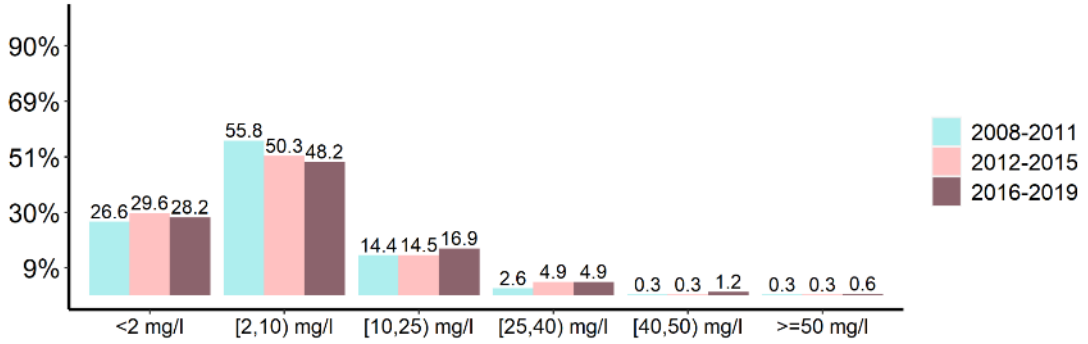


Figure 10. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Surface water average annual nitrate concentration trend

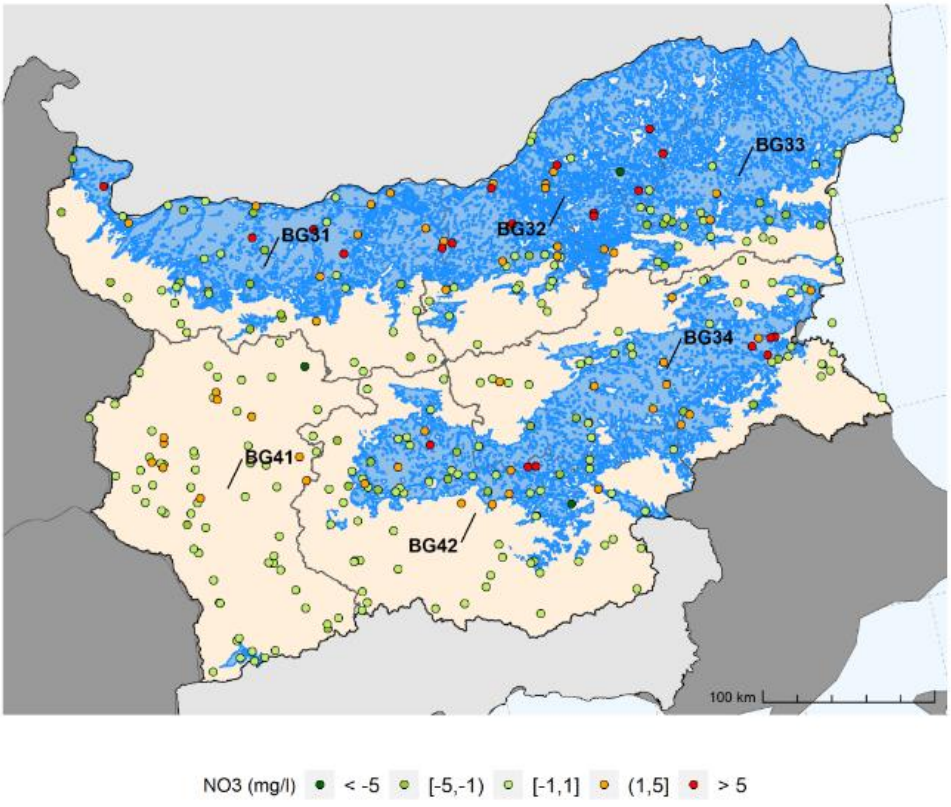


Figure 11. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ.

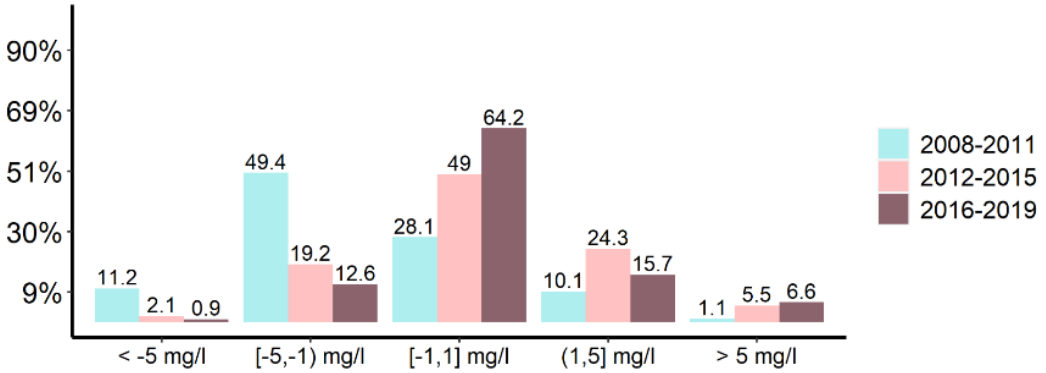


Figure 12. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Surface Water Eutrophication

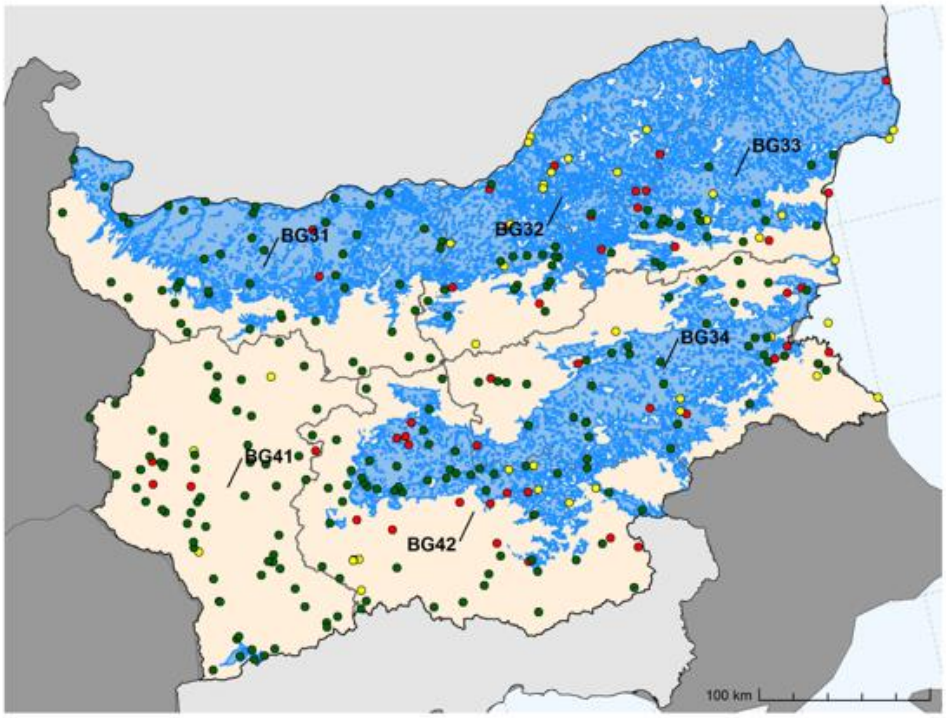


Figure 13. Spatial distribution of eutrophic status (map) and corresponding percentage of monitoring points per classes of status by reporting period (x axis). In the map in blue the NVZ.

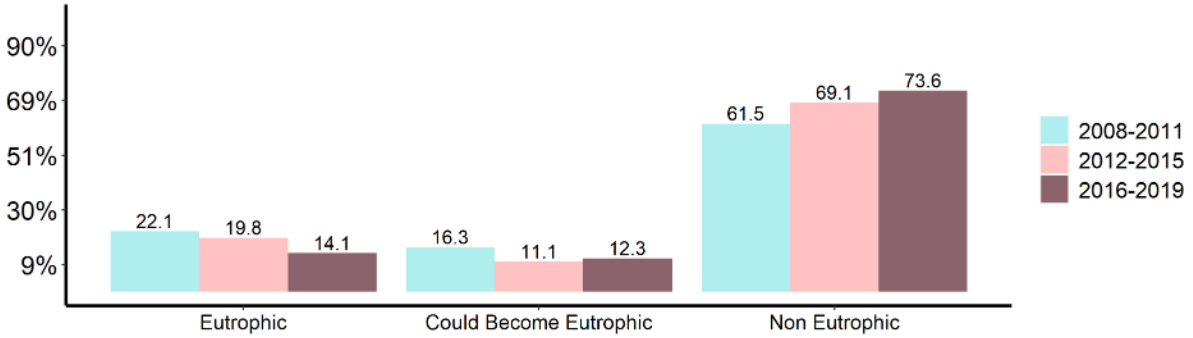
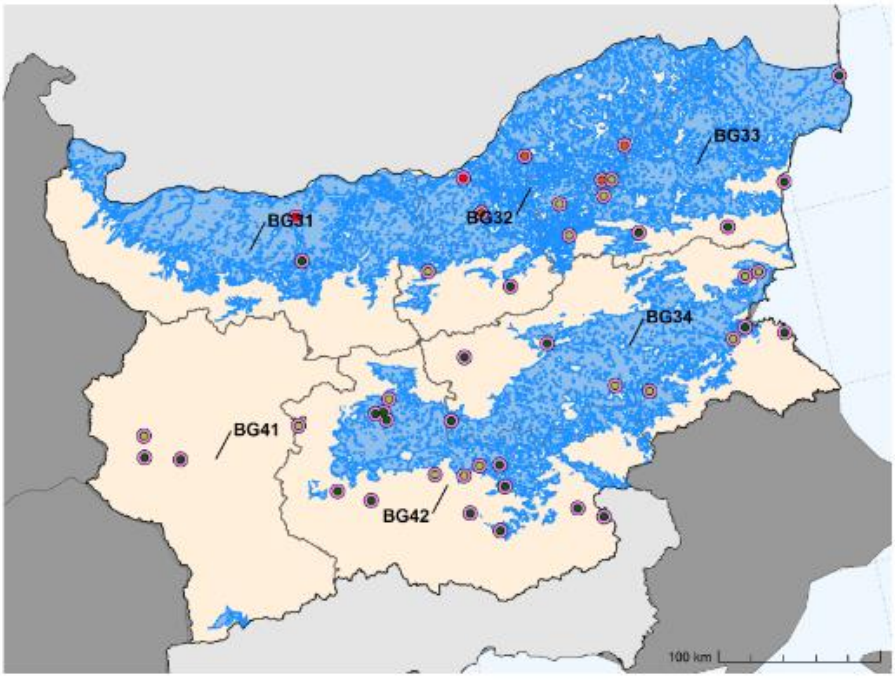


Figure 14. Comparison of percentage of monitoring points between the three reporting periods by classes of status (x axis)

The Eutrophic status vs average NO3 annual concentration



			Number of stations by classes of concentration						
NUTS ID	NUTS NAME	High trophic status	<2 mg/l	[2,10) mg/l	[10,25) mg/l	[25,40) mg/l	[40,50) mg/l	>=50 mg/l	Unclassified
BG31	Severozapaden	2	1	0	0	0	0	1	0
BG32	Severen tsentralen	8	1	2	0	0	4	1	0
BG33	Severoiztochen	6	3	3	0	0	0	0	0
BG34	Yugoiztochen	9	4	5	0	0	0	0	0
BG41	Yugozapaden	4	2	2	0	0	0	0	0
BG42	Yuzhen tsentralen	16	12	4	0	0	0	0	0
NO_NUTS	SALINE	1	1	0	0	0	0	0	0
	Total	**46**	**24**	**16**	**0**	**0**	**4**	**2**	**0**

Figure 15. The SW monitoring stations with eutrophic status versus the average NO3 annual concentration. In the map in blue the NVZ.

The analysis shows all the SW monitoring stations with the higher trophic status and the corresponding value of NO3 concentration. The map shows the spatial distribution of these points, and the table reports the number of stations with measurements with highest trophic status and the corresponding stations by classes of NO3 concentration. Only the NUTS of interest are reported.

Bulgaria uses the methodology of the 2015 reporting period for assessing eutrophication in rivers, lakes and coastal waters. However, in order to comply with the terminology used in the Guidance Document of Member States' reporting on the implementation of the Nitrates Directive 91/676/EEC, the status is provided as follows:

- points designated as Ultra-oligotrophic and Oligotrophic are classified as Non-Eutrophic;
- the points designated as Mesotrophic are classified May become eutrophic;
- all Eutrophic and Hypertrophic monitoring stations are classified as Eutrophic.

The trophic status of rivers was assessed using the combination of two parameters, nitrate and orthophosphate concentrations. The "less favourable of the two" approaches was adopted, i.e. the classification was made at the highest value of either of the two parameters. The two parameters were selected on the basis of the available monitoring information in the period 2016-2019 and their concentrations were determined for most of the points.

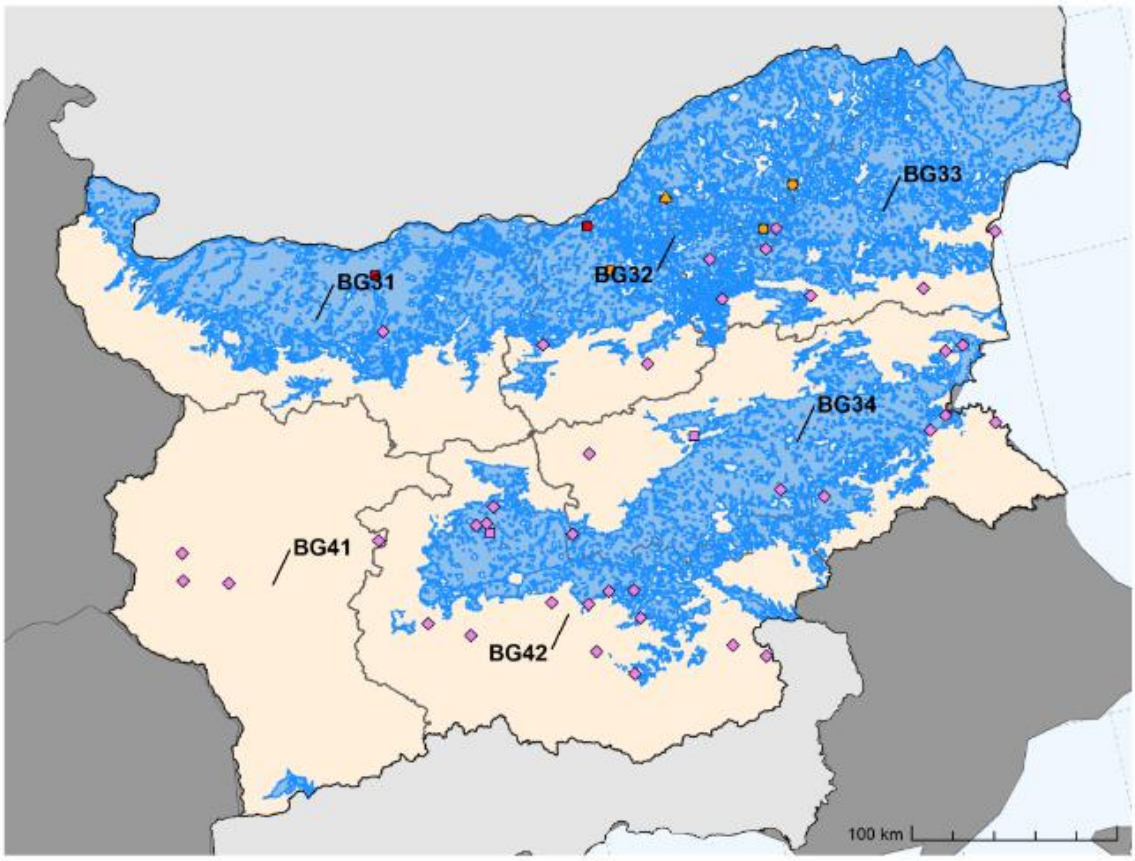
Nitrate, orthophosphate, total phosphorus, chlorophyll-a and transparency were analysed in the lakes, but the classification was carried out according to indicators of total phosphorus, chlorophyll-a and transparency. The 'less favourable indicator' approach was adopted, i.e. a classification was made at the highest value of any of the parameters.

For eutrophication in coastal marine waters the parameters nitrate, orthophosphate, total phosphorus and chlorophyll-a were used, but the classification has been carried out based on the following indicators: nitrate, orthophosphate and chlorophyll-a.

Table 5. Summary of SW stations by classes of trophic status and type.

		Number of stations with Trophic status		
Station Type	Description	Eutrophic	Could become eutrophic	Non Eutrophic
4	River water	6	24	238
5	Lake/reservoir water	39	11	2
6	Transitional water	0	0	0
7	Coastal water	1	5	0
8	Marine water	0	0	0
9	Not specified	0	0	0
	Total	**46**	**40**	**240**

Surface Water quality hotspot



		High trophic status		>=40 and < 50 mg/l incr.trend		>=50 mg/l	
NUTS ID	NUTS NAME	InNVZ	OutNVZ	InNVZ	OutNVZ	InNVZ	OutNVZ
BG31	Severozapaden	1	1	0	0	1	0
BG32	Severen tsentralen	4	4	3	1	1	0
BG33	Severoiztochen	0	6	0	0	0	0
BG34	Yugoiztochen	1	8	0	0	0	0
BG41	Yugozapaden	0	4	0	0	0	0
BG42	Yuzhen tsentralen	1	15	0	0	0	0
NO_NUTS	SALINE	0	1	0	0	0	0
	Total	**7**	**39**	**3**	**1**	**2**	**0**

Figure 16. SW hotspot analysis map (top graph) and distribution by NUTS2 (lower graph) of average NO3 annual concentration greater than 40 mg/l and trophic status. In the map in blue the NVZ.

The hotspot analysis identifies all the SW monitoring stations that have high eutrophic status, NO3 concentration in the range of 40-50 mg/l with increasing trends and above 50 mg/l. The map shows the spatial distribution of these points, and the table reports the number of stations by NUTS inside and outside NVZ.
Only the NUTS of interest are reported.

Measures in the Action Programme

The programme of measures for limiting and preventing pollution caused by nitrates from agricultural sources in vulnerable zones was published in 2006. The measures under the programme are mandatory for all farmers on the territory of nitrate vulnerable zones (NVZs). The NVZ areas were designed by Order No RD-660/28.8.2019 of the Minister for the Environment and Water.

The requirements under Part III, Section A concerning the availability of manure storage facilities have been obligatory for farmers since 31 December 2010. The programme is optional for farmers pasture-rearing endangered local species in accordance with Regulation No 7 of 2015 on the implementation of Measure 10 ‘Agri-environment-climate’ of the Rural Development Programme 2014-2020. The details of Action Programme are reported in Table 6.

Cost effectiveness analysis was not reported.

Table 6. Details of Action Programme

Measure	General details in Action Programme (*)
Period of prohibition of fertiliser application	• Different periods of prohibition are selected based on the municipalities and type of crops
Restrictions for application on sloped soils	• On slopes with a gradient from 3° to 6°: anti-erosion crop rotation and basic tillagefor crop
	• On slopes with a gradient above 6°, fertilisers must be applied at least 50 m away from surface water bodies
	• On slopes with a gradient from 6° to 12°: anti-erosion crop rotation where applicable, soil tillage across the slope, strip farming
	• Forbidden on slopes with gradient above 12°
Restrictions for application on soaked, frozen, or snow-covered soils	• Nitrogen fertilisers must not be applied to completely frozen or completely or partially snow-covered ground
Restrictions for application near watercourses (buffer strips)	• On flat terrain, nitrogen fertilisers should not be used next to surface water bodies (rivers, brooks, canals, lakes, dam lakes, the sea, etc.) at a distance of less than 5 m
	• On flat terrain, when applying liquid livestock manure or when irrigating vegetables and other crops with manure diluted with water, the distance to surface water bodies must be at least 5 m. In cases where the liquid fraction of livestock manure is applied on flat terrain, the distance to water bodies must be at least 10 m
	• on terrains with sloped, when applying solid and liquid fertilizers the distance to surface water bodies must be at least 10 m
Effluent storage works	• Solid livestock manure should be stored in normal conditions for a period of at least 6 months before being applied to the soil. Liquid manure should be applied to the soil after a 4-month storage period
Capacity of manure storage	• Depending on the species and number of livestock, agricultural holdings must have specific manure storage facilities and arrangements
	• Following the production of biogas, the by-product (organic mass) of manure may be applied to the soil without time-limits for storage, while respecting the prohibition period
Rational fertilisation (e.g., splitting fertilisation, limitations)	• Specific maximum rates for applicatio of N fertilizer for main agricultural crops
Crop rotation, permanent crop enhancement	• Crop rotation on sloped soils
Vegetation cover in rainy periods, winter	• Not specified
Fertilisation plans, spreading records	• Not specified
Other measures	• Recommendation for fertiliser application and application rates for nitrogen-containing fertilisers
	• In the developed Rules for Good Agricultural Practice are addressed issues related to vegetation cover in rainy periods and keeping diaries for fertilization
Date for application limit of 170 kg N/ha/year:	• Not specified

Controls

During the period 2016-2019, inspectors from the Regional Food Safety Directorates carried out a total of 7 146 inspections (compared to 7 729 in the previous reporting period), of which 3 820 used to check the compliance with the Rules of Good Agricultural Practice for the implementation of Measure 214 ‘Agri-environmental payments’ under the Rural Development Programme 2007-2013 and Measure 10 ‘Agri-environment-climate’ of the RDP 2020-2014 and 3 326 cross-compliance checks for compliance with the Programme of Measures for the Restriction and Prevention of Pollution by Nitrates Pollution of Agricultural Holdings (ZPZs) and for agricultural holdings.

Designation of NVZ

The vulnerable zones were initially designated by Order No RD-795 of 10.08.2004 of the Minister for the Environment and Water. Subsequently, by Order No RD-930 of 25.10.2010 of the Minister of Environment and Water, the NVZ was revised and updated. A subsequent review was carried out in 2015 by Order No RD 146/25.2.2015. During the course of this review, the boundaries of the NVZ were not changed and were kept identical to the territories of municipalities and parts thereof designated in 2010. By Order No 660/28.08.2019 of the Minister for the Environment and Water, a new review and update of the waters contaminated and threatened with pollution on the territory of the country were carried out. In the context of this revision, the boundaries of the NVZ were changed and the territories and 6 additional municipalities (compared to the 2015 NVZ) were included. The current area of NVZ is about 38 627.6 km^2, increasing of about 276 km^2 with respect to the previous reporting period.

Forecast of Water Quality

There was no forecast of water quality. Bulgaria used the trend determined during the reporting period to provide an overall picture of the water status.

Summary

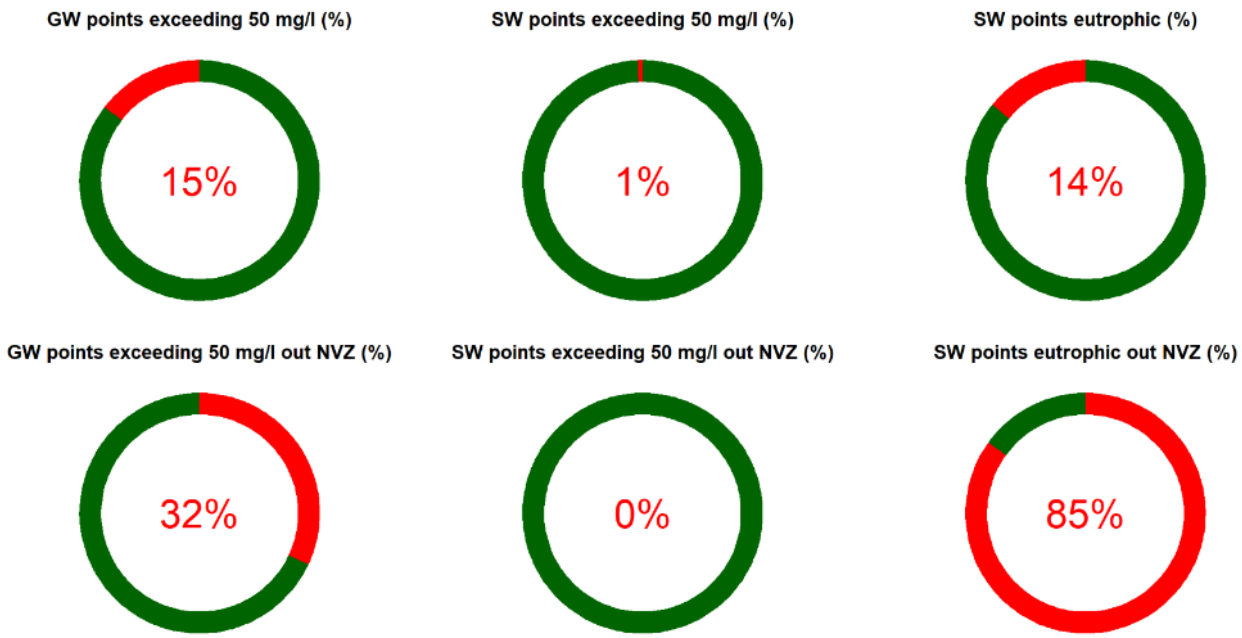


Figure 17. The summary plot for the period 2016-2019

This plot provides in the first row the percentage of stations exceeding 50 mg/l with respect to the total stations with measures and the percentage of eutrophic SW stations with respect to the total for which the trophic status is reported. In the second row, the percentage of stations exceeding 50 mg/l that are outside NVZ with respect to the total of stations exceeding 50 mg/, and the percentage of SW eutrophic stations that are outside NVZ with respect to the total that are eutrophic.

Long term analysis

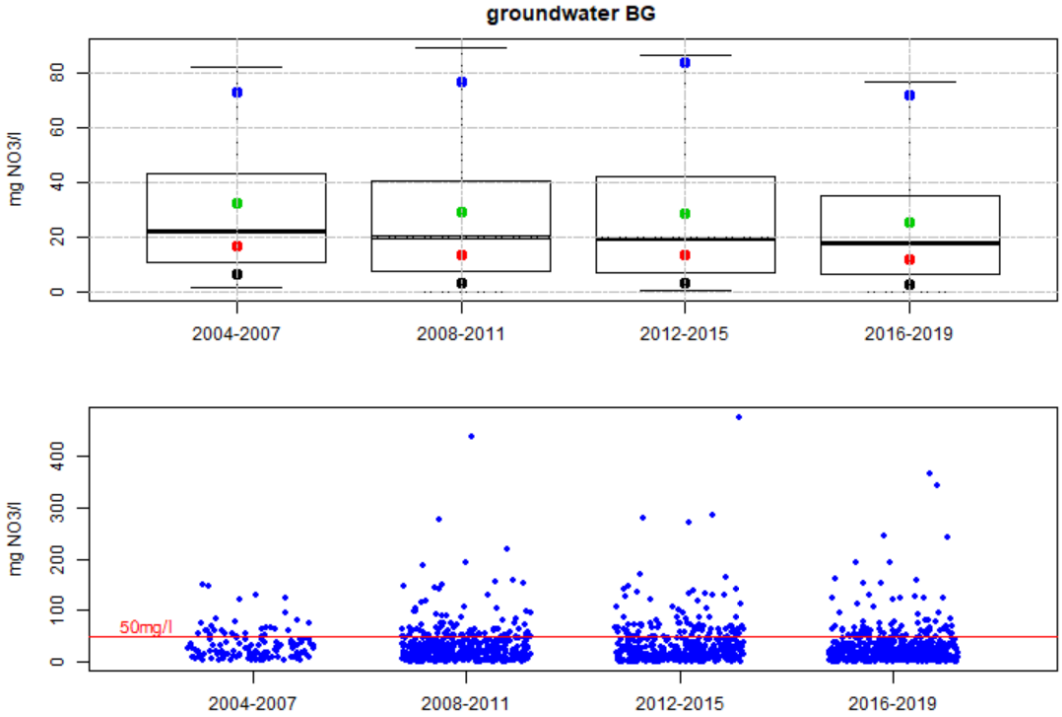


Figure 18. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for groundwater stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

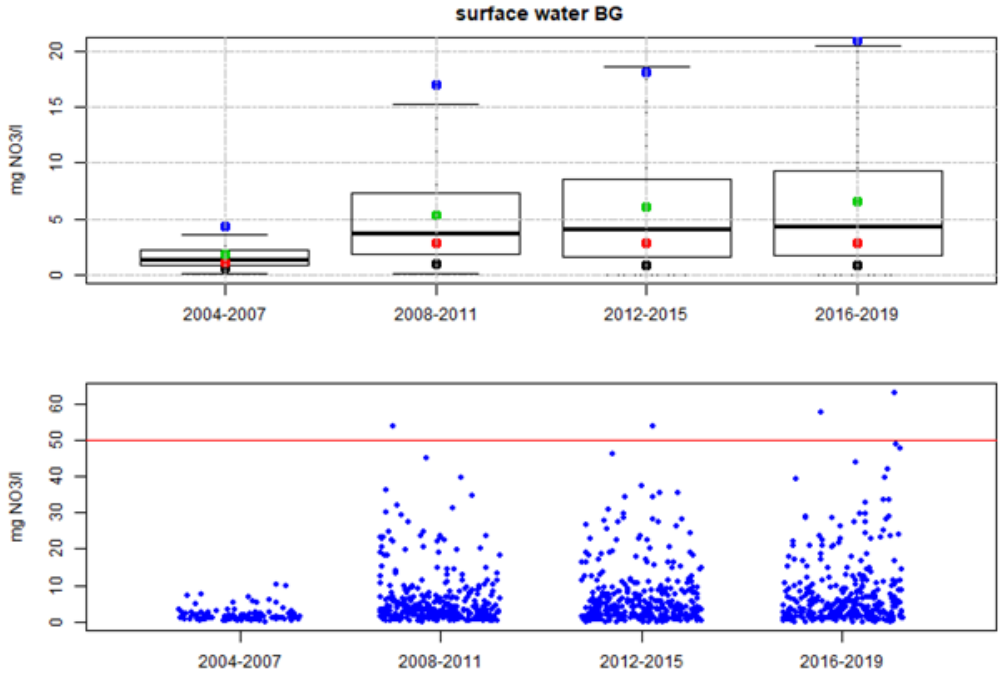


Figure 19. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for surface water stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

Conclusions and recommendations

Bulgaria has a low livestock density, the surplus of nitrogen is average for the EU and there is low surplus of for phosphorus.

There is a well-elaborated network of monitoring stations. The groundwater quality is generally good. However, there are hotspots, with a nitrate concentration > 50 mg/l and many monitoring points have a strong increasing trend.

A very high number polluted groundwater and of surface waters found to be eutrophic are located outside the NVZ, which were extended in 2015 and reviewed in 2019.

A revised action programme was published in 2020.

The Commission recommends Bulgaria to focus on the hotspots and to review the designation of NVZ and include areas that drain into waters that are eutrophic where agricultural pressure is significant.