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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

Slovenia's utilized agricultural area amounts to 0.48 Mha, representing 24% of the total land area and has remained stable since 2007. The major outputs of the agricultural industry excluding services and secondary activities include in a decreasing order forage (14.7%), milk (13.1%) and wine (13.1%).

Eurostat

Major land use statistics for Slovenia

Table 1.Utilized agricultural area (abbreviated as UAA)

Slovenia	2005	2007	2010	2013	2016
Utilised agricultural area UAA (1000 ha)	NA	498	483	479	478
arable land (1000 ha)	NA	175	170	174	174
permanent grass (1000 ha)	NA	297	286	277	276
permanent crops (1000 ha)	NA	26	27	27	28
kitchen gardens (1000 ha)	NA	NA	NA	NA	NA

Note:
Eurostat (FSS)

From 2007 the structure of agricultural land use in Slovenia is quite stable. Permanent grass (grassland) covers 58% of utilized agricultural area.

Animal distribution in Slovenia

The livestock density index (livestock unit per hectare of Utilized Agricultural Area) has remained stable and is higher than the EU average of 0.8. Poultry production increased by 28 %

Table 2. Livestock statistics

Slovenia	2005	2007	2010	2013	2016
Livestock index	1.08	1.13	1.07	1.00	1.05
dairy cows (10^6 heads)	0.12	0.12	0.11	0.11	0.11
live bovines (10^6 heads)	0.45	0.48	0.47	0.46	0.49
live pigs (10^6 heads)	0.55	0.54	0.40	0.29	0.27
live poultry (10^6 heads)	NA	NA	4.90	4.86	6.22

Note:
Eurostat (FSS)

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

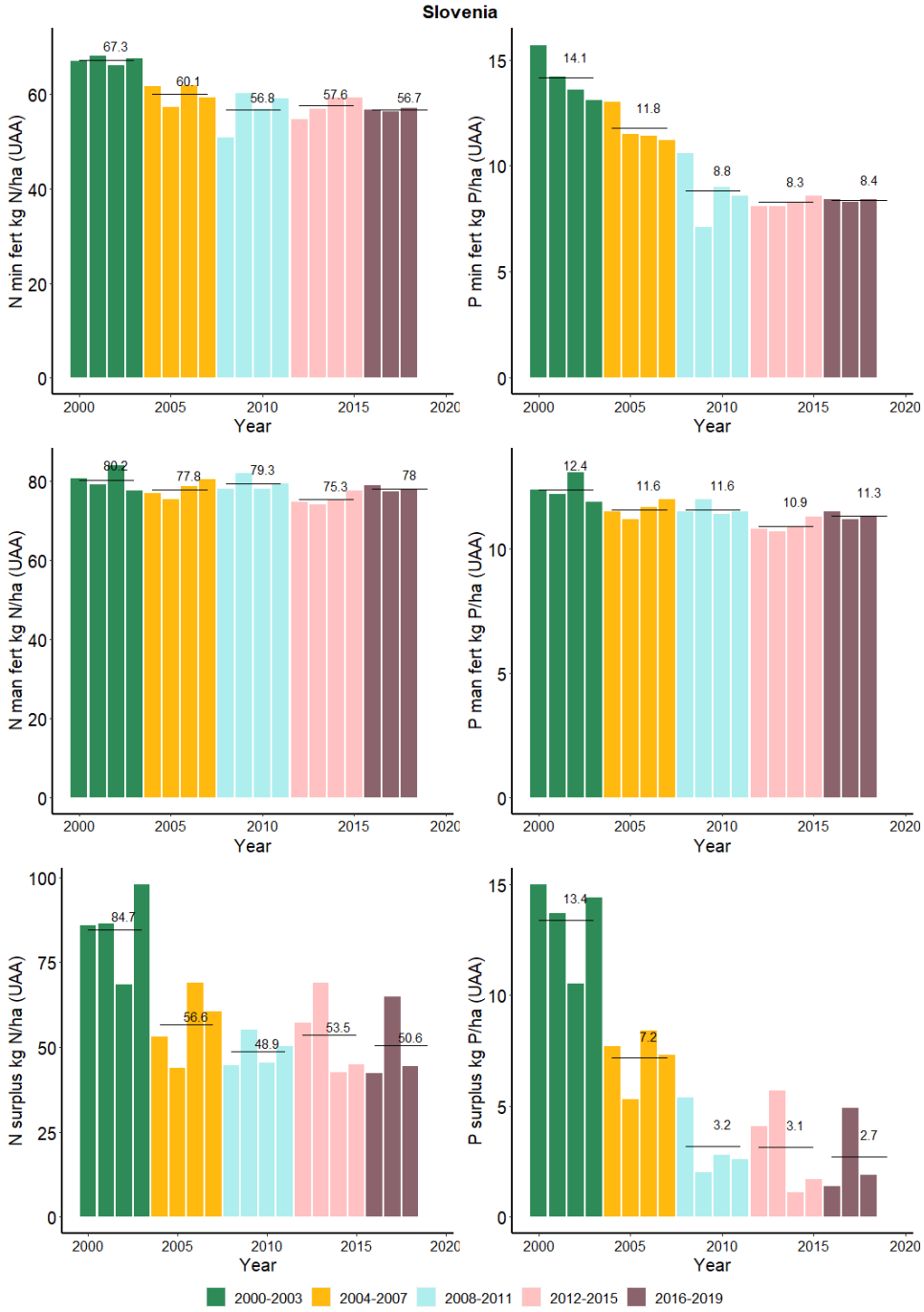


Figure 1. N and P fertilizers and gross surplus (kg/ha)

The N and P fertilizers and gross surplus are originated from EUROSTAT data for the years 2000-2017 while data for year 2018 have been retrieved from the Statistical Office of the Republic of Slovenia because of correspondence, for the previous years, with Eurostat statistics. Manure and inorganic fertilisers use remained stable for the last reporting period. The gross surplus decreased by 6% and 13% for N and P, respectively.

Livestock unit - LSU /ha

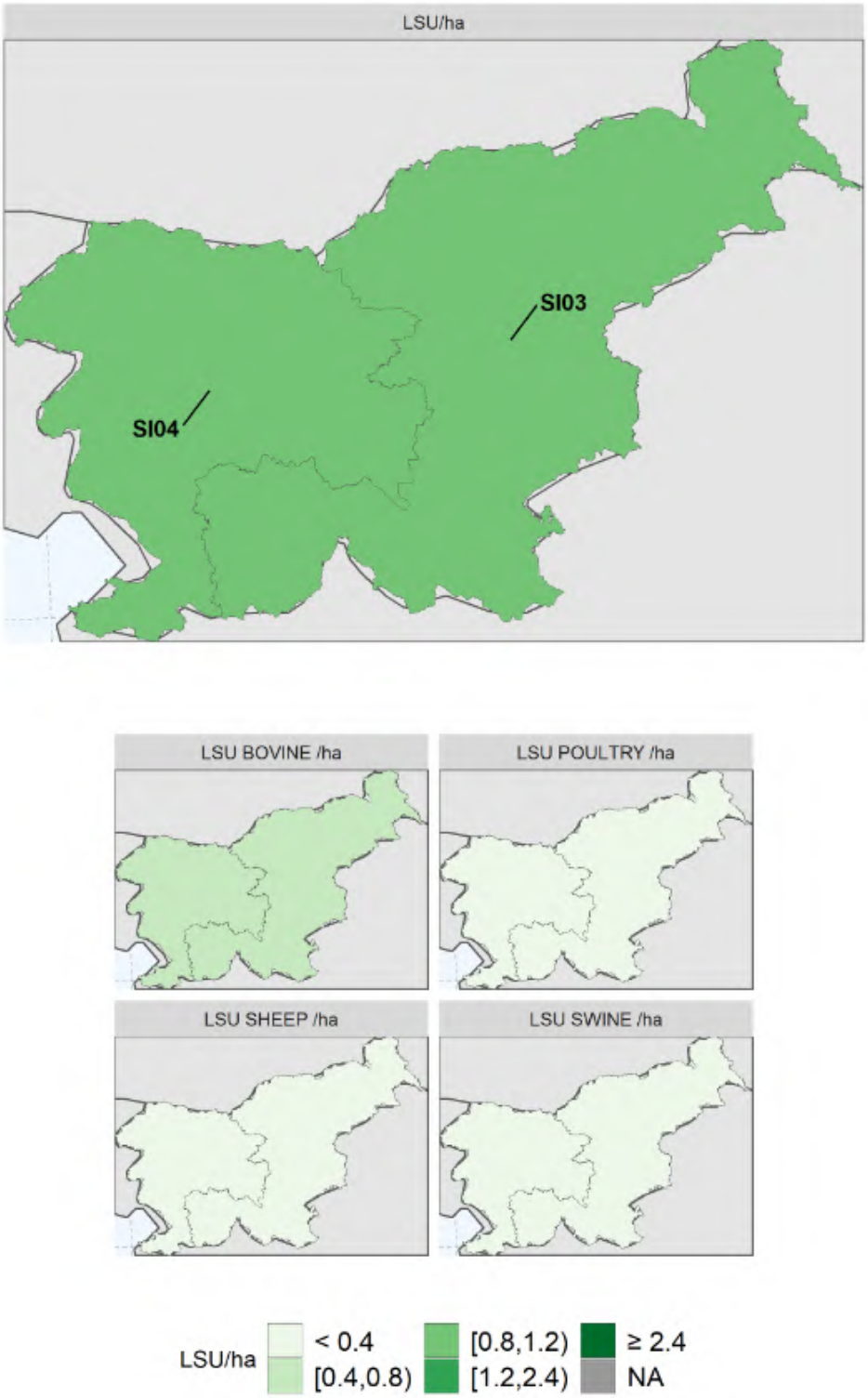


Figure 2. Map of livestock unit distribution, year 2016 (Source: Eurostat, February 2021)

Animal production from bovine is dominant respect to other animals 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

Water quality assessments are made on the basis of regulations aligned with the requirements of the Water Framework Directive and the Groundwater Directive. The monitoring programme has been drawn by the Slovenian Environment Agency (ARSO). Water quality monitoring programmes, which Slovenia has had in place for decades, were aligned with the requirements of the Water Framework Directive in 2006. Measurements for groundwater stations take place once to twice per year. For surface water measurement frequency usually ranges between 2 to 12 times per year for rivers and 4 to 12 for lakes. Marine and coastal waters are sampled 12 times per 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	22	19	18	22	16	18
1a	Phreatic groundwater (deep) 5-15 m	20	44	45	20	21	43
1b	Phreatic groundwater (deep) 15-30 m	14	31	33	14	13	28
1c	Phreatic groundwater (deep) >30 m	1	22	23	1	1	22
2	Captive groundwater	3	7	13	3	3	7
3	Karstic groundwater	44	75	79	44	44	74
9	Not specified	0	0	0	0	0	0
	Total	**104**	**198**	**211**	**104**	**98**	**192**

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	128	125	143	98	105	124	120	81	110
5	Lake/reservoir water	11	11	11	11	11	11	11	11	11
6	Transitional water	0	0	0	0	0	0	0	0	0
7	Coastal water	4	4	4	4	4	4	3	3	3
8	Marine water	1	1	1	1	1	1	0	0	0
9	Not specified	0	0	0	0	0	0	0	0	0
	Total	**144**	**141**	**159**	**114**	**121**	**140**	**134**	**95**	**124**

Groundwater Quality

Groundwater average annual nitrate concentration

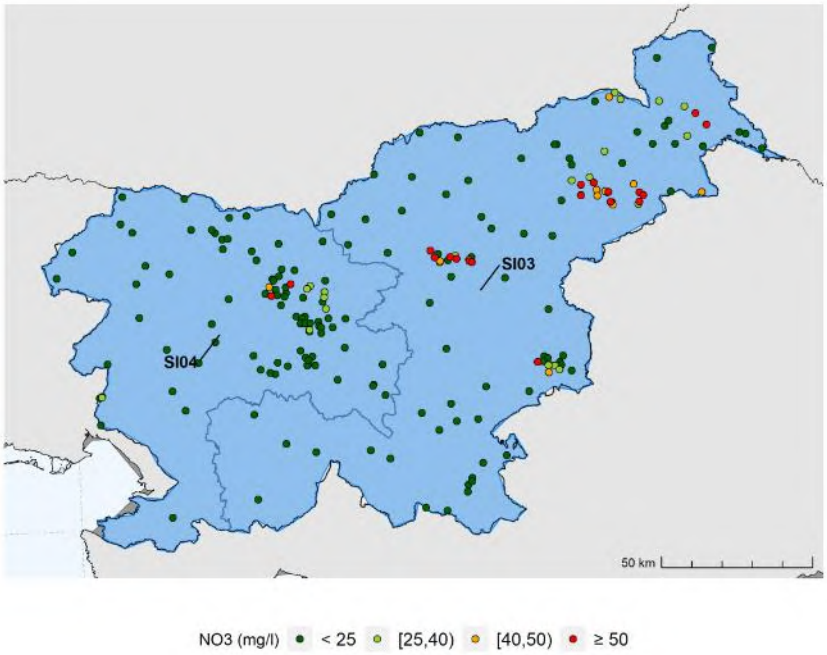


Figure 3. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis).

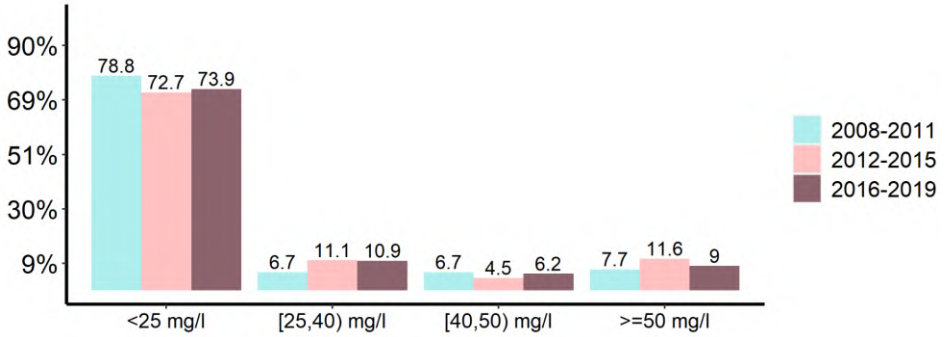
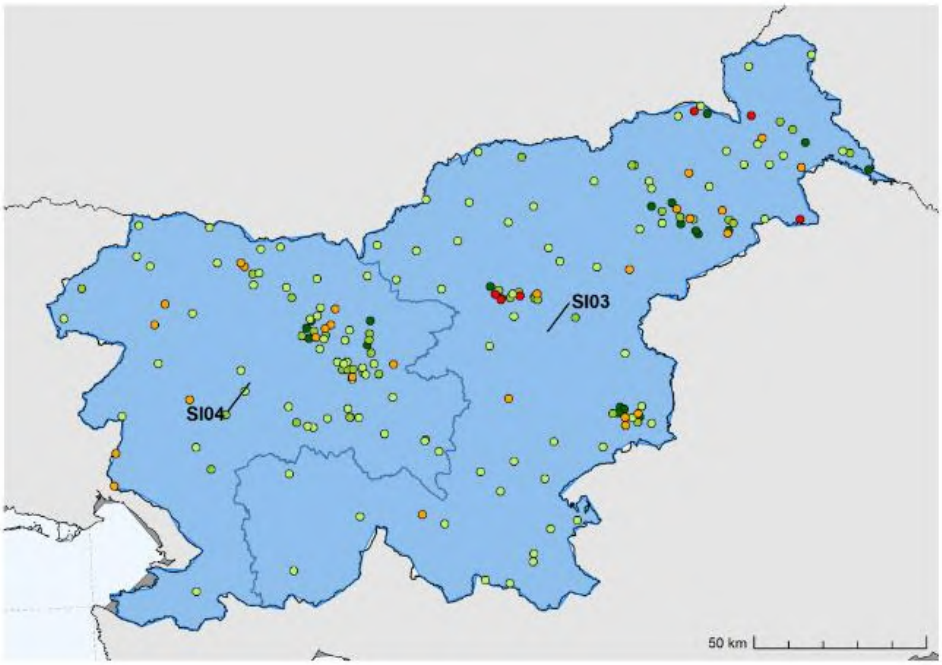


Figure 4. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Groundwater average annual nitrate concentration trend



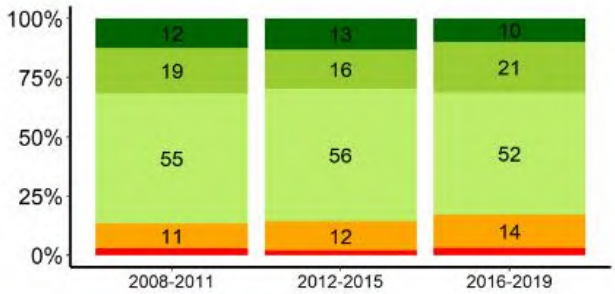


Figure 5. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

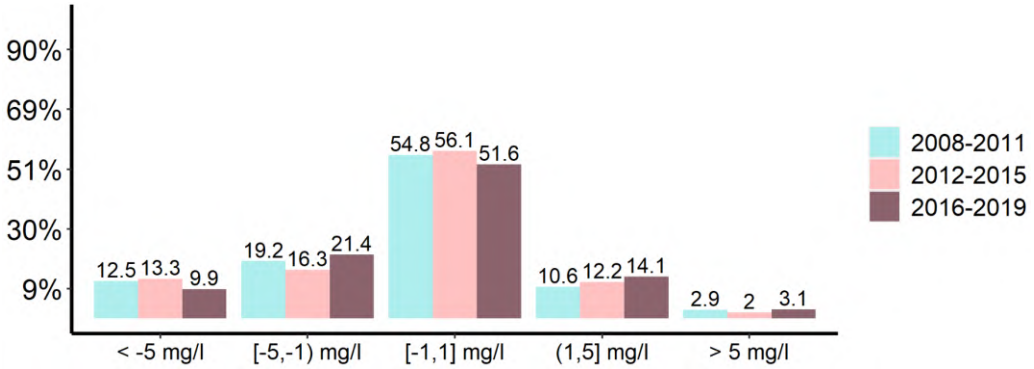
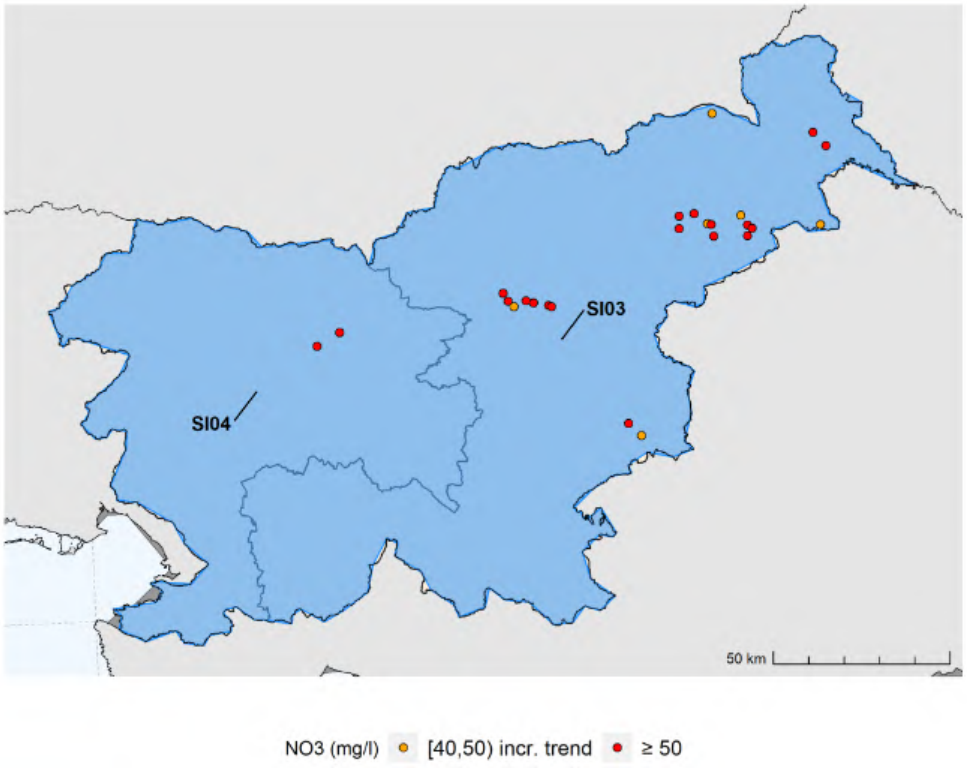


Figure 6. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Groundwater hotspot

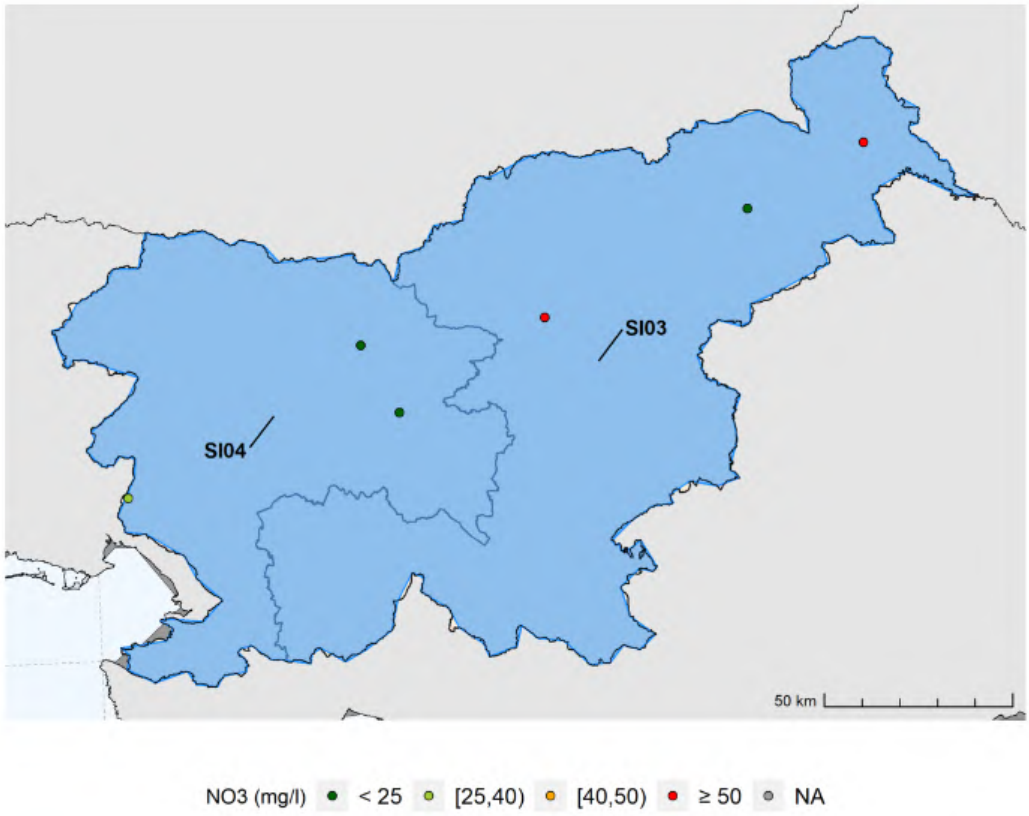


NUTS ID	NUTS NAME	>=40 and < 50 mg/l incr.trend	>=50 mg/l
SI03	Vzhodna Slovenija	6	17
SI04	Zahodna Slovenija	0	2
	Total	**6**	**19**

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	1	1	1
1a	Phreatic groundwater (deep) 5-15 m	1	1	0
1b	Phreatic groundwater (deep) 15-30 m	3	3	2
1c	Phreatic groundwater (deep) >30 m	0	0	0
2	Captive groundwater	0	0	0
3	Karstic groundwater	1	1	1
9	Not specified	0	0	0
	Total	**6**	**6**	**4**

Figure 8. GW removed stations map (top graph) and 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

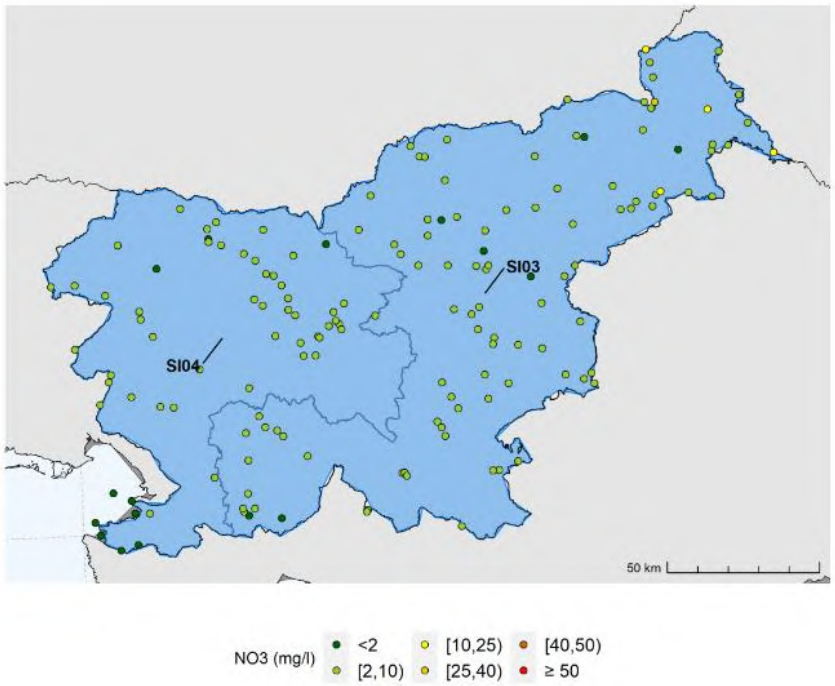


Figure 9. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

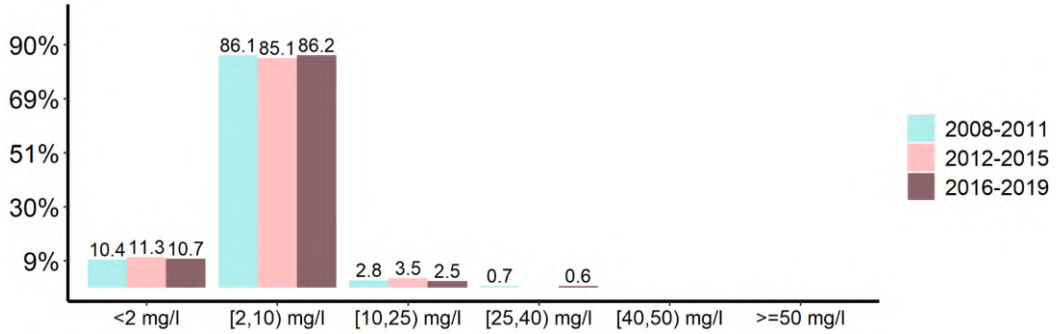


Figure 10. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Surface water average annual nitrate concentration trend

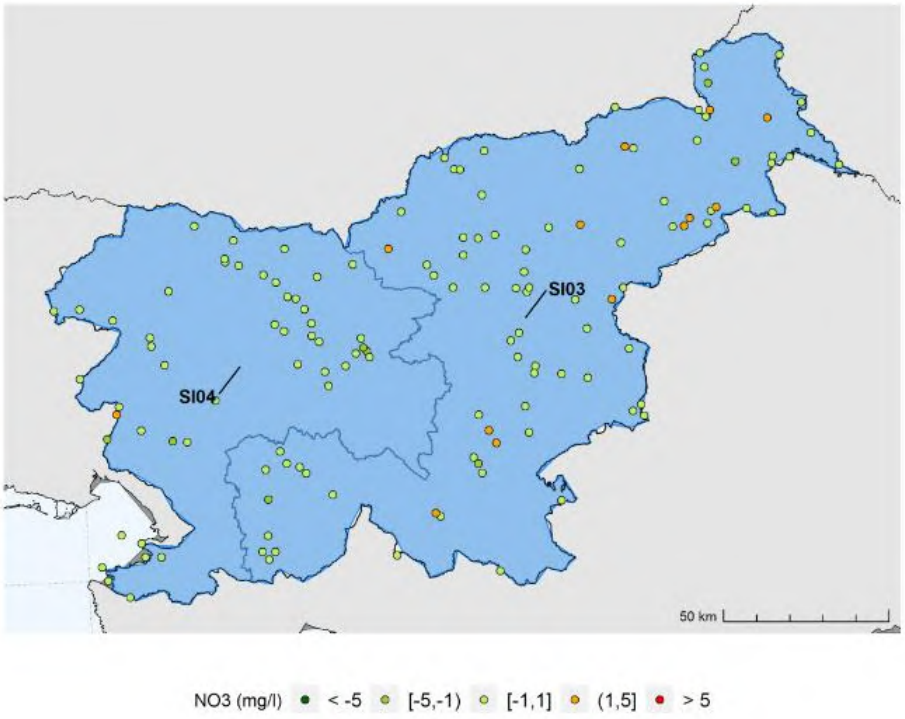


Figure 11. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

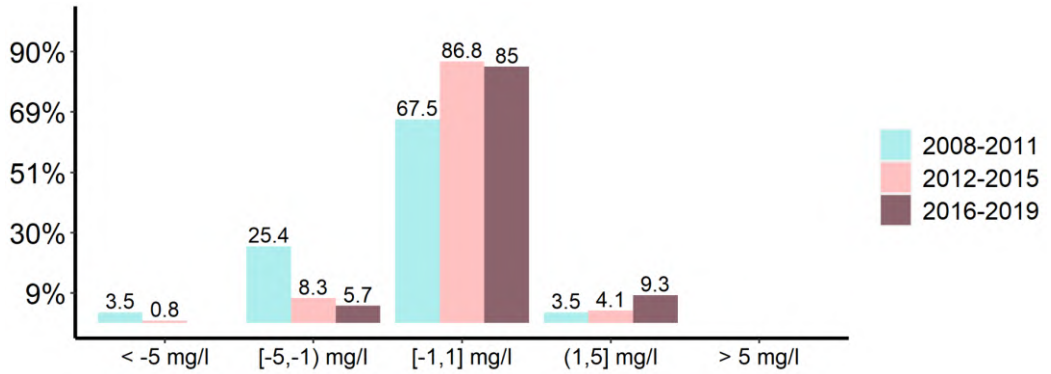
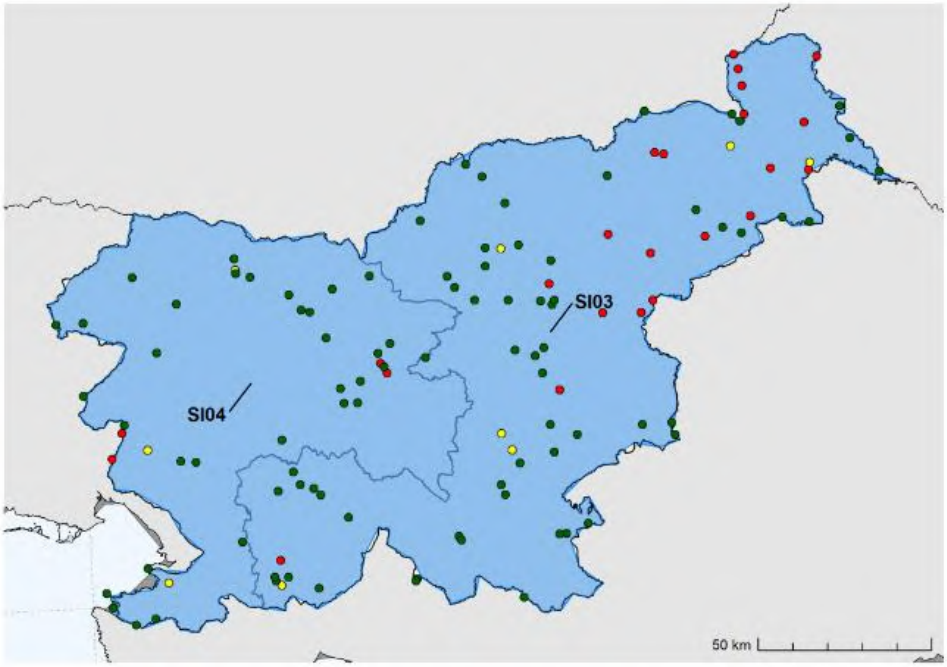


Figure 12. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Surface Water Eutrophication



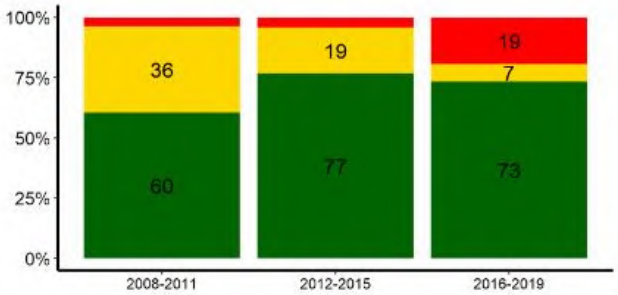


Figure 13. Spatial distribution of eutrophic status (map) and corresponding percentage of monitoring points per classes of status by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

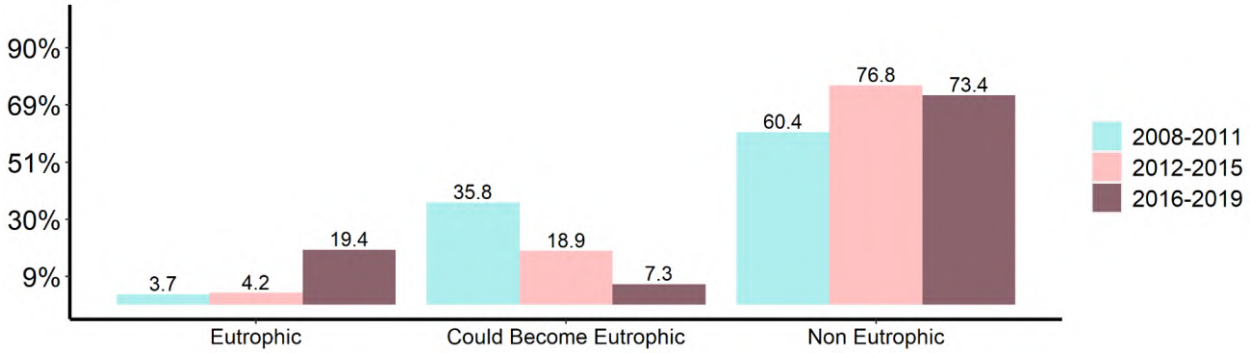
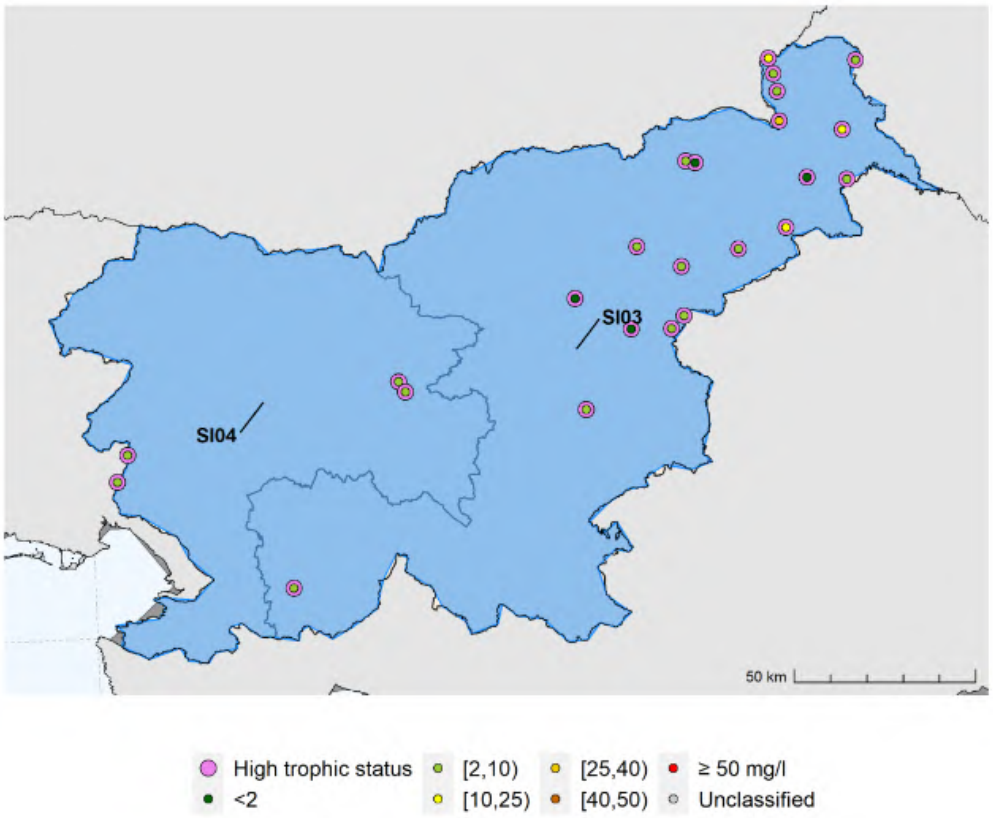


Figure 14. Comparison of percentage of monitoring points in the three reporting periods by classes of status (x axis)

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
SI03	Vzhodna Slovenija	20	4	12	3	1	0	0	0
SI04	Zahodna Slovenija	4	0	4	0	0	0	0	0
	Total	**24**	**4**	**16**	**3**	**1**	**0**	**0**	**0**

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

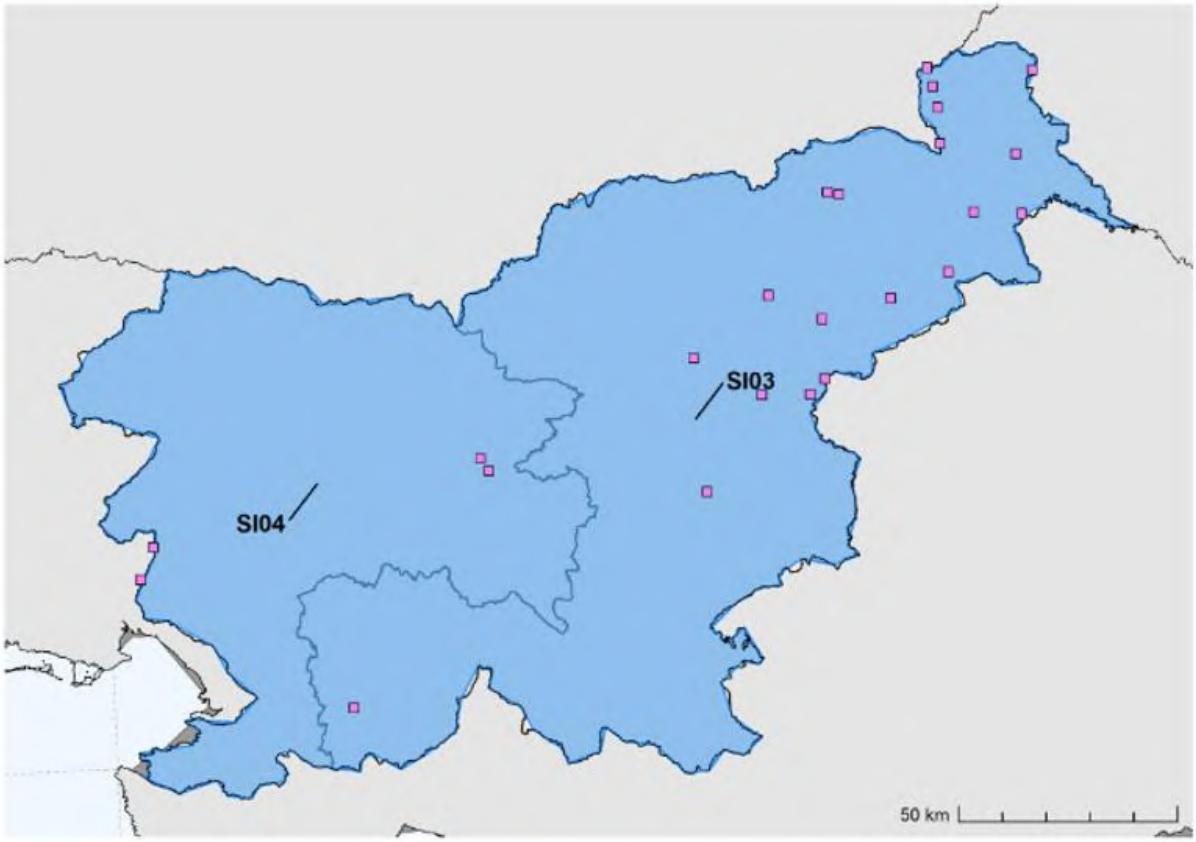
The analysis shows all the SW monitoring stations with the higher trophic status and the corresponding value of NO3 concentration. The map shows the spatial distribution of these points, and the table reports the number of stations with measurements with highest trophic status and the corresponding stations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

The assessment of the eutrophication of rivers derives from the evaluation of the ecological status, on the basis of the biological quality element of phytobenthos and macrophytes, and the concentrations of nitrate and total phosphorus. This assessment is performed as part of Slovenia's obligations under the Water Framework Directive. Each parameter is given a score based on a type specific reference condition. The final assessment of eutrophication in rivers is based on the worst scoring element.
The trophic status of lakes is in line with the requirements of the Water Framework Directive. The trophic status of lakes is based on the biological element phytoplankton and the concentration of total phosphorus.
The evaluation of trophic status of coastal waters is based on the phytoplankton biomass and on the concentration of nutrients including nitrate, total phosphorus and orthophosphate. The final assessment of eutrophication in coastal waters is based on the worst scoring element.
Most of rivers in Slovenia are non-eutrophic, while the majority of lakes are eutrophic or could become eutrophic. All monitored coastal waters are non-eutrophic.

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	19	5	86
5	Lake/reservoir water	5	4	2
6	Transitional water	0	0	0
7	Coastal water	0	0	3
8	Marine water	0	0	0
9	Not specified	0	0	0
	Total	**24**	**9**	**91**

Surface Water quality hotspot



High Trophic Status [40,50) mg/l incr. trend ≥ 50 mg/l

NUTS ID	NUTS NAME	High trophic status	>=40 and < 50 mg/l incr.trend	>=50 mg/l
SI03	Vzhodna Slovenija	20	0	0
SI04	Zahodna Slovenija	4	0	0
	Total	**24**	**0**	**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.

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.

Measures in the Action Programme

The Action Programme (AP) was published for the first time on 15/04/2008 and was revised in 2009, 2013, 2015 and recently in 2017. The deadline for imposing a limit of 170 kg/ha of nitrogen from livestock manure was 01/01/2003. The AP remains valid and unchanged from the previous report for 2012–2015, except for these amendments: i) definition of winter crops, ii) the preparation of land for sowing of spring cereals, grasses and grass-clover mixtures, or spring fertilisation of winter crops and sowed grassland, iii) a prohibition was imposed on fertiliser application using compost or digestate on agricultural land from 1 December to 15 February if such fertiliser comprises more than 20 per cent dry matter, iv) the prohibitions and requirements do not apply in cases involving research commissioned for the implementation of the Decree by the ministry responsible for the environment or the ministry responsible for agriculture, v) the form for providing and receiving livestock manure, digestate or compost.

Additional measures are taken under the Rural Development Programme of the Republic of Slovenia 2014–2020 and include 19 operations that involve obligatory and optional requirements. In the 2016–2019 period no new study of cost-effectiveness was conducted.

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Table 6. Details of the Action Programme

Measure	General details in Action Programme (*)
Period of prohibition of fertiliser application	• Fertilization of agricultural land using liquid organic fertilisers is prohibited between 15 November and 1 March. Exception exceptions concerning the fertilisation of agricultural land with liquid organic fertilisers are listed in paragraphs of Article 8 of the Decree.
	• The fertilisation of agricultural land with solid manure, compost or digestate, where the latter contains more than 20% of dry matter is prohibited from 1 December to 15 February.
	• The fertilisation with mineral fertilisers containing nitrogen is prohibited from 15 October to 1 March. The fertilisation of winter cereals with mineral fertilisers containing nitrogen is prohibited from 1 December to 15 February.
Restrictions for application on sloped soils	• On steeply sloping land that incline towards surface waters, the doses of organic and mineral fertilisers that contain nitrogen shall be divided into several parts so that one-time dose of applied nitrogen does not exceed 80 kg/ha. In In addition, one of the following measures must be ensured: the field must be bounded by transverse green zones, or there must be a belt of land at least 15 m wide, with green cover or containing other agricultural crops, or the field must be worked transversely to the slope, or the field must have green cover throughout the winter (Article 10 of the Decree).
Restrictions for application on soaked, frozen, or snow-covered soils	• Fertilisation using slurry, organic manure and mineral fertilisers shall be prohibited on flooded soil, water-saturated soil, snow-covered soil and frozen soil (Article 10 of the Decree).
Restrictions for application near watercourses (buffer strips)	• Application of fertilisers is prohibited near watercourses at a distance 15 meters from the boundary of the bank of the watercourse of the 1st order and 5 meters from the boundary of the bank of the watercourse of the 2nd order.
	• If no water protection regime is stipulated for the area surrounding a facility for the capture of drinking water that is part of the public drinking water supply system, the application of liquid organic fertilisers into/onto the soil and the ploughing of permanent grassland is prohibited within 100 m of the facility until water protection regimes are adopted (Article 11 of the Decree).
Effluent storage works	• Livestock manure and biogas slurry (even if such slurry does not contain livestock manure) is stored in reservoirs for liquid manure, in cesspits or in other storage facilities for livestock manure.
	• Storage facilities for livestock manure shall be located, constructed and managed so that no uncontrolled discharge and pollution of water or land occurs. They shall be watertight, stable and resistant to mechanical, heat or chemical damage.
	• Storage facilities for livestock manure shall be regularly maintained. In the event of damage, the livestock manure or biogas slurry shall be quickly and safely used or stored elsewhere in a manner that prevents the pollution of water or land.
	• Conduits and pipelines connecting stalls with storage facilities for livestock manure or connecting storage facilities for livestock manure shall be watertight, stable and resistant to mechanical, heat or chemical damage. The conduits and pipelines shall be regularly maintained. The use of a conduit or pipeline to remove liquid organic fertilisers is not permitted if the conduit or pipeline is damaged (Article 12 of the Decree).
Capacity of manure storage	• The capacity of storage facilities for livestock manure shall be adjusted to the number and species of animals on an agricultural holding and shall provide sufficient capacity for at least six months' storage.
	• The minimum necessary capacity levels for livestock manure storage facilities are set out in Table 3 of Annex 1 of the Decree.
	• A storage facility for liquid manure or slurry shall not be required if, due to special methods of rearing and of storing manure with litter, slurry or liquid manure are not produced (Article 12 of the Decree).
Rational fertilisation (e.g., splitting fertilisation, limitations)	• Fertiliser must be used in accordance with the plants' nutrient requirements. These requirements shall be determined on the basis of the expected crops, soil types, ground conditions, climatic conditions, use of land and other conditions of cultivation.
	• Limit value for the input of nitrogen into the soil per single unit of agricultural land use in the course of the fertilisation of individual species of agricultural plants may not exceed the limit values given in Table 4 of Annex 1 of the Decree.
	• The annual application of nitrogen from organic fertilisers per single unit of agricultural land use may not exceed 250 kg N/ha (Article 13 of the Decree)
Crop rotation, permanent crop enhancement	• The provisions are part of chapter 5.1.3.1 related to Measures agri-environment-climate payments from the Rural Development Program of the Republic of Slovenia for the period 2014- 2020 and its implementation in the period 2016-2019.
Vegetation cover in rainy periods, winter	• Vegetation cover in rainy periods and in winter is part of additional measures within the Rural Development Program of the Republic of Slovenia for the period 2014-2020, namely in agri-environment measures, which includes 19 operations with mandatory and optional requirements.
Fertilisation plans, spreading records	• An agricultural holding on which the annual application of nitrogen from livestock manure exceeds 350 kg N/year and which at the same time exceeds the annual load of 140 kg N/ha of agricultural land in use from livestock manure must keep data on the use of livestock manure in written form. This data must contain a list of the units of agricultural land use that are fertilized using livestock manure, and the quantity, time and type of manure used.
Other measures	• Not specified
Date for application limit of 170 kg N/ha/year:	• 1 January 2003

Controls

Annual administrative controls on the implementation of the Action Programme measures carried by the Inspectorate of the Republic of Slovenia for Agriculture, Forestry, Hunting and Fisheries concerned about 11.4% of the farmers. Additional controls are also performed under the frame of Cross-Compliance. Several problems were detected in implementing the Action Programme including the non-sufficient supervision in extensive protected zones in which the application of fertilisers is not permitted, the incomplete fertilisation plans with regard to the needs of specific cultures, as well as the time prohibitions on the use of liquid organic fertiliser in the event of adverse weather condition.

Designation of NVZ

Slovenia has adopted a whole territory approach.

Forecast of Water Quality

Slovenia bases its forecast of water quality changes on modelling. By 2050 the basic assumptions include the increase of crop nutrient uptakes, and a decrease of the nitrogen surplus. It is estimated considering climate change, that nitrate leaching will be reduced by 2050.

Summary

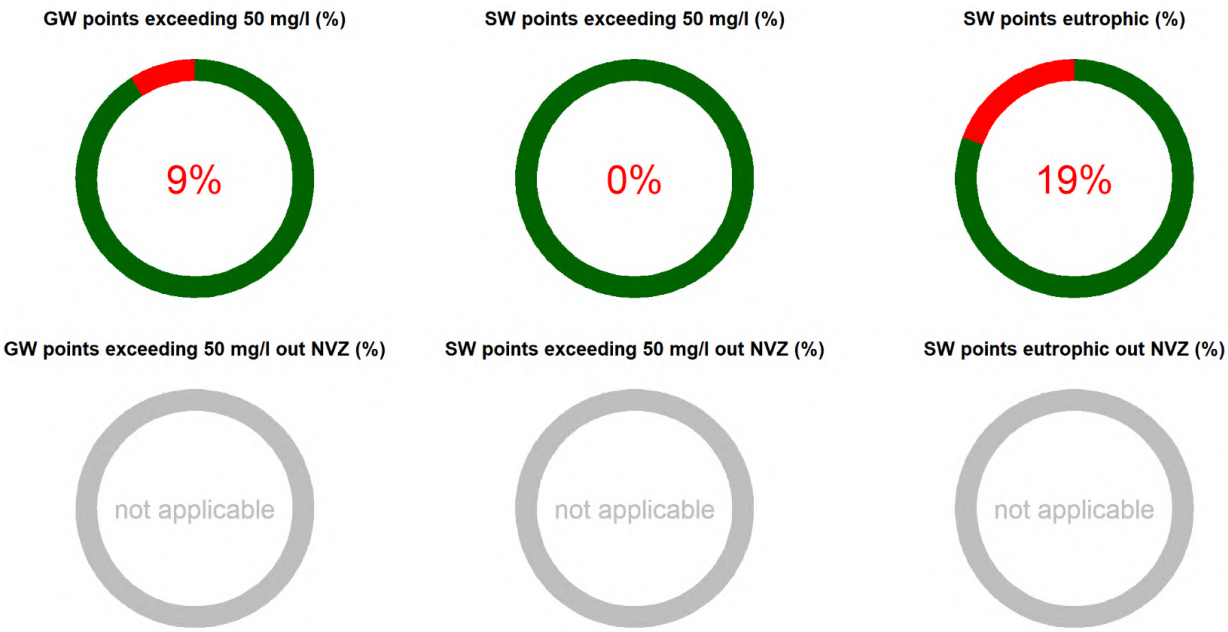

Figure 17. The summary plot for the period 2016-2019

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

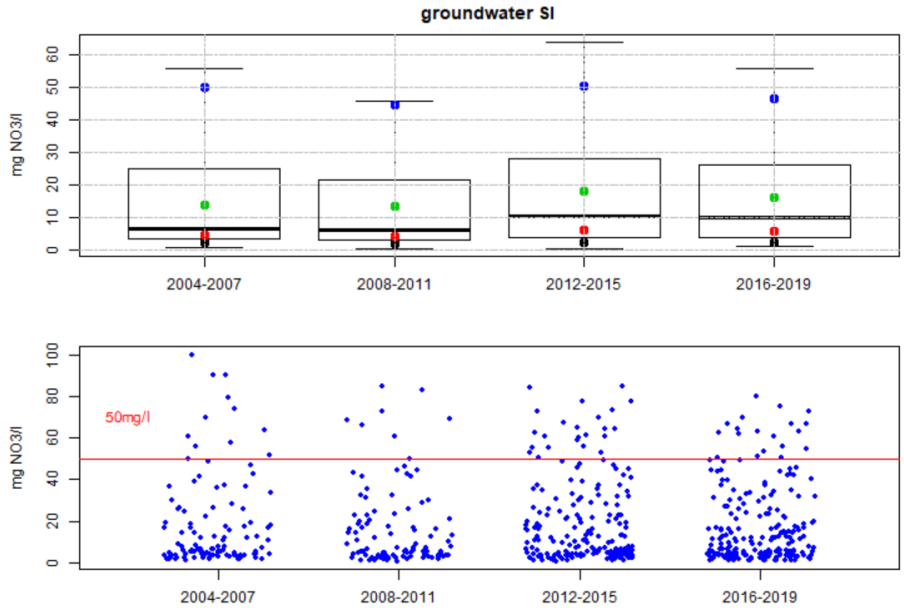

Figure 18. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for groundwater stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

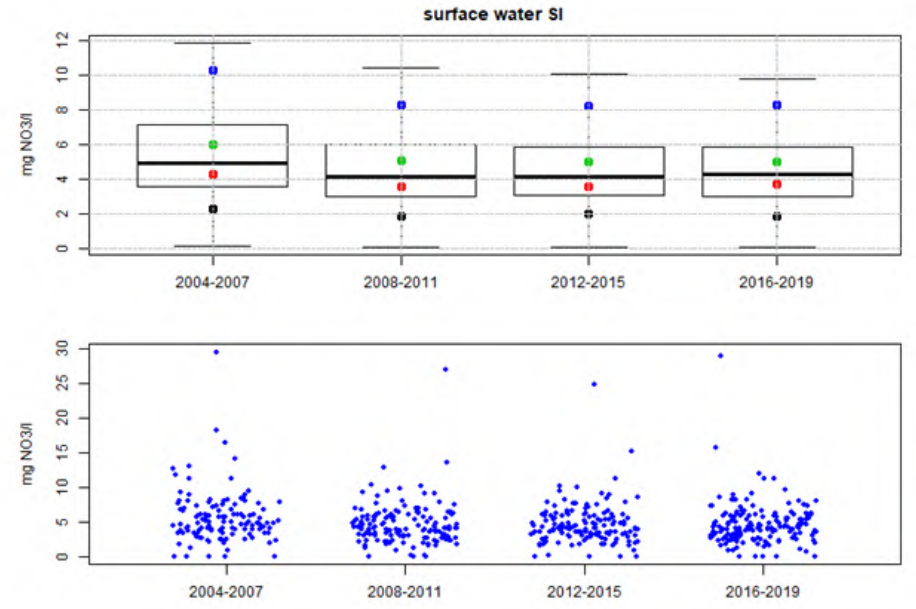

Figure 19. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for surface water stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

Conclusions and recommendations

Slovenia has an average livestock density and a surplus of nitrogen and phosphorus slightly below the average.

There is a well-elaborated network of monitoring stations. There are a number of hotspots, with a nitrate concentration above 50 mg/l. and a number of surface waters are eutrophic.

A revised action programme was published in 2017.

The Commission recommends Slovenia to continue to follow-up these hotspots and to take appropriate actions if it appears necessary.