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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

Romania's utilized agricultural area amounts to 13.5 Mha, representing 58% of the total land area. The major outputs of the agricultural industry include in a decreasing order forage (14.7%), milk (13.1%) and wine production (13.1%).
Eurostat

Major land use statistics for Romania

Table 1.Utilized agricultural area (abbreviated as UAA)

Romania	2005	2007	2010	2013	2016
Utilised agricultural area UAA (1000 ha)	NA	13630	14156	13905	13521
arable land (1000 ha)	NA	8675	9146	8746	8582
permanent grass (1000 ha)	NA	4494	4547	4717	4521
permanent crops (1000 ha)	NA	358	345	328	316
kitchen gardens (1000 ha)	NA	104	119	113	101

Note:
Eurostat (FSS)

Romania's arable land has decreased by 1.1% since 2007. Permanent grassland and crops decreased by 2% and 4%, respectively.

Animal distribution in Romania

Romania has seen a decrease in all livestock. The livestock density index (livestock unit per hectare of Utilized Agricultural Area) has decreased by 17% and is below the EU average of 0.8.

Table 2. Livestock statistics

Romania	2005	2007	2010	2013	2016
Livestock index	0.47	0.44	0.41	0.38	0.39
dairy cows (10^6 heads)	1.62	1.57	1.18	1.17	1.19
live bovines (10^6 heads)	2.86	2.82	2.00	2.02	2.05
live pigs (10^6 heads)	6.60	6.57	5.43	5.18	4.71
live poultry (10^6 heads)	NA	NA	79.19	76.30	77.20

Note:
Eurostat (FSS)

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

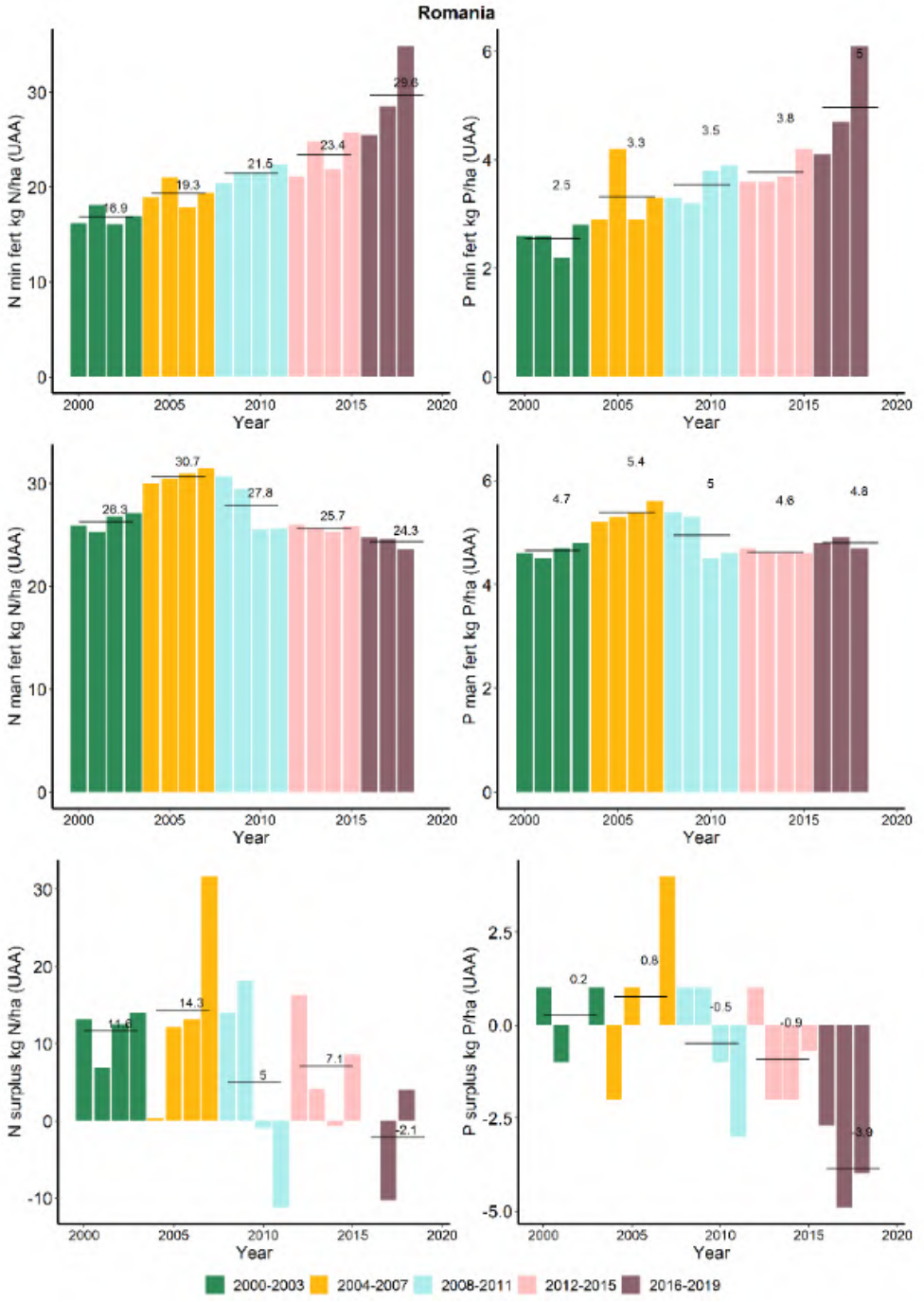


Figure 1. N and P fertilizers and gross surplus (kg/ha)

The gross nitrogen and phosphorus gross surpluses originate from EUROSTAT data for the years 2000-2018. The consumption of inorganic nitrogen and phosphorus has increased since the 2000-2003 reporting period. The organic fertilizer consumption has decreased for the last reporting period for nitrogen and remained stable for phosphorus. Both the gross nitrogen and phosphorus surpluses resulted negative for the last reporting period. This is explained by the higher yields observed this reporting period. 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

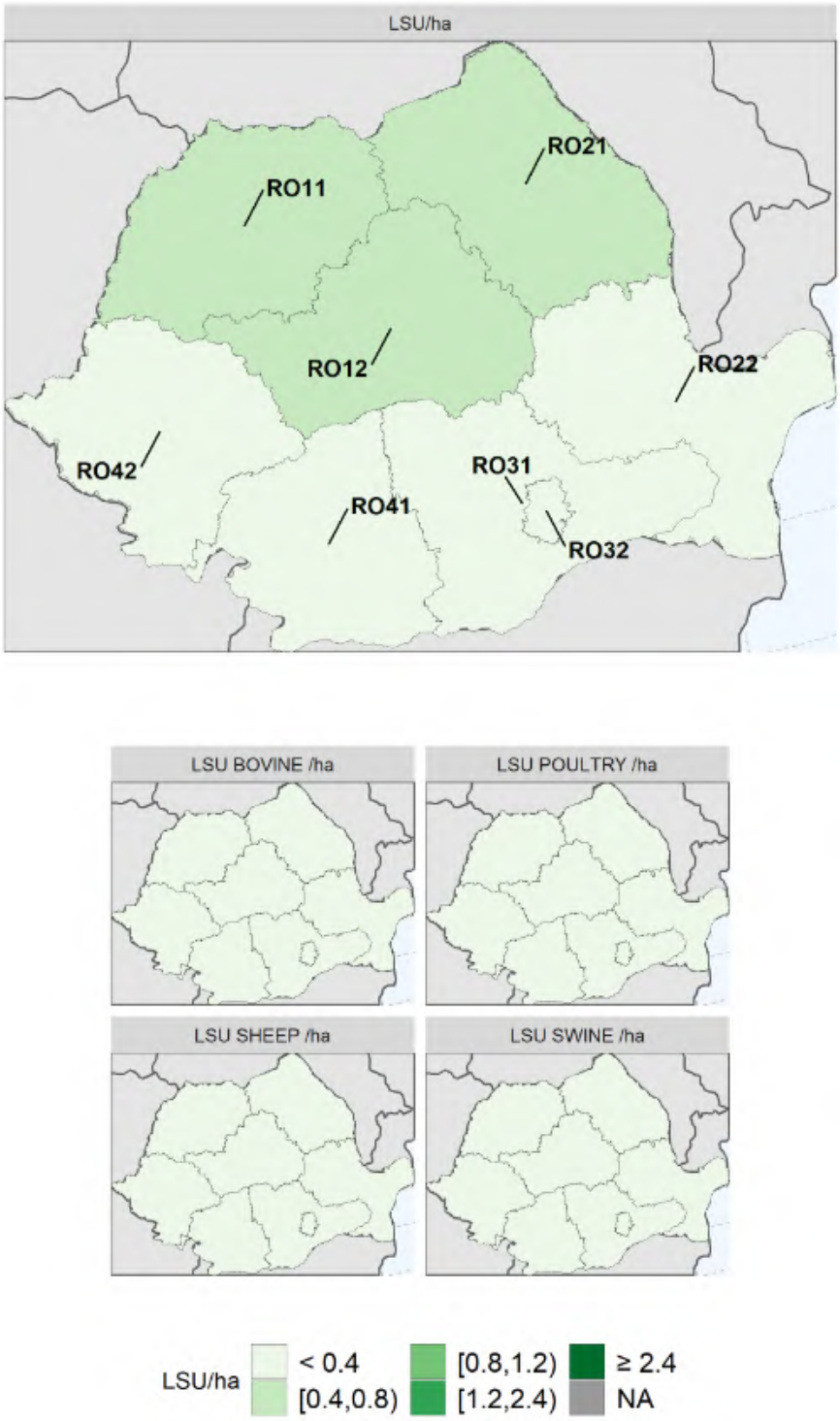


Figure 2. Map of livestock unit distribution, year 2016 (Source: Eurostat, February 2021)

Animal production is concentrated in the northern part of the Romania (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 National Administration 'Romanian Waters' manages the National Integrated Monitoring System of Romanian Waters. The actual monitoring network was established in 2006 and covers 11 river basins covering the requirement of the WFD and the Nitrates Directive. The groundwater monitoring is carried out with a frequency of 1-2 times per year for the surveillance programme, and a frequency of 2 times per year for the monitoring points under the operational programme. For surface water, monitoring frequencies range generally between 4-26 times/year.

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	242	150	173	143	85	117
1a	Phreatic groundwater (deep) 5-15 m	852	511	572	461	376	464
1b	Phreatic groundwater (deep) 15-30 m	396	291	305	178	207	258
1c	Phreatic groundwater (deep) >30 m	151	134	123	51	82	111
2	Captive groundwater	125	139	152	79	78	122
3	Karstic groundwater	43	31	59	17	21	42
9	Not specified	0	0	0	0	0	0
	Total	**1809**	**1256**	**1384**	**929**	**849**	**1114**

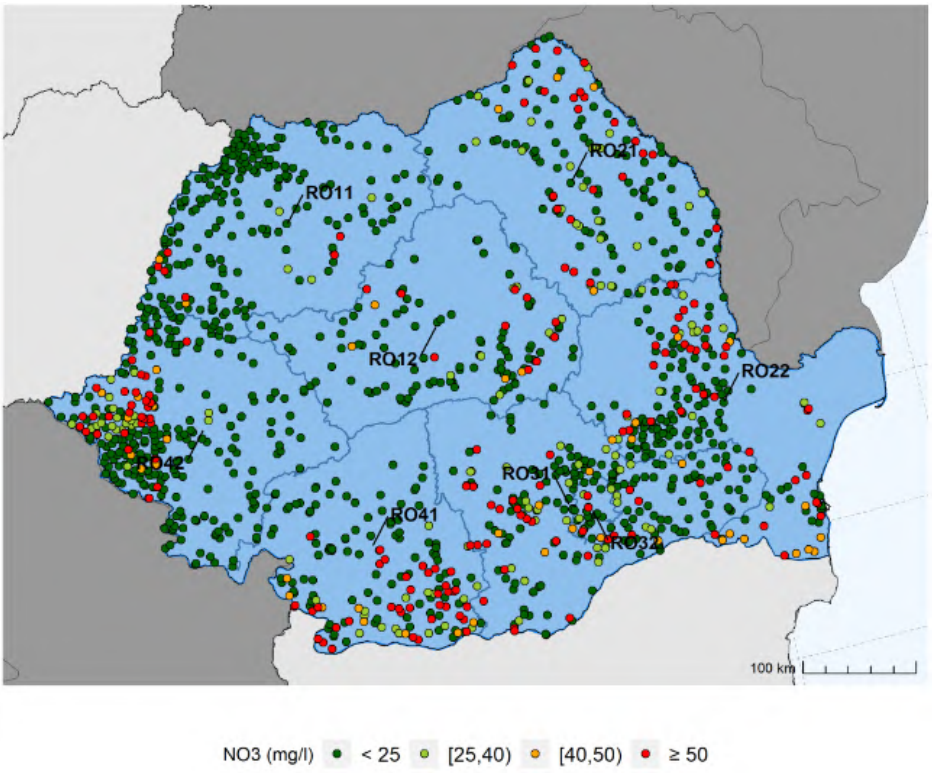
Surface water quality monitoring network

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	768	905	871	612	671	723	0	905	871
5	Lake/reservoir water	345	319	252	277	260	241	219	319	270
6	Transitional water	7	5	5	6	4	5	0	5	5
7	Coastal water	35	25	23	31	23	23	0	25	23
8	Marine water	12	5	4	4	4	4	0	5	4
9	Not specified	0	0	0	0	0	0	0	0	0
	Total	**1167**	**1259**	**1155**	**930**	**962**	**996**	**219**	**1259**	**1173**

Groundwater Quality

Groundwater average annual nitrate concentration



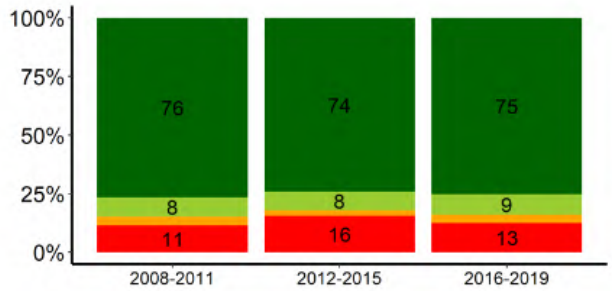


Figure 3. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

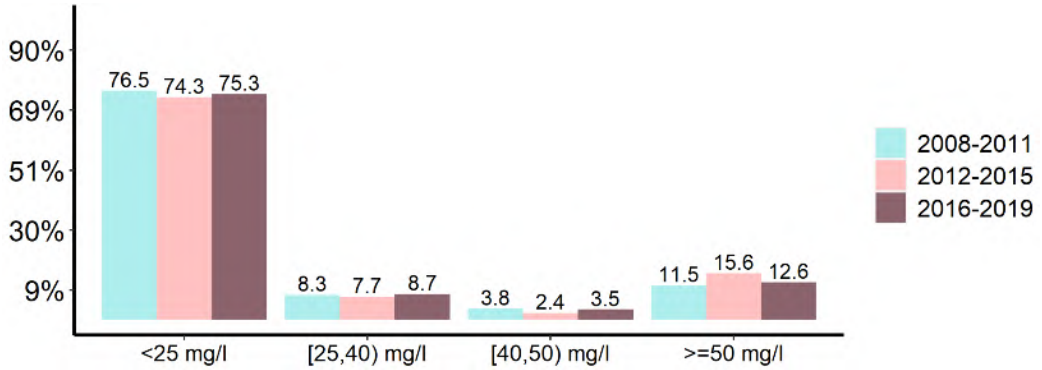
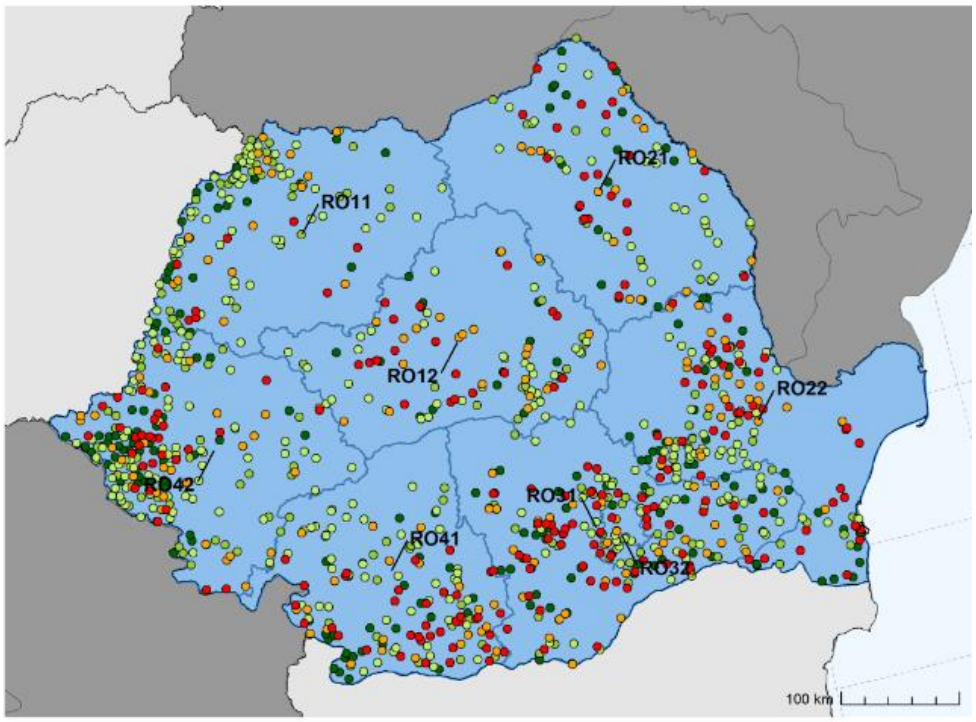


Figure 4. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Groundwater average annual nitrate concentration trend



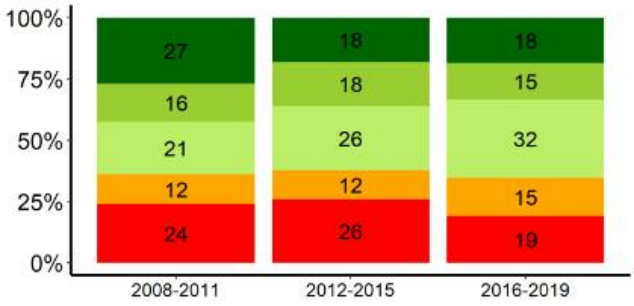


Figure 5. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis).

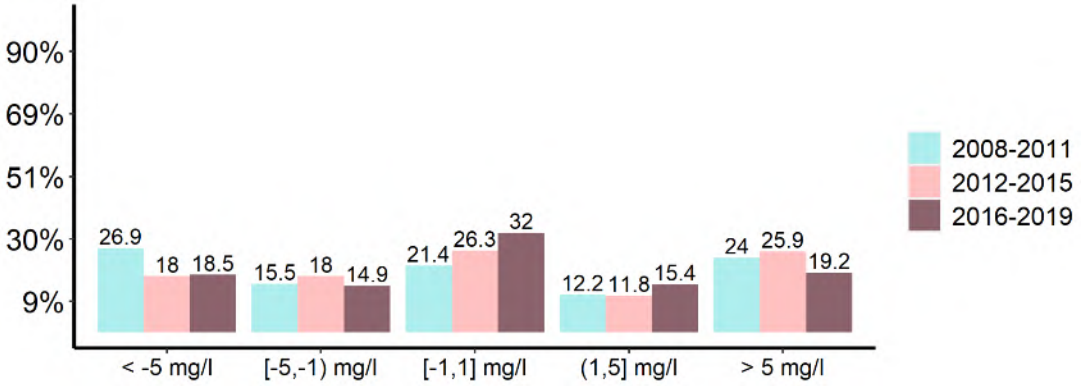
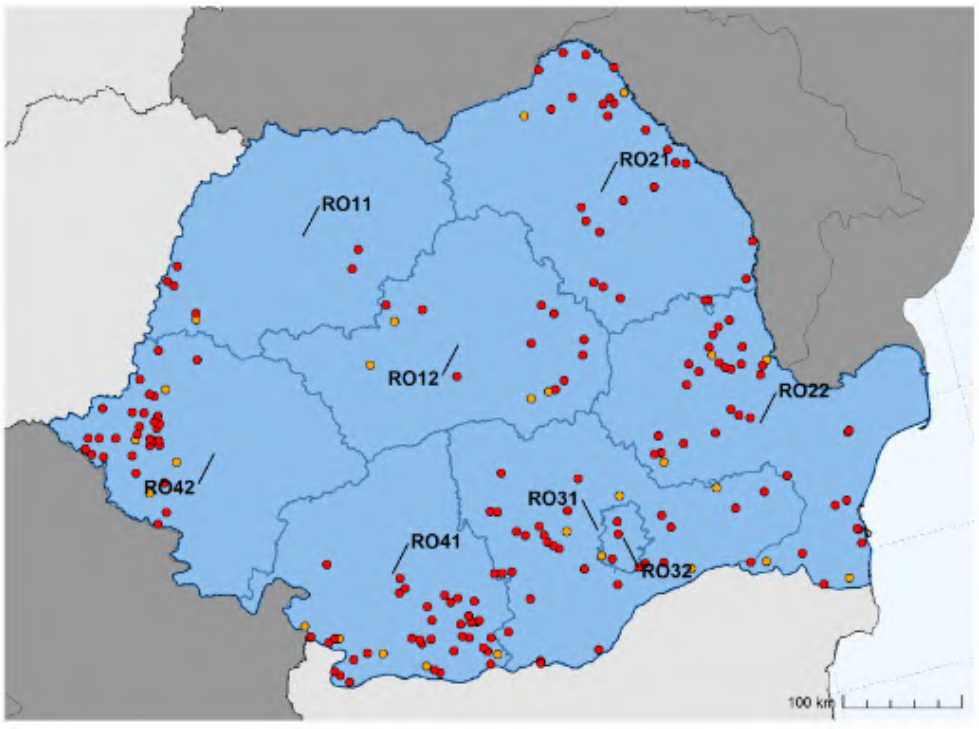


Figure 6. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Groundwater hotspot

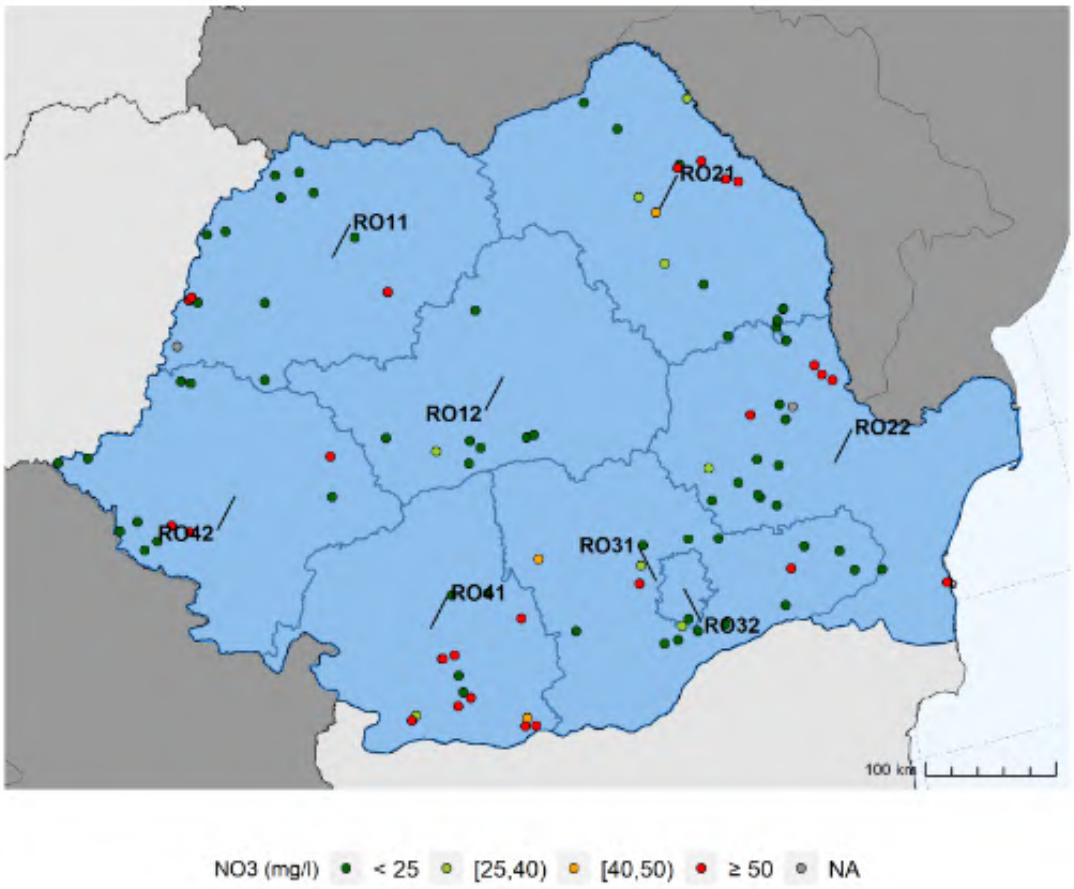


NUTS ID	NUTS NAME	>=40 and < 50 mg/l incr.trend	>=50 mg/l
RO11	Nord-Vest	1	6
RO12	Centru	4	10
RO21	Nord-Est	2	26
RO22	Sud-Est	5	32
RO31	Sud - Muntenia	4	28
RO32	Bucuresti - Ilfov	1	3
RO41	Sud-Vest Oltenia	5	38
RO42	Vest	4	30
0	NA	0	1
	Total	**26**	**174**

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

The hotspot analysis identifies all the GW monitoring stations that have NO3 concentration in the range of 40-50 mg/l with increasing trends or are 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



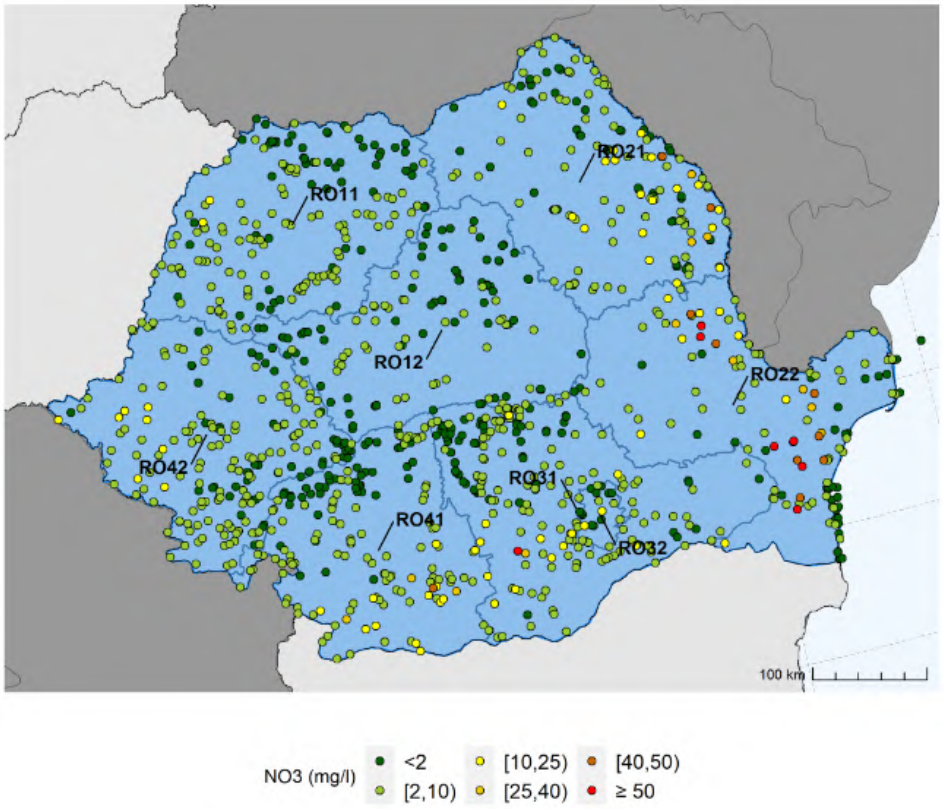
Station Type	Description	Number of removed stations		
		total removed	with measurements	with trends
0	Phreatic groundwater (shallow): 0-5 m	10	10	6
1a	Phreatic groundwater (deep) 5-15 m	45	44	21
1b	Phreatic groundwater (deep) 15-30 m	22	22	11
1c	Phreatic groundwater (deep) >30 m	7	7	4
2	Captive groundwater	21	20	12
3	Karstic groundwater	2	2	1
9	Not specified	0	0	0
	Total	**107**	**105**	**55**

Figure 8. GW removed stations map (top graph) and distribution by groundwater type (lower graph).

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



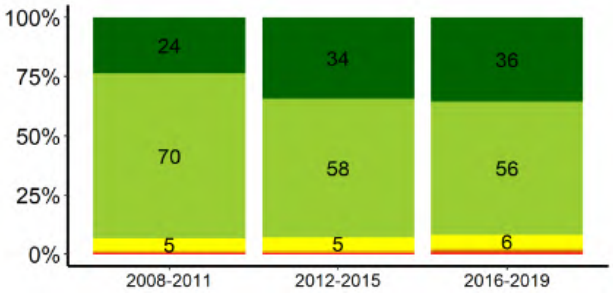


Figure 9. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

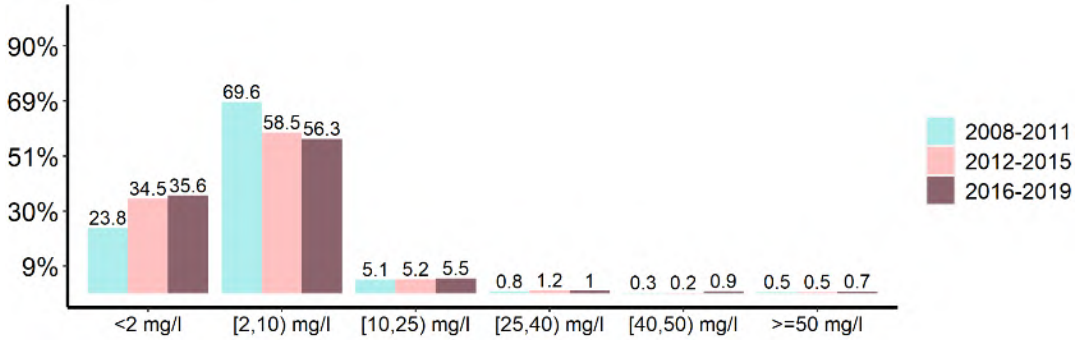


Figure 10. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Surface water average annual nitrate concentration trend

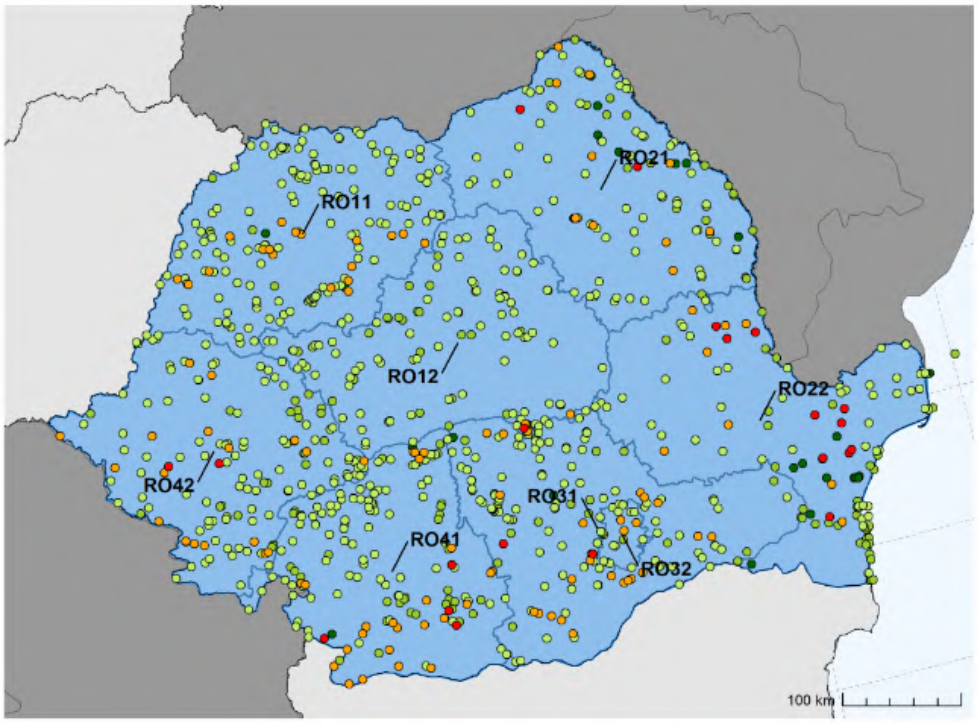


Figure 11. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

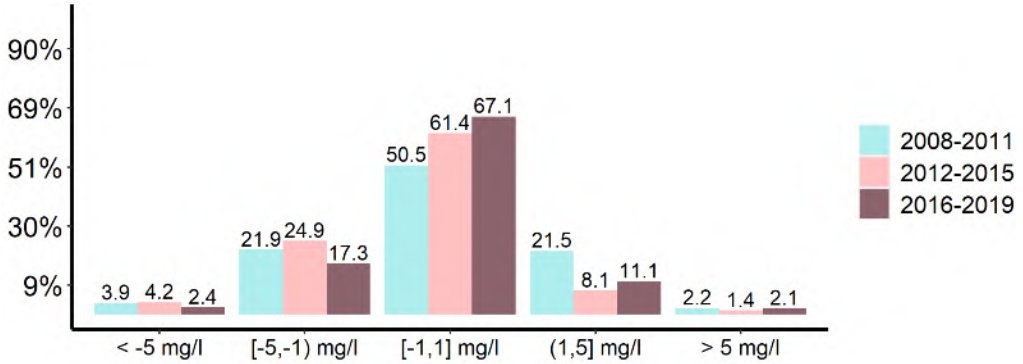
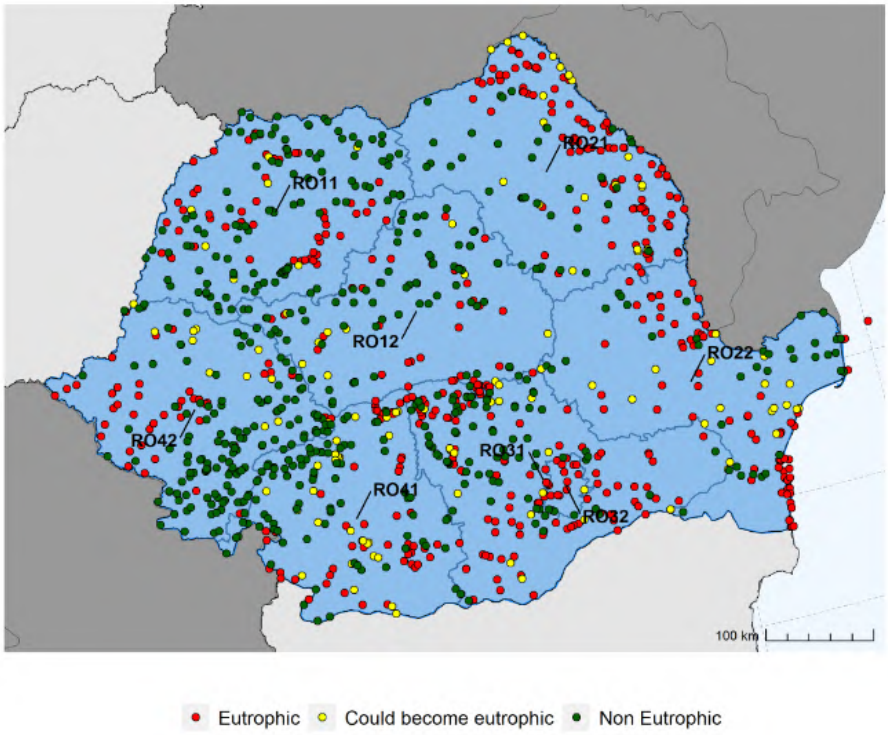


Figure 12. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Surface Water Eutrophication



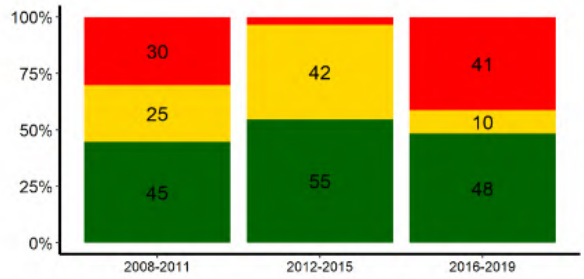


Figure 13. Spatial distribution of eutrophic status (map) and corresponding percentage of monitoring points per classes of status by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

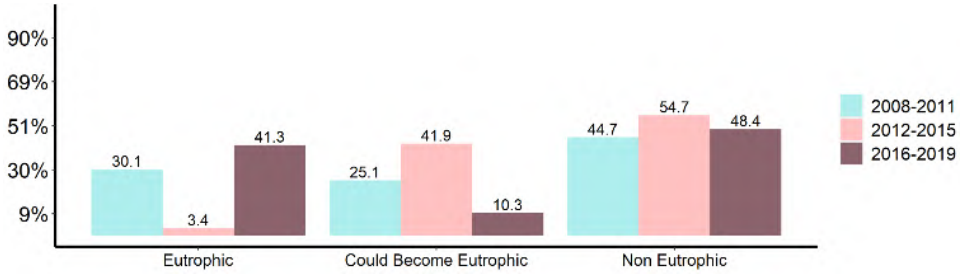
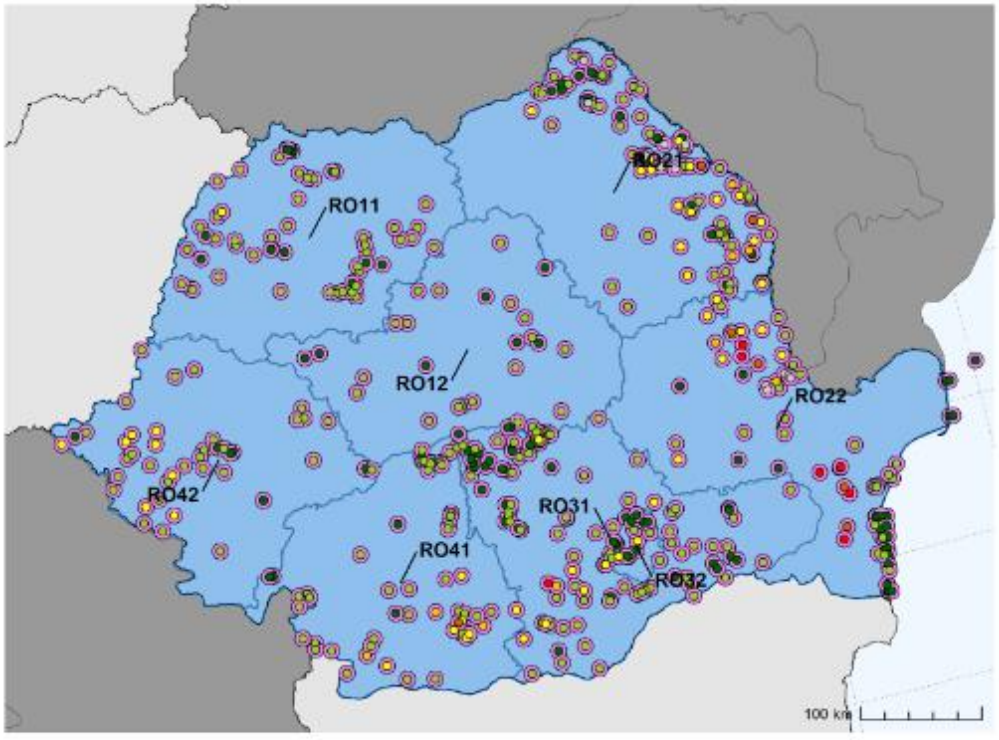


Figure 14. Comparison of percentage of monitoring points in the three reporting periods by classes of status (x axis)

In the current reporting period, the assessment of the trophic status was carried out using a different methodological approach respect to the previous reporting periods, 2008-2011 and 2012-2015. The new method is in line with the reporting guidelines and takes into account the correlation with the Water Framework Directive requirements, including the “one out, all out” principle.

The Eutrophic status vs average NO3 annual concentration



NUTS ID	NUTS NAME	High trophic status	Number of stations by classes of concentration						
			<2 mg/l	[2,10) mg/l	[10,25) mg/l	[25,40) mg/l	[40,50) mg/l	>=50 mg/l	Unclassified
NO_NUTS	SALINE	32	28	4	0	0	0	0	0
RO11	Nord-Vest	55	14	40	1	0	0	0	0
RO12	Centru	40	8	31	1	0	0	0	0
RO21	Nord-Est	103	23	47	17	3	2	0	11
RO22	Sud-Est	46	4	17	7	2	4	7	5
RO31	Sud - Muntenia	97	30	59	6	1	0	1	0
RO32	Bucuresti - Ilfov	16	11	3	2	0	0	0	0
RO41	Sud-Vest Oltenia	51	4	36	7	3	1	0	0
RO42	Vest	44	8	28	8	0	0	0	0
	Total	**484**	**130**	**265**	**49**	**9**	**7**	**8**	**16**

Figure 15. The SW monitoring stations with eutrophic status versus the average NO3 annual concentration.

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.

The classification and assessment system for the status of water bodies has been developed in line with the requirements of the Water Framework Directive. The indicator parameters of the eutrophication process include nutrients (nitrate, nitrite, total nitrogen, phosphate, and total phosphorus), dissolved oxygen and organic substances (measured by BOD5), transparency (Secchi disk), as well as chlorophyll-a. The trophic status of surface waters was assessed using the ecological status/potential classes in the monitoring section.

For rivers the classification is based on the concentrations of total phosphorus, phosphate, nitrate, nitrite, dissolved oxygen and chlorophyll-a where the limit of the trophic status depends on the water types. For rivers the limit values between very good/good status and maximum/good ecological potential and good/moderate are [0.110 mg/l P to 0.32 mg/l P] and [0.22 to 0.66 mg/l P] for total phosphorus, [0.035 to 0.13 mg/l P-PO4] and [0.075 to 0.67 mg/l P-PO4] for phosphate, [0.7 to 2.6 mg/l N-NO3] and [1.4 to 5.5 mg/l N-NO3] for nitrate, [10 to 8 mg/l] and [8 to 6 mg/l] for dissolved oxygen.

For lakes the limit values between very good/good status and maximum/good ecological potential and good/moderate are [0.02 mg/l P to 0.18 mg/l P] and [0.04 to 0.38 mg/l P] for total phosphorus, [0.015 to 0.12 mg/l P-PO4] and [0.03 to 0.25 mg/l P-PO4] for phosphate, [0.4 to 1.6 mg/l N-NO3] and [0.8 to 3.3 mg/l N-NO3] for nitrate, [10 to 8 mg/l] and [8 to 6 mg/l] for dissolved oxygen.

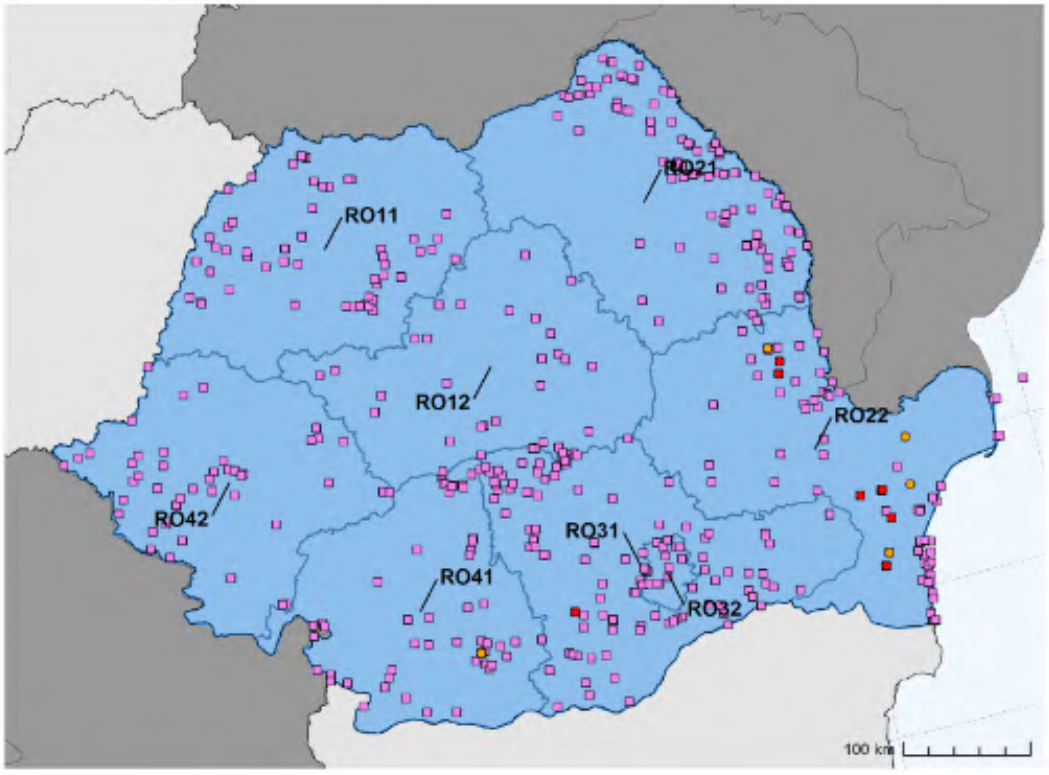
For transitional water the limit values between very good/good status and maximum/good ecological potential and good/moderate are [0.012 to 0.03 mg/l P-PO4] and [0.3 mg/l P-PO4] for phosphate, [<1 mg/l N-NO3] and [1 to 1.53 mg/l N-NO3] for nitrate, [9 to 13 mg/l] and [6.2 to 9 mg/l] for dissolved oxygen, and [2.6 µg/l] and [3.9 µg/l] for chlorophyll-a.

Considering this classification scheme, all coastal waters and transitional waters are eutrophic. For surface waters the number of eutrophic water bodies is slightly higher than that of the non-eutrophic water bodies.

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	348	99	424
5	Lake/reservoir water	104	22	144
6	Transitional water	5	0	0
7	Coastal water	23	0	0
8	Marine water	4	0	0
9	Not specified	0	0	0
	Total	**484**	**121**	**568**

Surface Water quality hotspot

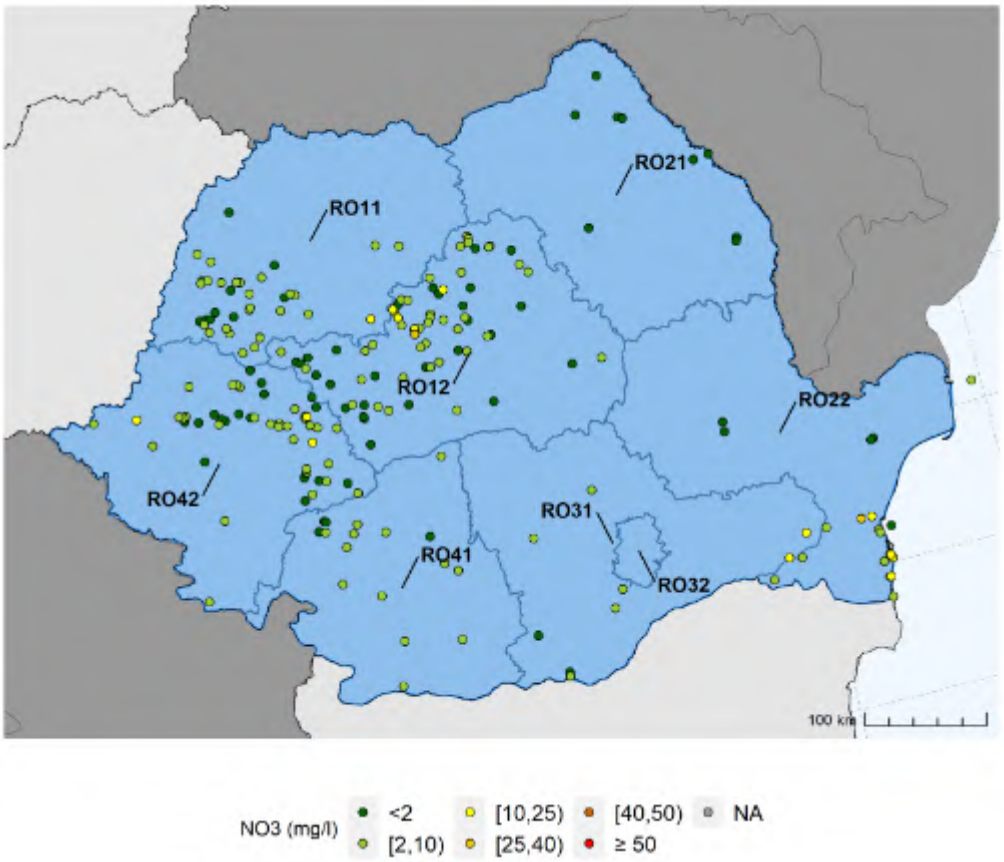


NUTS ID	NUTS NAME	High trophic status	>=40 and < 50 mg/l incr.trend	>=50 mg/l
NO_NUTS	SALINE	32	0	0
RO11	Nord-Vest	55	0	0
RO12	Centru	40	0	0
RO21	Nord-Est	103	0	0
RO22	Sud-Est	46	4	7
RO31	Sud - Muntenia	97	0	1
RO32	Bucuresti - Ilfov	16	0	0
RO41	Sud-Vest Oltenia	51	1	0
RO42	Vest	44	0	0
	Total	**484**	**5**	**8**

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.

The hotspot analysis identifies all the SW monitoring stations that have high trophic status, NO3 concentration in the range of 40-50 mg/l with increasing trends or are 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.

Surface Water Stations Removed



Station Type	Description	Number of removed stations			
		total removed	with measurements	with trends	with trophic status
4	River water	171	171	59	171
5	Lake/reservoir water	42	42	31	42
6	Transitional water	0	0	0	0
7	Coastal water	2	2	2	2
8	Marine water	1	1	1	1
9	Not specified	0	0	0	0
	Total	**216**	**216**	**93**	**216**

Figure 17. SW removed stations map (top graph) and distribution by surface water type (lower graph).

The removed stations analysis identifies all the SW 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.

Measures in the Action Programme

The first Code of Good Agricultural Practice was drawn up in 2003 and was revised in 2005 and recently on 31/07/2015. The Action Programme (AP) was published for the first time in 2007 and was revised in 2010 and 2013. Currently no amendments were made to the Programme as compared to the previous report. Cost effectiveness was not reported.

Table 6. Details of the Action Programme

Measure	General details in Action Programme (*)
Period of prohibition of fertiliser application	The prohibition periods for field application of fertilizers are defined by the time interval in which the average air temperature drops below 5°C. This interval corresponds to the period when the requirements of the crop for nutrients are reduced or when the risk of percolation / surface runoff is high.
	• For solid organic fertiliser on arable land and grassland: 1 November to 15 March
	• For liquid organic fertilizers and mineral fertilizers on arable land for autumn crop: 1 November to 1 March
	• For liquid organic fertilizers and mineral fertilizers on arable land for other cultures and on grassland: 1 October to 15 March
Restrictions for application on sloped soils	• On arable land with a slope of up to 12%, it is recommended to maintain the percentage of autumn crops and / or cover crops at least 20% of the arable area of the farm
	• On arable land with a slope of more than 12%, it is mandatory to maintain the share of autumn crops and / or cover crops at least 30% of the arable area of the farm
Restrictions for application on soaked, frozen, or snow-covered soils	• On soils saturated with water, flooded, frozen or covered with snow, the application of organic fertilizers of animal nature is prohibited
Restrictions for application near watercourses (buffer strips)	• Protection zones and buffer strips are established in accordance with art. 40 and annex 2 of the Water Law no. 107/1996, with the subsequent modifications and completions, along the watercourses. The width of the protection zones is established according to the width of the watercourse, the type and destination of the water resource or the hydrotechnical arrangement
Effluent storage works	• Within the Code of Good Agricultural Practice, 2015, were introduced the criteria for selecting the methods of storage and construction of municipal platforms, individual warehouses and temporary warehouses in the field
Capacity of manure storage	• Within the Code of Good Agricultural Practice, 2015, were introduced the estimation of the necessary storage capacity according to the category of animals and the maintenance system
Rational fertilisation (e.g., splitting fertilisation, limitations)	• Maximum quantities of fertilizers (mineral + organic) that can be applied on agricultural land.
	• For organic fertilizers of animal origin maximum N-total applied must not exceed 170 kg N/ha/year.
	• For mineral fertilizers the maximum N-total that can be applied is given by the difference between the value imposed by the maximum standard and the amount of mineralized nitrogen from organic fertilizers of animal nature applied in the field
	• The technical means for the application of fertilizers depends on the type and condition of the fertilizers, the method for dosing and application, the type of operation and the capacity.
Crop rotation, permanent crop enhancement	• It is recommended to rotate a fast-growing crop with the main crop
Vegetation cover in rainy periods, winter	• Not specified
Fertilisation plans, spreading records	• The fertilization plan must be drawn up on the basis of an agrochemical study carried out by specialized bodies of the Ministry of Agriculture and Rural Development (County Pedological and Agrochemical Studies Office-OSPA) in accordance with the requirements of the Environmental Agreement (Integrated Environmental Agreement) necessary for the operation of the farm.
Other measures	• Not specified
Date for application limit of 170 kg N/ha/year:	• Not specified

Controls

Administrative controls took place on around 10% of the farms each year. The most significant non-compliance concerned mostly manure storage and storage capacity (8.3% of the farms controlled). The main problems with complying with the manure storage is that most farms are subsistence and semi-subsistence farms with little economic capacity not allowing them to have their own storage capacities. In addition, the farmers have difficulties to understand the proposed measures and are poorly equipped. Finally, due to strict ban periods for manure spreading, in recent years, when above 5-degree temperatures occurred early, the manure could not be spread efficiently.

Designation of NVZ

Romania has adopted a whole territory approach.

Forecast of Water Quality

It is anticipated that if additional pollution reduction measures are not taken, nitrate concentrations in surface water bodies are not expected to diminish. Romania estimates future water quality developments based on the MONERIS model that is applied across the Danube region. There are currently no results of forecast for the coming years.

Summary

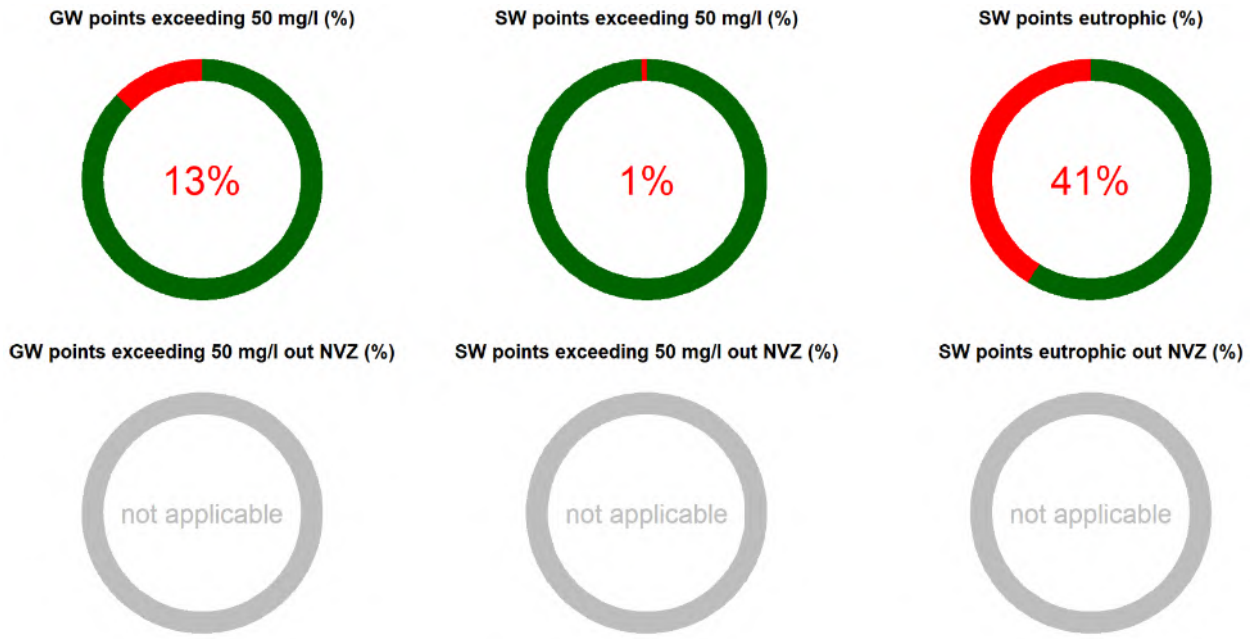


Figure 18. The summary plot for the period 2016-2019

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.

In the current reporting period, the assessment of the trophic status was carried out using a different methodological approach respect to the previous reporting periods, 2008-2011 and 2012-2015. The new method is in line with the reporting guidelines and takes into account the correlation with the Water Framework Directive requirements, including the “one out, all out” principle.

Long term analysis

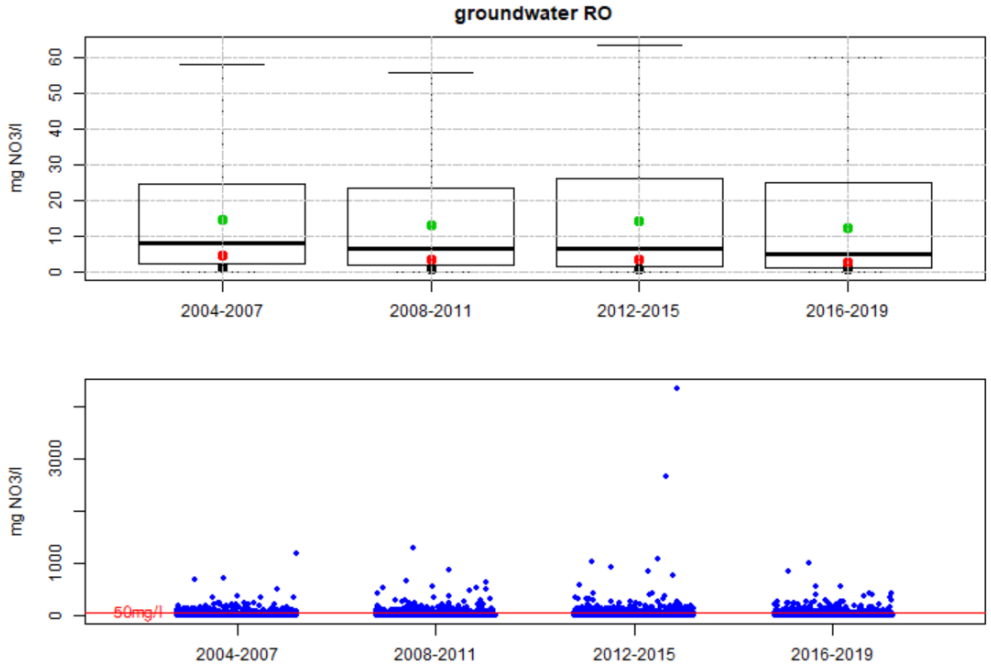


Figure 19. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for groundwater stations. RPs represent the reporting periods, RP7 being the last period (2016-2019). The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

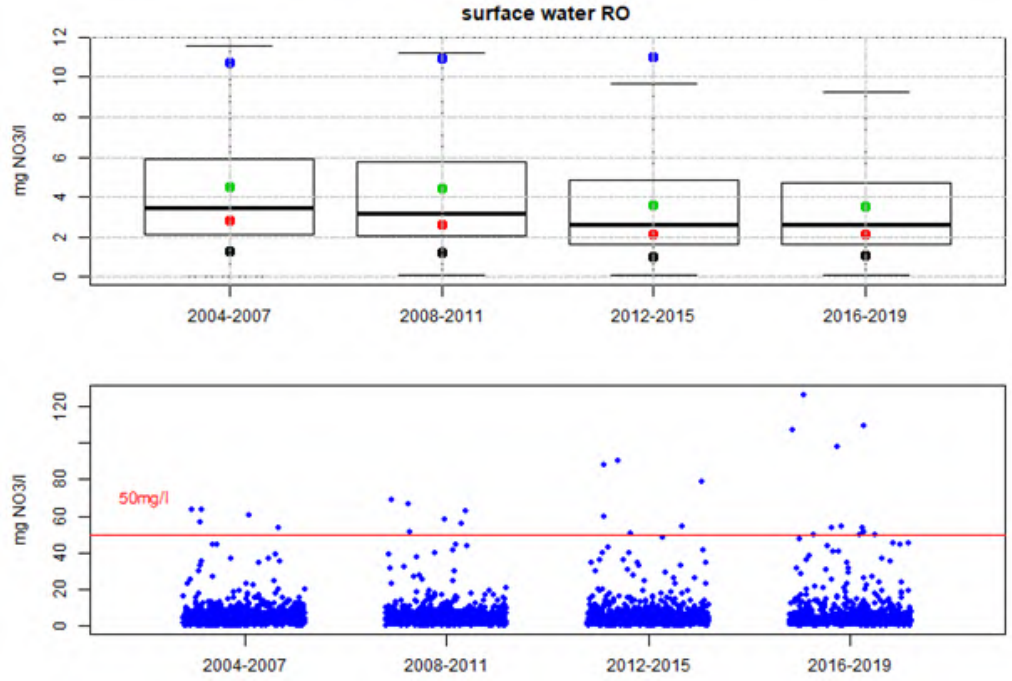


Figure 20. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for surface water stations. RPs represent the reporting periods, RP7 being the last period (2016-2019). The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

Conclusions and recommendations

Romania has a low livestock density and has a negative balance for nitrogen as well as phosphorus.

There is a well elaborated network of monitoring stations. There is a number of groundwater hotspots showing nitrates concentration above 50 mg/l in NVZ, also a high number of stations show an increasing trend. A high number of surface waters are affected by eutrophication.

The action programmes was revised in 2012.

The Commission recommends Romania to address the groundwater hotspots with high nitrate pollution and increasing trend.