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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

Hungary's utilized agricultural area amounts 5.3 Mha, representing 68% of the total land area and has remained stable since 2010. The major outputs of the agricultural industry include in a decreasing order milk (31%), forage plants (22%) and cattle (14.9%).

Eurostat

Major land use statistics for Hungary

Table 1.Utilized agricultural area (abbreviated as UAA)

Hungary	2005	2007	2010	2013	2016
Utilised agricultural area UAA (1000 ha)	NA	5807	5343	5340	5349
arable land (1000 ha)	NA	4494	4308	4326	4332
permanent grass (1000 ha)	NA	1017	763	759	783
permanent crops (1000 ha)	NA	199	176	182	176
kitchen gardens (1000 ha)	NA	96	NA	81	65

Note:

Eurostat (FSS)

Hungary's arable land has remained stable since 2010.

Animal distribution in Hungary

Hungary's live poultry have increased since 2013. The livestock density index (livestock unit per hectare of Utilized Agricultural Area) has remained stable and is lower than the EU average of 0.8.

Table 2. Livestock statistics

Hungary	2005	2007	2010	2013	2016
Livestock index	0.59	0.57	0.53	0.49	0.52
dairy cows (10^6 heads)	0.28	0.27	0.24	0.25	0.24
live bovines (10^6 heads)	0.71	0.70	0.68	0.78	0.85
live pigs (10^6 heads)	3.85	3.87	3.17	3.00	2.91
live poultry (10^6 heads)	NA	NA	48.70	41.10	46.69

Note:

Eurostat (FSS)

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

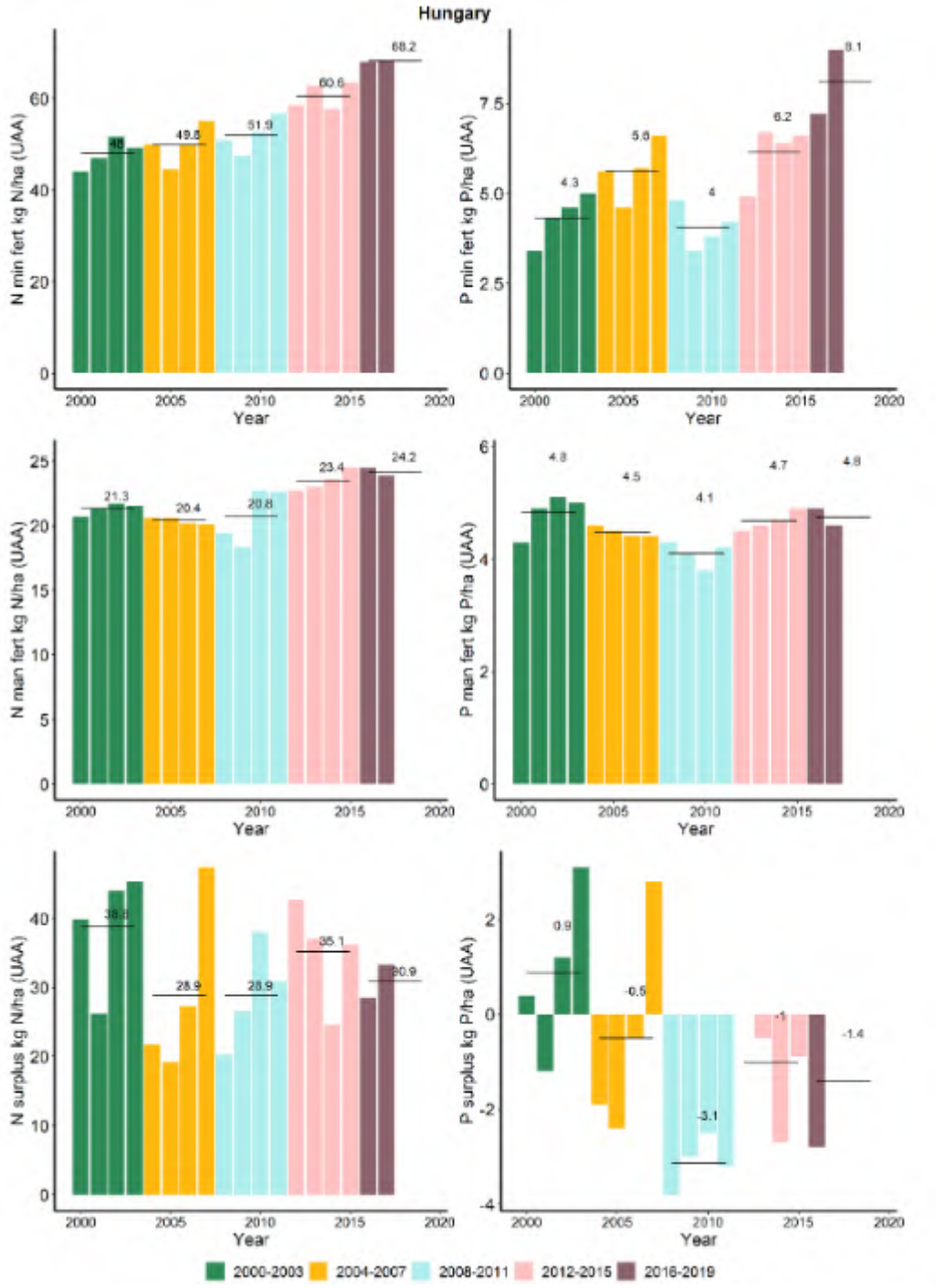


Figure 1. N and P fertilizers and gross surplus (kg/ha)

The gross nitrogen and phosphorus surpluses originate from EUROSTAT data for the years 2000-2017. N and P mineral fertilizers increased by around 13% and 30% with respect to the previous reporting period, while manure N and P remained stable. The nitrogen and phosphorus surplus decreased significantly from the last reporting period by 12% and 40% respectively. 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

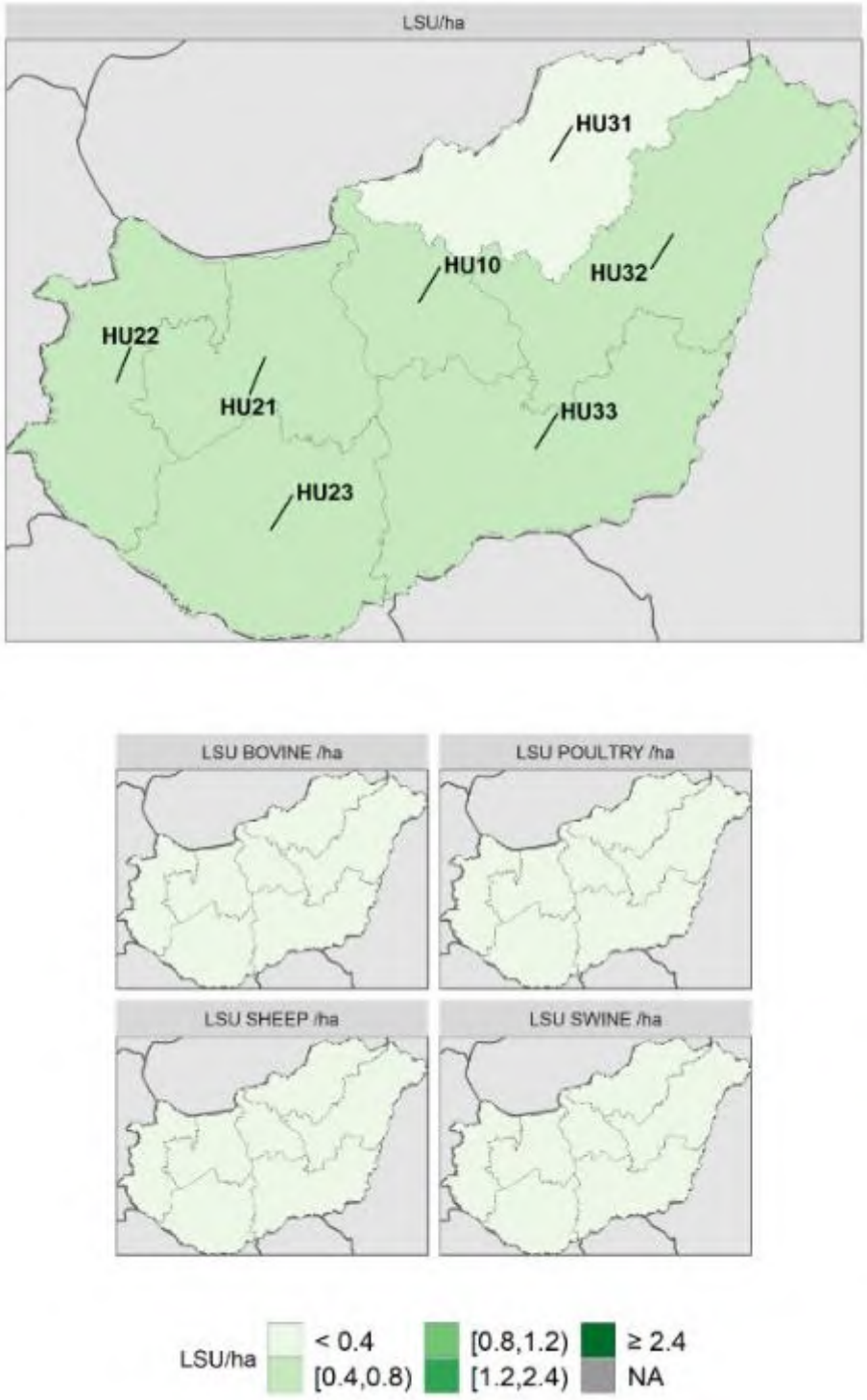


Figure 2. Map of livestock unit distribution, year 2016 (Source: Eurostat, February 2021)

Animal production is generally in the range of 0.4-0.8 LSU/ha Hungary (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

For groundwater and surface water measurements, some stations have same coordinates due to different depth. 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	227	225	220	217	222	210
1a	Phreatic groundwater (deep) 5-15 m	416	404	434	405	398	401
1b	Phreatic groundwater (deep) 15-30 m	225	221	235	223	220	224
1c	Phreatic groundwater (deep) >30 m	24	32	68	21	31	68
2	Captive groundwater	714	718	669	700	709	646
3	Karstic groundwater	157	156	162	154	156	161
9	Not specified	0	0	0	0	0	0
	Total	**1763**	**1756**	**1788**	**1720**	**1736**	**1710**

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	480	480	810	187	282	378	480	480	808
5	Lake/reservoir water	45	50	117	25	31	36	45	45	112
6	Transitional water	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	Coastal water	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	Marine water	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	Not specified	0	0	0	0	0	0	0	0	0
	Total	**525**	**530**	**927**	**212**	**313**	**414**	**525**	**525**	**920**

Groundwater Quality

Groundwater average annual nitrate concentration

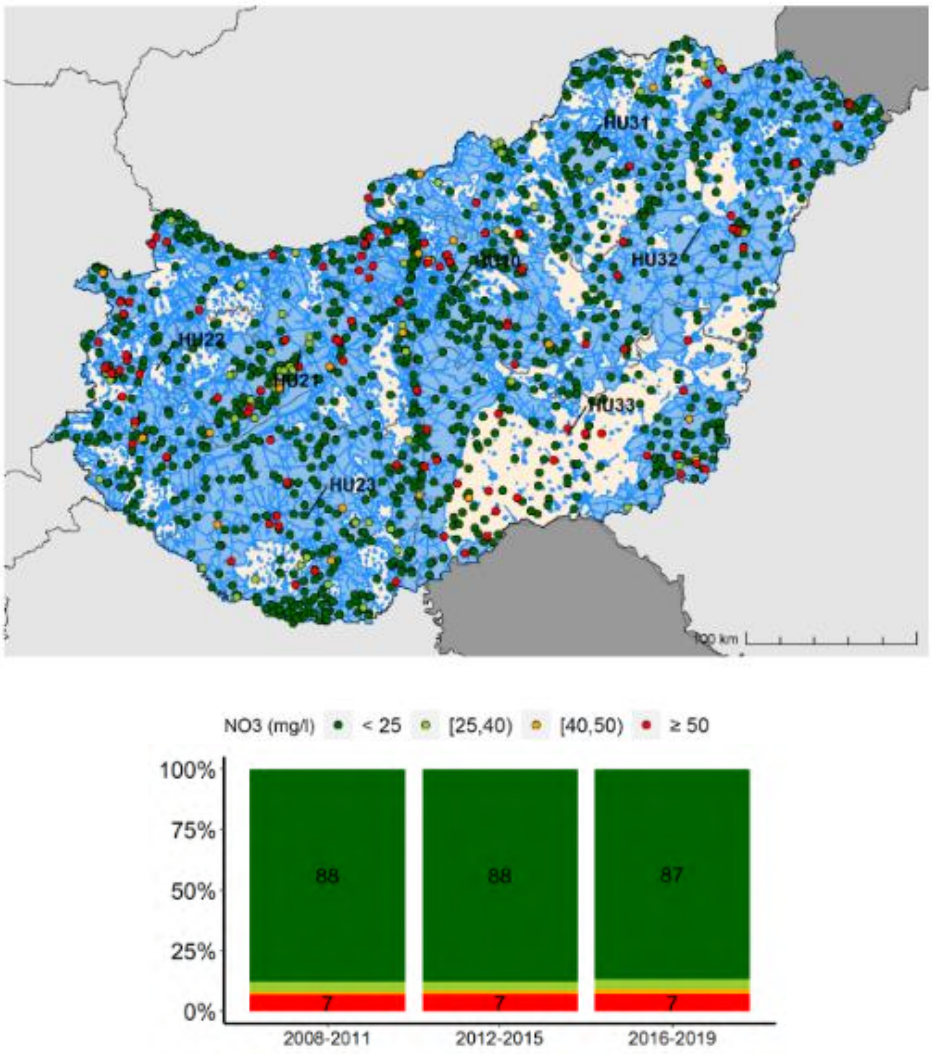


Figure 3. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ

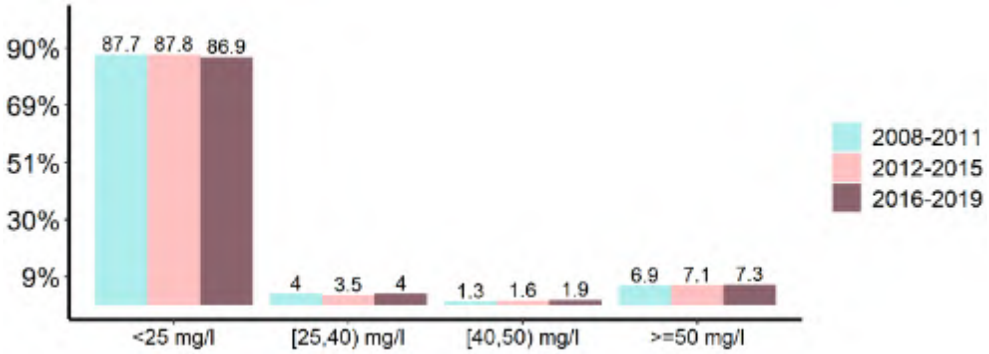


Figure 4. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis).

Groundwater average annual nitrate concentration trend

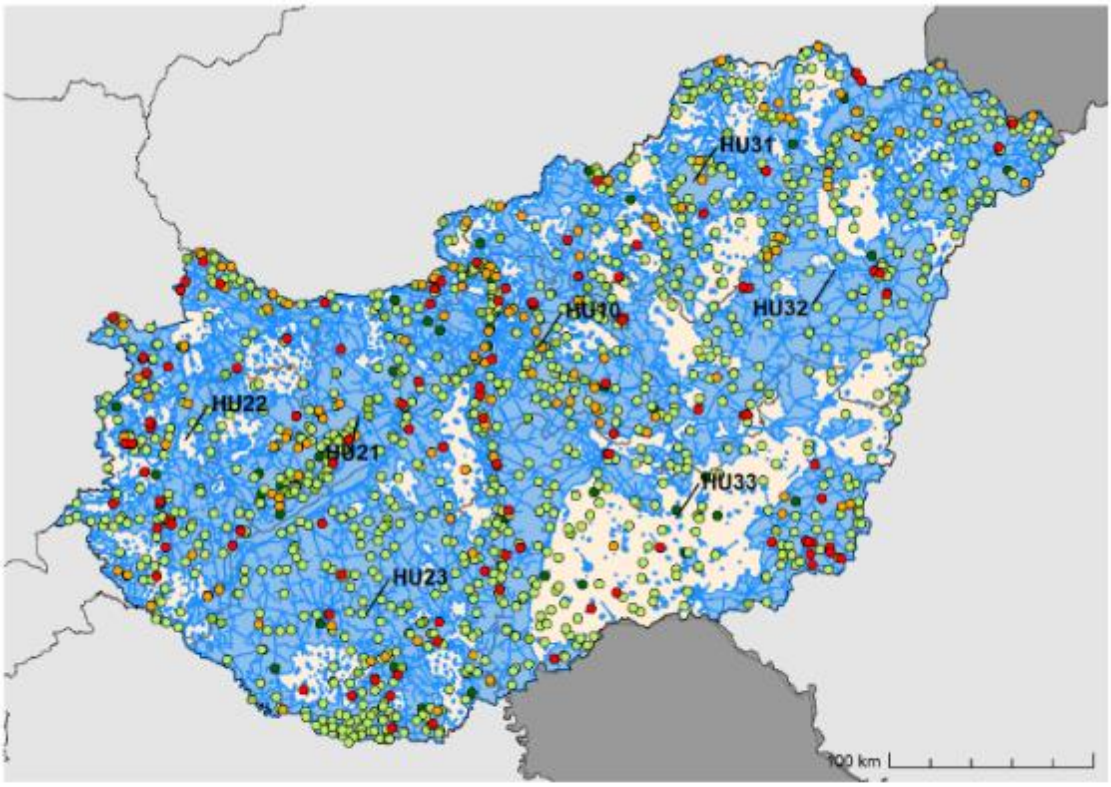


Figure 5. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). In the map in blue the NVZ

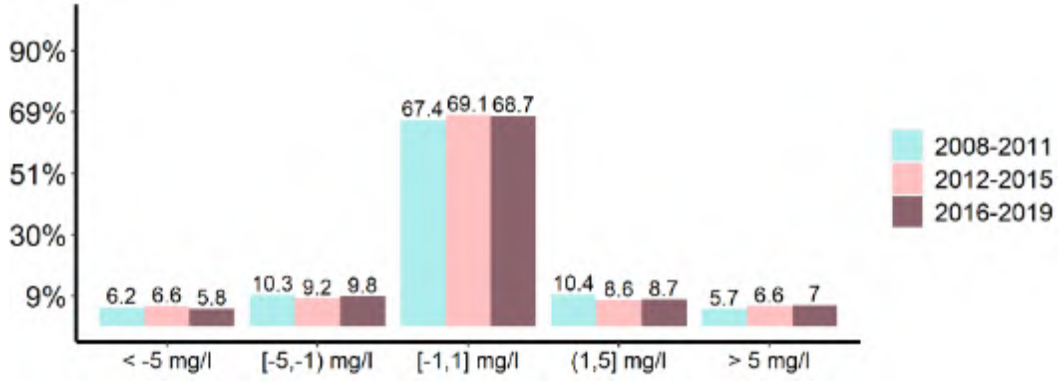
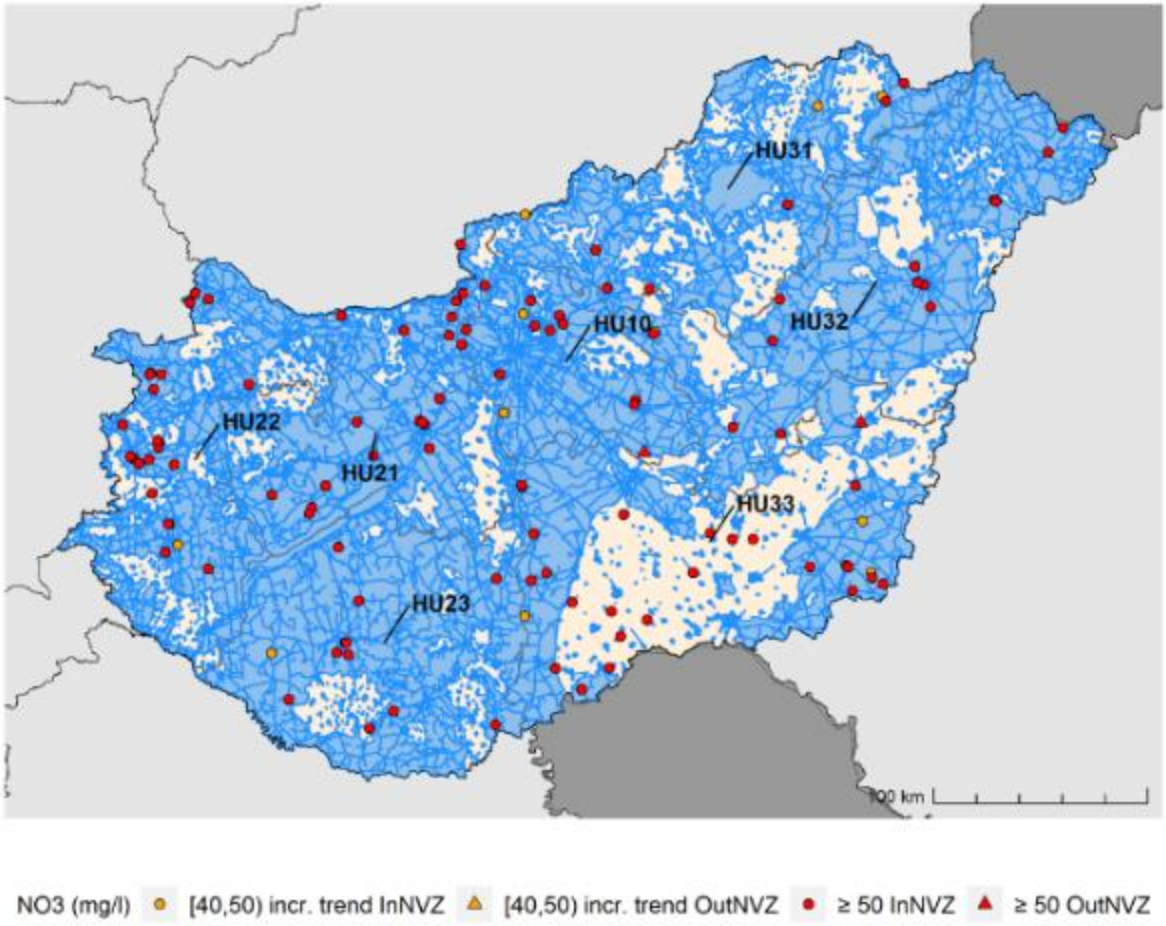


Figure 6. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Groundwater hotspot

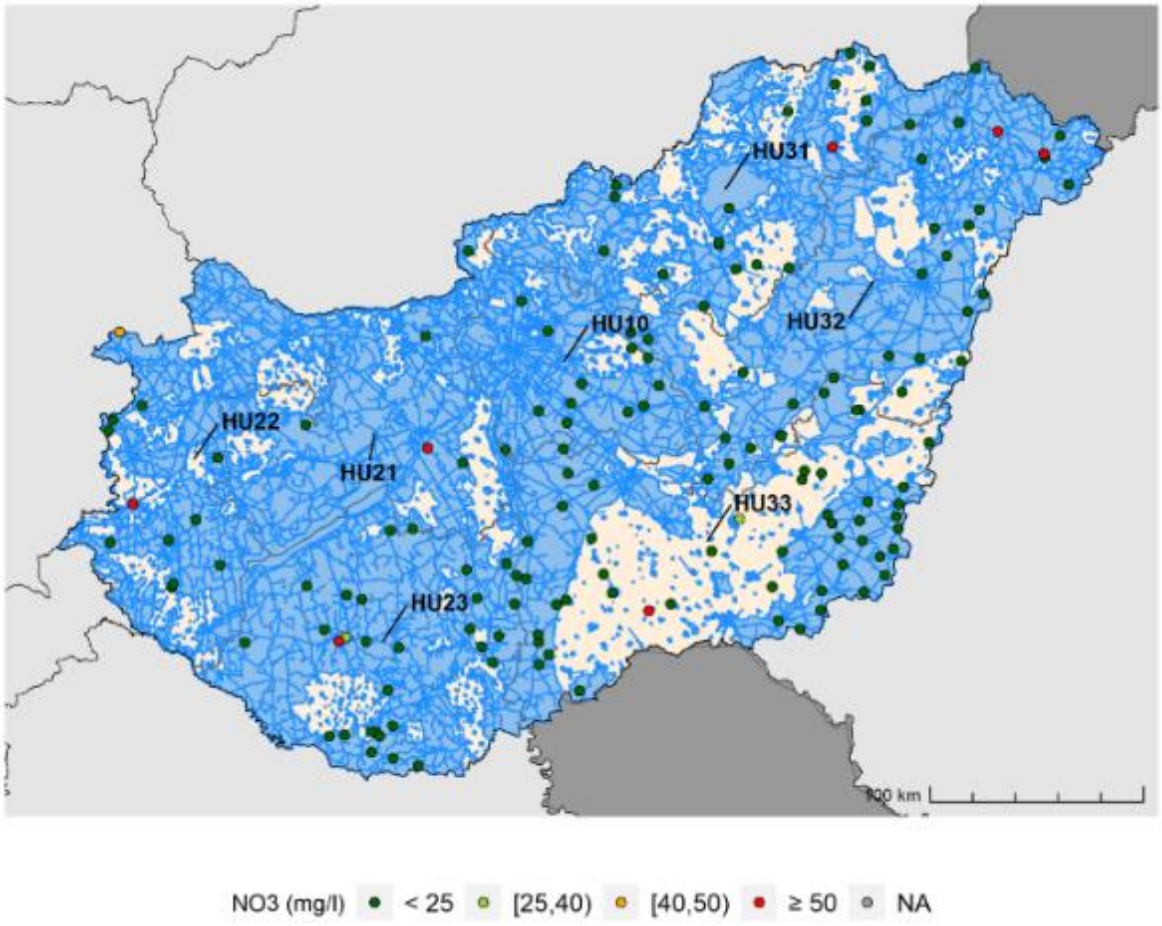


		>=40 and < 50 mg/l incr.trend		>=50 mg/l	
NUTS ID	NUTS NAME	InNVZ	OutNVZ	InNVZ	OutNVZ
HU10	Közép-Magyarország	2	0	14	1
HU21	Közép-Dunántúl	1	0	21	0
HU22	Nyugat-Dunántúl	5	0	23	0
HU23	Dél-Dunántúl	1	0	15	0
HU31	Észak-Magyarország	3	0	7	0
HU32	Észak-Alföld	2	0	18	0
HU33	Dél-Alföld	3	0	30	1
	Total	**17**	**0**	**128**	**2**

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 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	16	16	16
1a	Phreatic groundwater (deep) 5-15 m	13	13	12
1b	Phreatic groundwater (deep) 15-30 m	15	15	15
1c	Phreatic groundwater (deep) >30 m	1	1	1
2	Captive groundwater	117	117	115
3	Karstic groundwater	4	4	4
9	Not specified	0	0	0
	Total	**166**	**166**	**163**

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

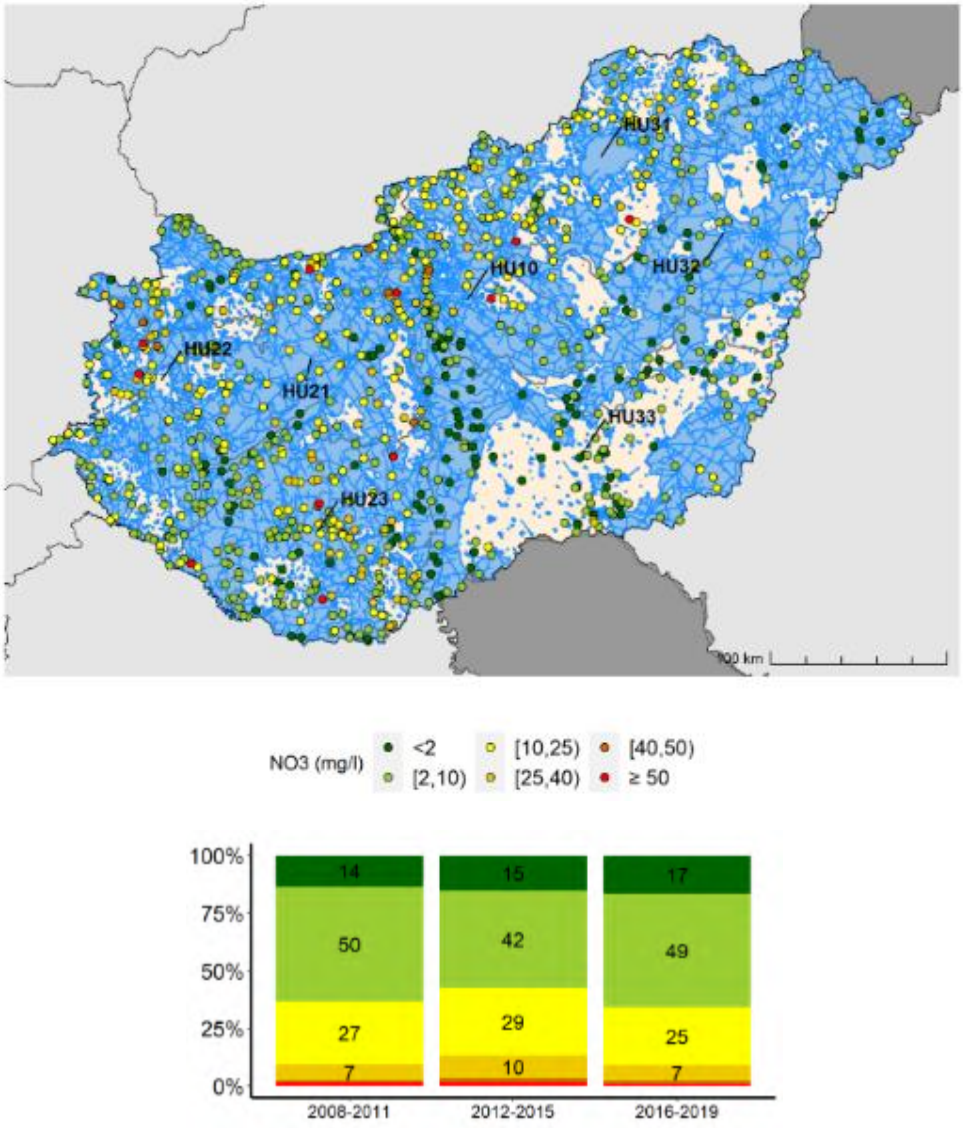


Figure 9. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ

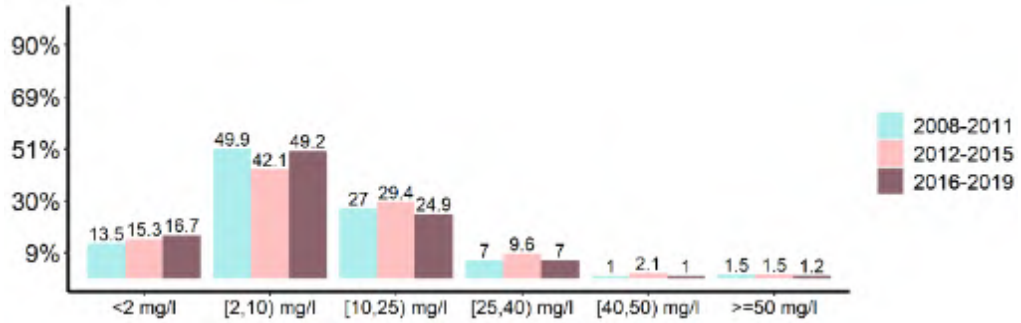


Figure 10. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Surface water average annual nitrate concentration trend

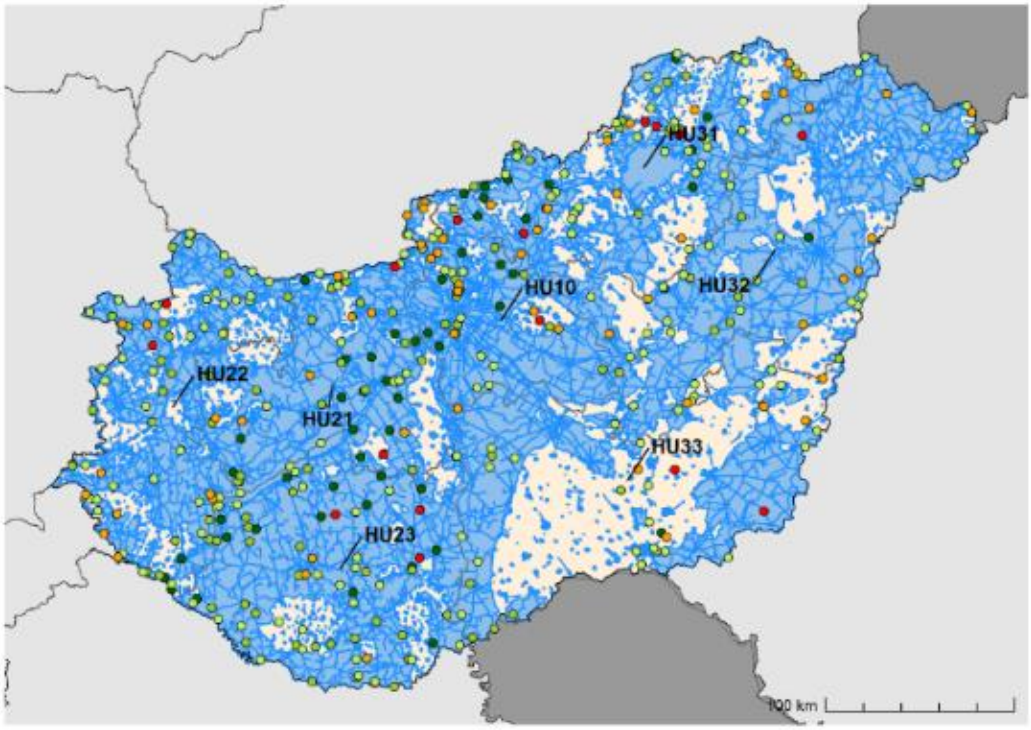


Figure 11. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ

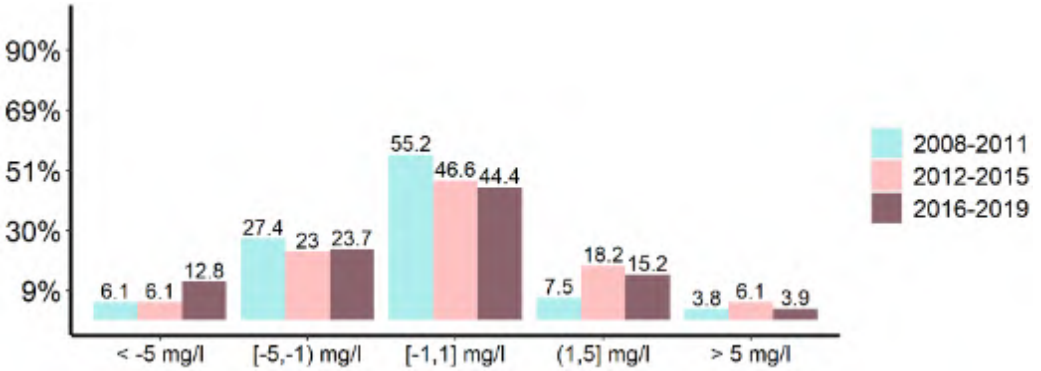


Figure 12. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Surface Water Eutrophication

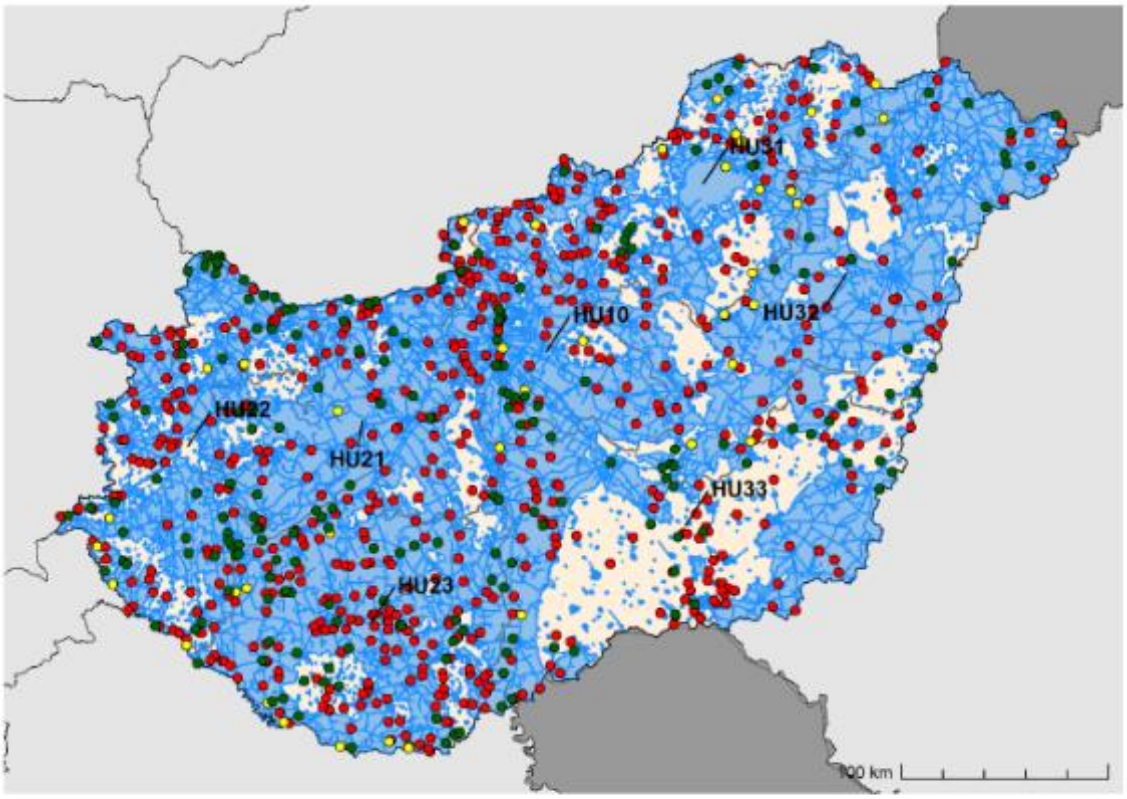


Figure 13. Spatial distribution of eutrophic status (map) and corresponding percentage of monitoring points per classes of status by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ

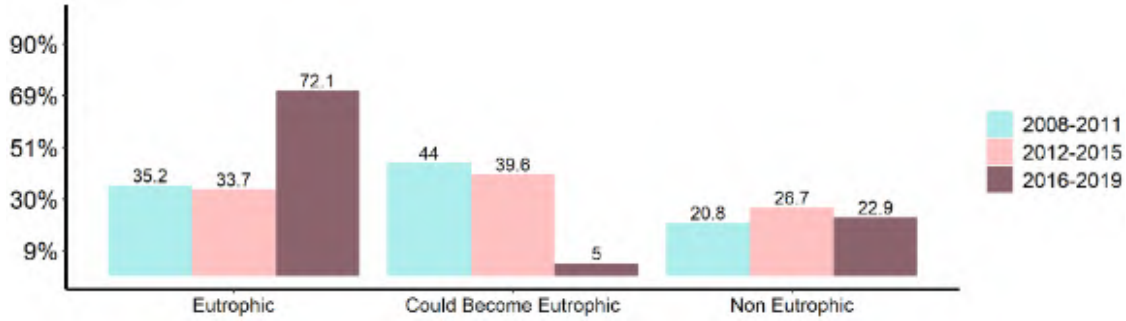
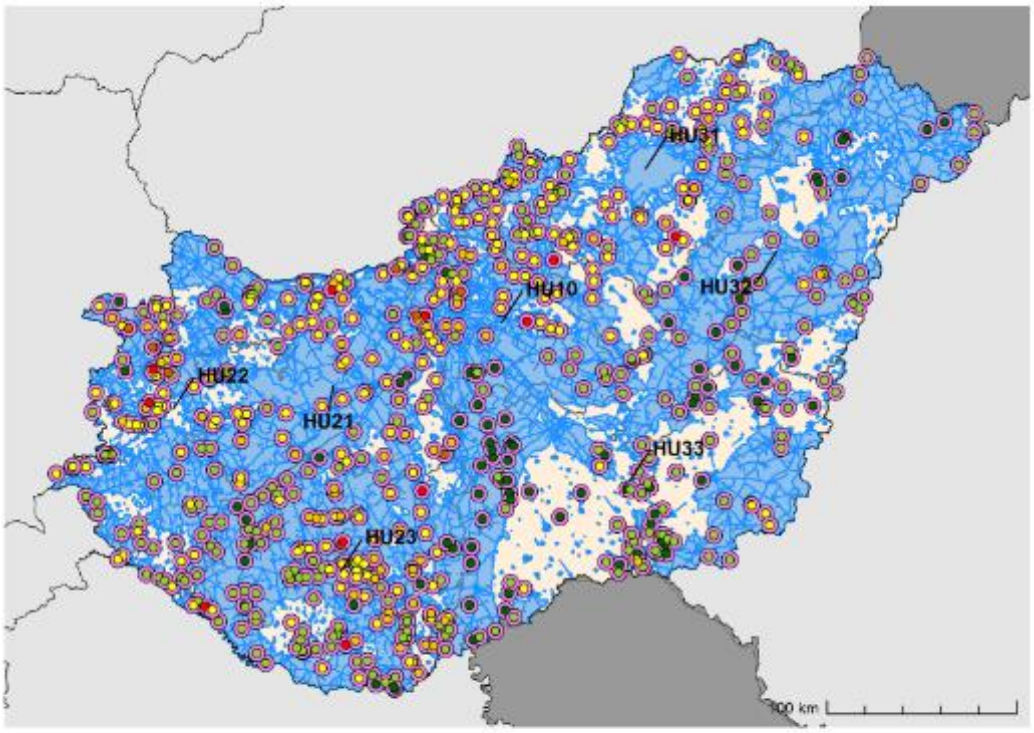


Figure 14. Comparison of percentage of monitoring points in the three reporting periods by classes of status (x axis)

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
HU10	Közép-Magyarország	66	4	23	25	10	2	2	0
HU21	Közép-Dunántúl	71	3	16	39	10	2	1	0
HU22	Nyugat-Dunántúl	103	4	47	35	11	4	2	0
HU23	Dél-Dunántúl	156	13	73	43	22	1	4	0
HU31	Észak-Magyarország	108	0	40	56	10	0	2	0
HU32	Észak-Alföld	62	19	35	7	1	0	0	0
HU33	Dél-Alföld	97	42	48	6	1	0	0	0
	Total	**663**	**85**	**282**	**211**	**65**	**9**	**11**	**0**

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

The analysis shows all the SW monitoring stations with the highest 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 assessment of eutrophication was carried out in accordance with the methodology of the integrated ecological status assessment under the Water Framework Directive, linking the ecological status assessment to the trophic categories given in Table 5 of Guide 23 “Guidelines on the assessment of eutrophication in the context of European water policies” (WFD CIS Guidance Document No. 23).

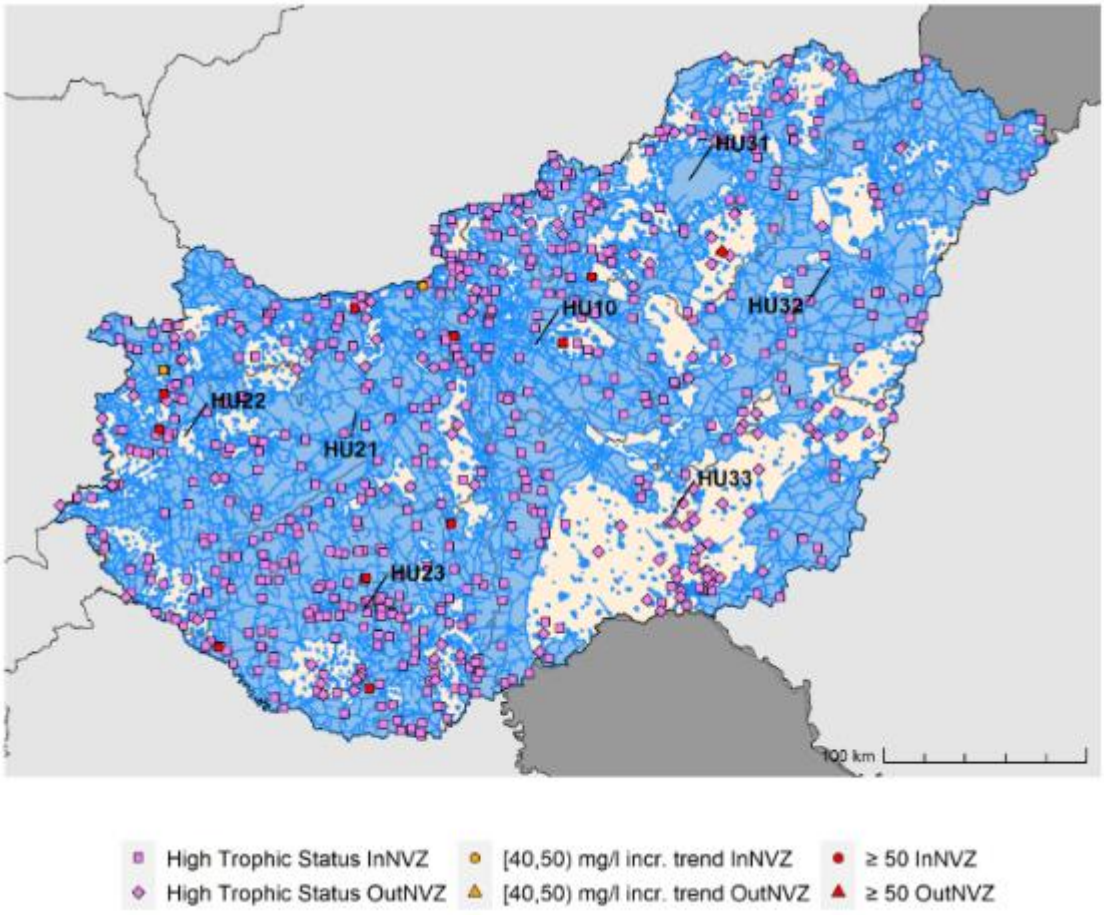
In the 2016 report, waters with a moderate status according to the WFD were classified in the potentially eutrophic category and were classified as eutrophic according to the new definition of the guidance (point 5.3.2 of the Nitrate Reporting Guidelines, Article 23 of the Common Implementation Strategy), unless there was no degree of eutrophic in the previous report.

When assessing trophic status according to the requirements of the Nitrate Reporting Guidelines, three quarters of the watercourses are eutrophic, mostly due to the application of the new classification system.

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	626	41	141
5	Lake/reservoir water	37	5	70
6	Transitional water	NA	NA	NA
7	Coastal water	NA	NA	NA
8	Marine water	NA	NA	NA
9	Not specified	0	0	0
	Total	**663**	**46**	**211**

Surface Water quality hotspot

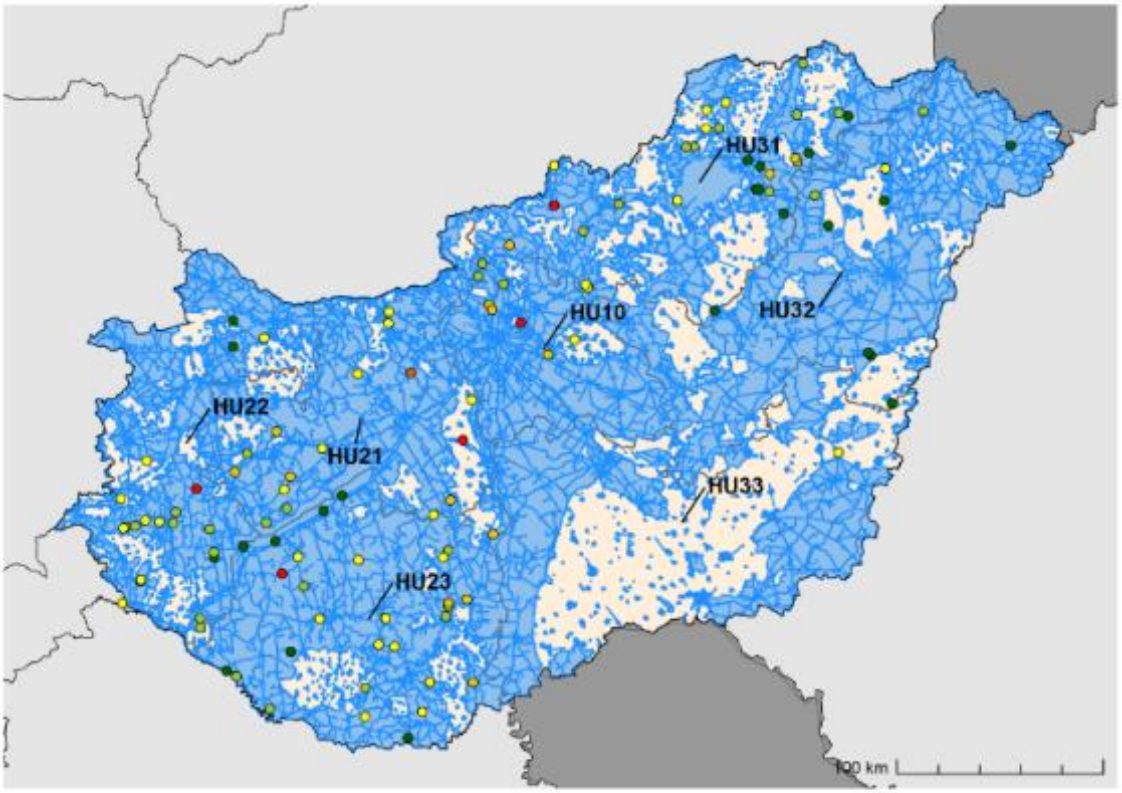


		High trophic status		>=40 and < 50 mg/l incr.trend		>=50 mg/l	
NUTS ID	NUTS NAME	InNVZ	OutNVZ	InNVZ	OutNVZ	InNVZ	OutNVZ
HU10	Közép-Magyarország	63	3	0	0	2	0
HU21	Közép-Dunántúl	58	13	1	0	1	0
HU22	Nyugat-Dunántúl	88	15	1	0	2	0
HU23	Dél-Dunántúl	145	11	0	0	4	0
HU31	Észak-Magyarország	85	23	0	0	1	1
HU32	Észak-Alföld	53	9	0	0	0	0
HU33	Dél-Alföld	58	39	0	0	0	0
	Total	**550**	**113**	**2**	**0**	**10**	**1**

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 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.

Surface Water Stations Removed



Station Type	Description	Number of removed stations			
		total removed	with measurements	with trends	with trophic status
4	River water	103	103	26	103
5	Lake/reservoir water	12	12	0	11
6	Transitional water	0	0	0	0
7	Coastal water	0	0	0	0
8	Marine water	0	0	0	0
9	Not specified	0	0	0	0
	Total	**115**	**115**	**26**	**114**

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, trends and trophic status per type.

Measures in the Action Programme

The Hungarian Action Programme was published for the first time in 2001 and was reviewed in 2017.

The main measures are summarized in the following table.

According to Directive 2016/2284 (National Emission Ceilings, NEC), Hungary is required to reduce ammonia emissions by 32 % by 2030. The Ministry of Agriculture funded a number of studies for the preliminary analysis of emission control measures on ammonia reduction. For the selected measures, the impact on farmers' income and production costs, and the impact on the national budget were analysed.

Table 6. Details of Action Programme

Measure	General details in Action Programme (*)
Period of prohibition of fertiliser application	• Fertilisation is prohibited from 31 October until 15 February. Top dressing of winter cereals is allowed from 1 February. No temporary manure stacks are allowed at land parcel edges during this period. Winter grazing is not allowed either unless annual N pressures remain below 120 kg/ha. (section 4(2) of the Decree)
	• Winter grazing is not allowed either unless annual N pressures remain below 120 kg/ha. (section 4(2) of the Decree)
Restrictions for application on sloped soils	• Fertiliser application in plantations with a slope above 15% is allowed only if anti-erosion safeguards are put in place. Slurry application in areas with gradients above 6% is allowed only with injection or sliding hose technique. (sections 4(4)-(7) of the Decree)
	• Slurry application on slopes below 12% is allowed only on the basis of soil protection plans. (sections 4(4)-(7) of the Decree)
	• The fertilisers must be immediately incorporated on slopes above 12%. Fertiliser application is not allowed on slopes above 17%. (sections 4(4)-(7) of the Decree)
	• No temporary manure stacks are allowed if the surface water is within 100 m or if the highest groundwater level is below 1.5 m. (sections 4(4)-(7) of the Decree)
Restrictions for application on soaked, frozen, or snow-covered soils	• Applying fertiliser or creating and maintaining temporary manure stacks on soaked, frozen or snow-covered soil are not permitted (section 4(8) of the Decree)
Restrictions for application near watercourses (buffer strips)	• At the time of fertiliser application, no nutrient is allowed to reach surface waters either directly or indirectly, i.e. via infiltration or erosion. For such purpose it is not allowed to apply: - fertilisers in the 2-m strip of the shoreline of surface waters; - livestock manure: a)in the 20-m strip of the shoreline of lakes; b)in the 5-m strip measured from other surface waters; the safety distance may be reduced to 3 m if the cultivated land parcel is not wider than 50 m and not larger than 1 ha; c) within a 25 m radius from any spring or any well used for the supply of drinking water for animals or human consumption (section 5(1) of the Decree)
Effluent storage works	• Not specified
Capacity of manure storage	• Insulated and leak-free manure storage vessels are necessary with the required technical specifications and a capacity to store manure for at least 6 months (sections 8(1)-(9) of the Decree)
Rational fertilisation (e.g., splitting fertilisation, limitations)	• The applied nutrient volume may not exceed the nutrient demand adjusted for crop yield levels under the actual site conditions, which must be reduced with the nutrient volume supplied by the soil. (section 6(1) of the Decree)
	• For intensive grazing, the livestock density may not exceed 15 LSUwhen the number of animals to be considered for livestock density at the livestock farm does not exceed 15 LU (section 6(8) of the Decree)
	• The period between fertiliser application and sowing may not be longer than 15 days. The applied volume of active substance may not exceed the volume required for autumn-winter growth (section 6(9) of the Decree)
Crop rotation, permanent crop enhancement	• Not specified
Vegetation cover in rainy periods, winter	• Not specified
Fertilisation plans, spreading records	• The permitted maximum nutrient volumes are shown by soil type and nutrient supply in Annex 3 (section 6(2) of the Decree)
	• The nutrient management plan should be drawn up on the basis of soil analyses (section 6(7) of the Decree)
Other measures	• On slopes above 2% the cultivation method must facilitate the input of precipitation into the soil. (section 4(9) of the Decree)
	• Creation of buffer strips in sites where fertilisation is prohibited (section 5(1)-(3) of the Decree)
Date for application limit of 170 kg N/ha/year:	• 03 April 2001

(*) Decree No. 59/2008. (IV. 29.) of the Ministry of Agriculture

Controls

The soil protection authority conducts checks on compliance with the rules of good agricultural practice on arable land, while the water protection authority is responsible for carrying out checks on livestock farms.

During the current reporting period, 6.4% of the livestock farms located in vulnerable zones were subjected to administrative checks, while 3% were subjected to on/site checks. Arable land control rates in vulnerable zones were 35% and 4.3% for administrative and on/site checks, respectively.

Based on the experience of the checks, nutrient management based on soil testing remains the biggest problem for farmers and non-compliance with the maximum levels in nutrient management was to a lesser extent.

Based on the experience of the on-the-spot checks, 0.58 % of the animal holdings checked did not comply with the legal requirements in force, which shows a significant improvement compared to the previous cycle.

Designation of NVZ

Following the second report on the implementation of the Nitrates Directive of 2012, covering the period 2008-2011, Hungary has revised the nitrate vulnerable zones. The area increased by 23.1 % (representing about 70 % of the country's territory).

Forecast of Water Quality

Nitrogen emission tests were carried out for the periods 2016 to 2018 and 2025 to 2027. The MONERIS model, adapted to national conditions, was used for the forecast. The analysis is based on a simple linear extrapolation (with a conservative approach, implying a more moderate change) in terms of population, point emissions and land use. In the case of nitrogen, changes in nutrient balances are uncertain and cannot be predicted with certainty based on recent trends.

Due to the future evolution of the loads, a model calculation that uses the lower balances was carried out. The results show that low nutrient balances will significantly reduce the nitrogen load of agricultural origin. The time-scale may vary greatly from one water body to another, but at least few decades are necessary, as groundwater may have a residence time of up to hundreds of years.

Summary

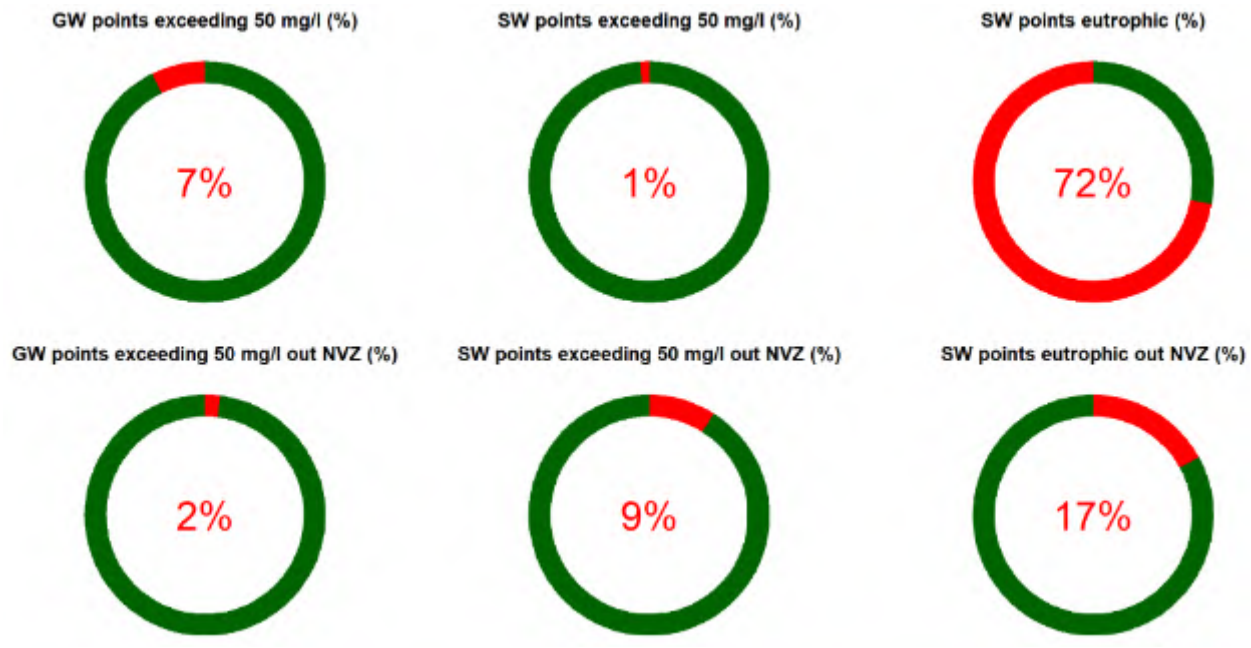


Figure 18. The summary plot for the period 2016-2019

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/l, and the percentage of SW eutrophic stations that are outside NVZ with respect to the total that are eutrophic.

Long term analysis

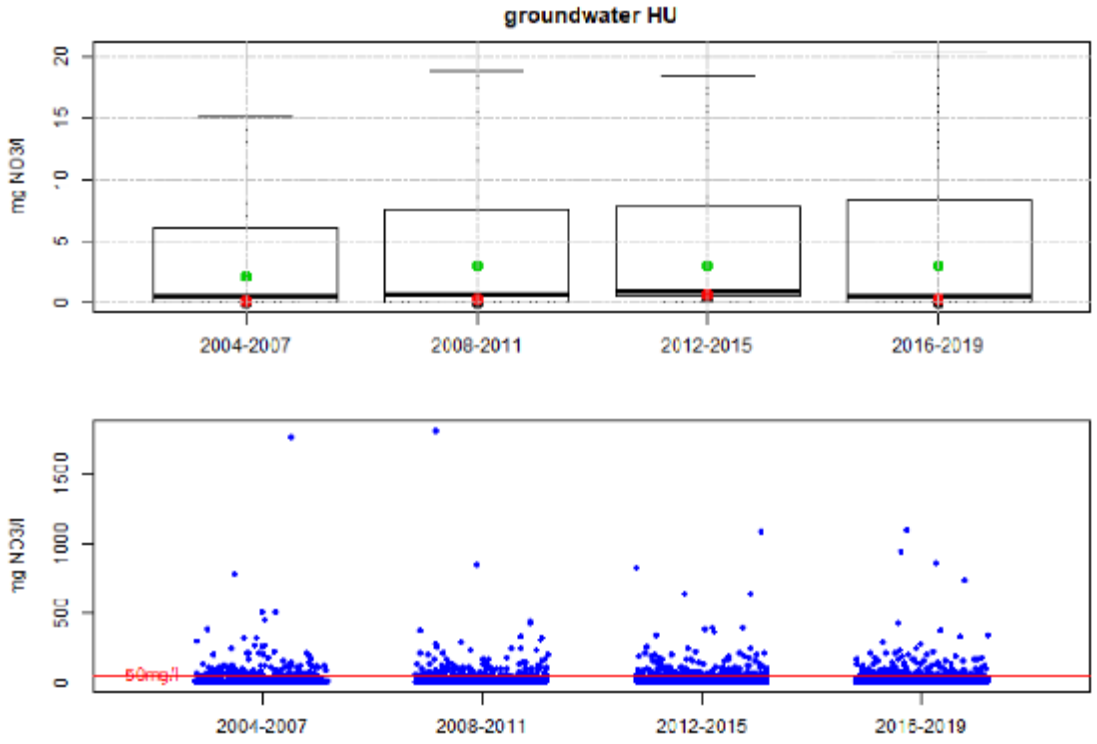


Figure 19. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period for groundwater stations. RPs represent the reporting periods, RP7 being the last period (2016-2019). The blue, red, green and black dots represent the mean of the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

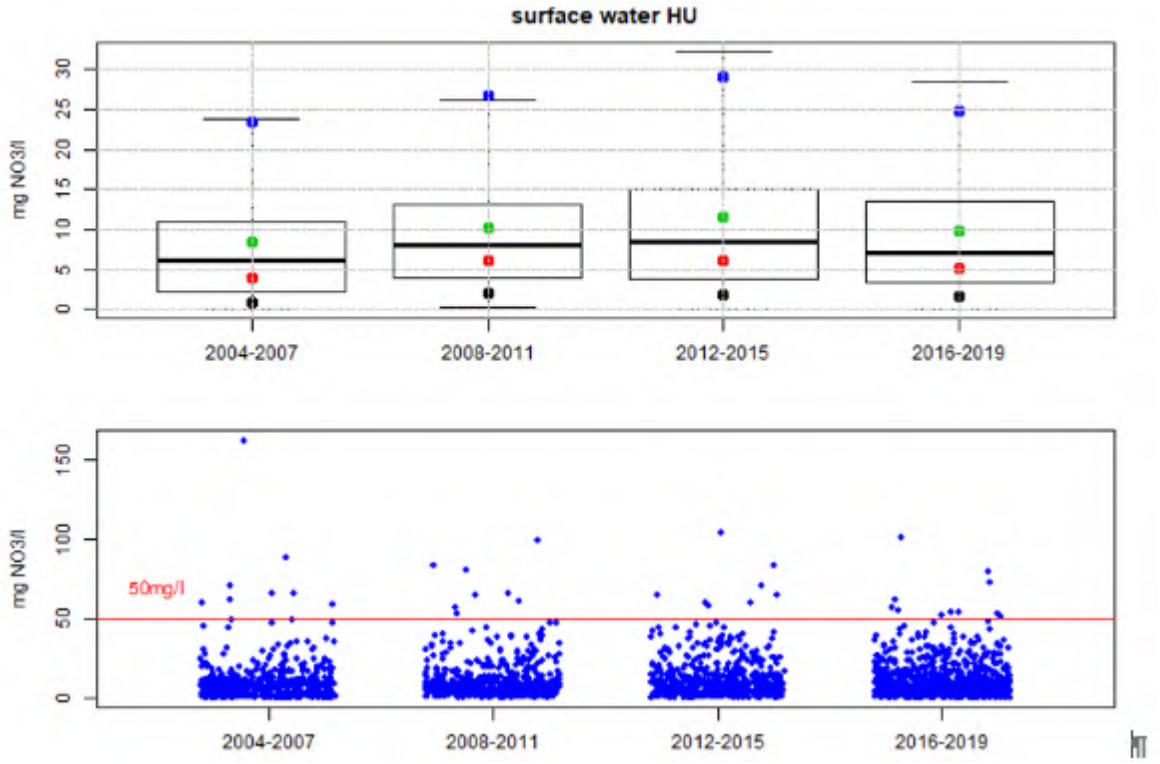


Figure 20. Time series of box whisker plots along with the distribution of the of the average NO3 annual concentrations for surface water stations. RPs represent the reporting periods, RP7 being the last period (2016-2019). The blue, red, green and black dots represent the mean of the fourth third, second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

Conclusions and recommendations

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

There is a well-elaborated network of monitoring stations. The groundwater quality is generally good. However, there are some hotspots, with a nitrate concentration > 50 mg/l. A very high number of surface waters our found to be eutrophic

A number of surface waters found to be eutrophic are located outside the NVZ.

A revised action programme was published in 2019.

The Commission recommends Hungary to review the designation of NVZ and include areas that drain into waters that are eutrophic when agriculture pressure is significant.