EUROPEAN
COMMISSION

Brussels, 11.10.2021
SWD(2021) 1001 final

PART 17/38

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

Finland's utilised agricultural area amounts to 2.27 Mha, representing 9.1% of the total land area and has remained stable since 2007. The major outputs of the agricultural industry excluding services and secondary acts include in a decreasing order milk (24.8%), horticulture and vegetables (11.6%) and cereals (10.0%).
Eurostat

Major land use statistics for Finland

Table 1.Utilized agricultural area (abbreviated as UAA)

Finland	2005	2007	2010	2013	2016
Utilised agricultural area UAA (1000 ha)	NA	2255	2292	2259	2274
arable land (1000 ha)	NA	2255	2253	1969	2244
permanent grass (1000 ha)	NA	34	33	31	26
permanent crops (1000 ha)	NA	4	4	3	3
kitchen gardens (1000 ha)	NA	1	1	NA	1

Note:
Eurostat (FSS)

There were no major changes in the extent arable land of Finland. Permanent grass has decreased by 21% since 2007.

Animal distribution in Finland

Finland's bovine and pigs remained stable from the last reporting period. The livestock density index (livestock unit per hectare of Utilized Agricultural Area) has also remained stable and is below the EU average of 0.8.

Table 2. Livestock statistics

Finland	2005	2007	2010	2013	2016
Livestock index	0.51	0.50	0.49	0.51	0.48
dairy cows (10^6 heads)	0.31	0.29	0.28	0.28	0.28
live bovines (10^6 heads)	0.94	0.90	0.91	0.90	0.89
live pigs (10^6 heads)	1.44	1.43	1.34	1.26	1.20
live poultry (10^6 heads)	NA	NA	9.31	13.41	15.39

Note:
Eurostat (FSS)

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

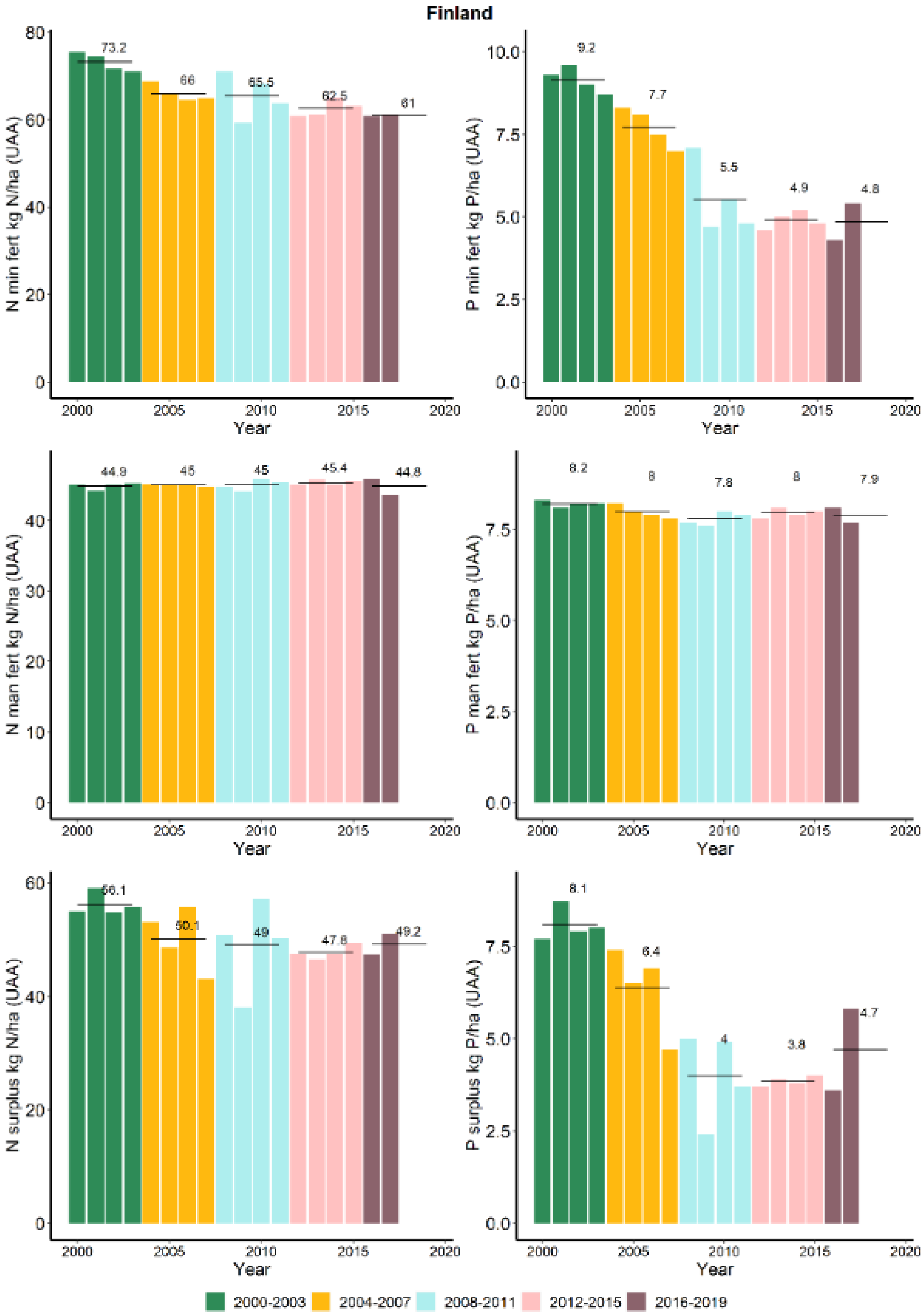


Figure 1. N and P fertilizers and gross surplus (kg/ha)

The gross nitrogen and phosphorus surpluses originate from EUROSTAT data for the years 2000-2017. The mineral fertilizers decreased significantly from 2000-2003 but are stable with respect to the last reporting period. Both manure nitrogen and phosphorus remained unchanged from 2000. The nitrogen surplus for the current period is similar to that of the previous reporting period. In the plots: N/P min and N/P man are respectively the N/P mineral fertilizers and N/P manure.

For comparison purposes, Finland provided N and P mineral fertilizers, manure and surplus data from the Natural Resources Institute Finland (Luke). Small differences occurred between the Eurostat and Luke dataset in the period 2000-2017. In particular, N and P manure fertiliser input are systematically lower on average of around 10% respect Eurostat, while N and P mineral fertiliser resulted 12% (average) lower than Eurostat.

Livestock unit - LSU /ha

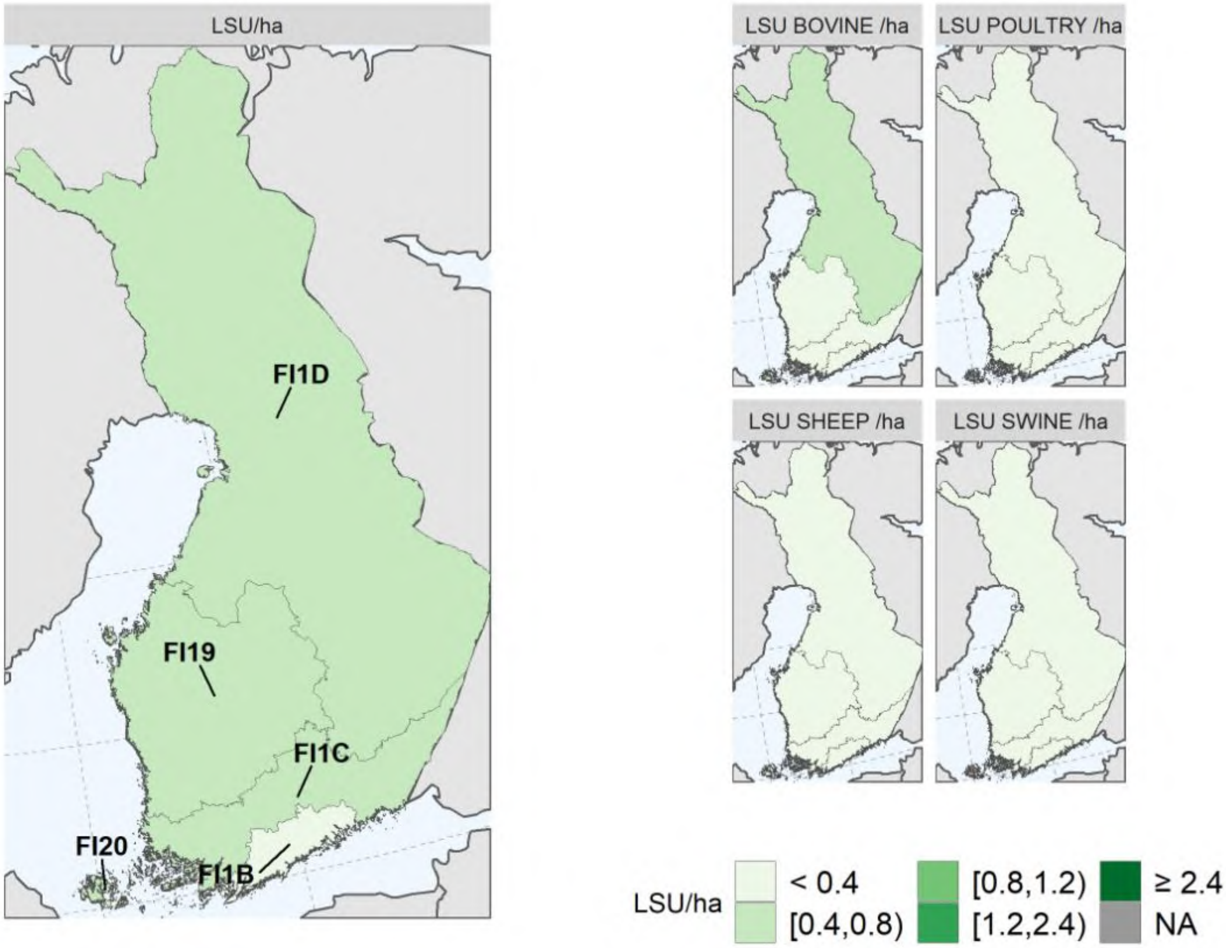


Figure 2. Map of livestock unit distribution, year 2016 (Source: Eurostat, February 2021)

Animal production is mostly dominated by bovine breeding (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 monitoring network used for reporting under the Nitrates Directive covers the whole territory. For this reporting period only sites that are clearly affected by agricultural loads were used for the reporting. These sites are also included in the monitoring required under the Water Framework Directive (WFD).

Some of the monitoring sites have been used for many years dating back to the period 2000–2003. However, some of the monitoring sites are no longer reported as they are principally forestry sites. In addition, the measured concentrations at these sites did not exceed 25 mg/l NO3. The trophic level of surface waters was assessed based on the ecological status classification laid down in the Water Framework Directive (WFD)

While surface waters monitoring is presented only for monitoring locations affected by agriculture, groundwater monitoring includes locations affected by agriculture and background stations (stations with no human impact). Since 2016, the Finnish Government outsourced sampling and sample analysis. However, collected data did not reveal any changes on the results of concentrations and trends.

The river monitoring sites are shallow, and all the sampling depths used were included in the data. In lakes, samples were taken at depths ranging from 0 to 2 meters, including both composite samples and grab samples. In lakes and coastal waters, oxygen content was calculated at a layer close to the bottom.

The nutrient and chlorophyll-a samples of coastal waters were taken from the surface. Nutrient sampling included taking grab samples at depths of 0 and 5 meters and composite samples with the maximum depth of 5 meters. The data on the chlorophyll-a concentration of phytoplankton contain composite samples (max depth 10 m) and grab samples ranging from the surface to the depth of 5 meters.

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

Station Type	Description	Number of stations with measurements			Number of stations with Trends		
		2008-2011	2012-2015	2016-2019	2008-2011	2012-2015	2016-2019
0	Phreatic groundwater (shallow): 0-5 m	37	121	49	31	121	49
1a	Phreatic groundwater (deep) 5-15 m	35	59	140	18	59	140
1b	Phreatic groundwater (deep) 15-30 m	7	7	4	3	7	4
1c	Phreatic groundwater (deep) >30 m	0	0	0	0	0	0
2	Captive groundwater	0	0	0	0	0	0
3	Karstic groundwater	0	0	0	0	0	0
9	Not specified	0	0	0	0	0	0
	Total	**79**	**187**	**193**	**52**	**187**	**193**

Surface water quality monitoring network

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

Station Type	Description	Number of stations with measurements			Number of stations with Trends			Number of stations with Trophic status		
		2008-2011	2012-2015	2016-2019	2008-2011	2012-2015	2016-2019	2008-2011	2012-2015	2016-2019
4	River water	81	79	68	80	79	68	62	79	68
5	Lake/reservoir water	60	88	79	59	86	45	59	88	79
6	Transitional water	0	0	0	0	0	0	0	0	0
7	Coastal water	44	75	76	44	75	42	43	75	76
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	**185**	**242**	**223**	**183**	**240**	**155**	**164**	**242**	**223**

Groundwater Quality

Groundwater average annual nitrate concentration

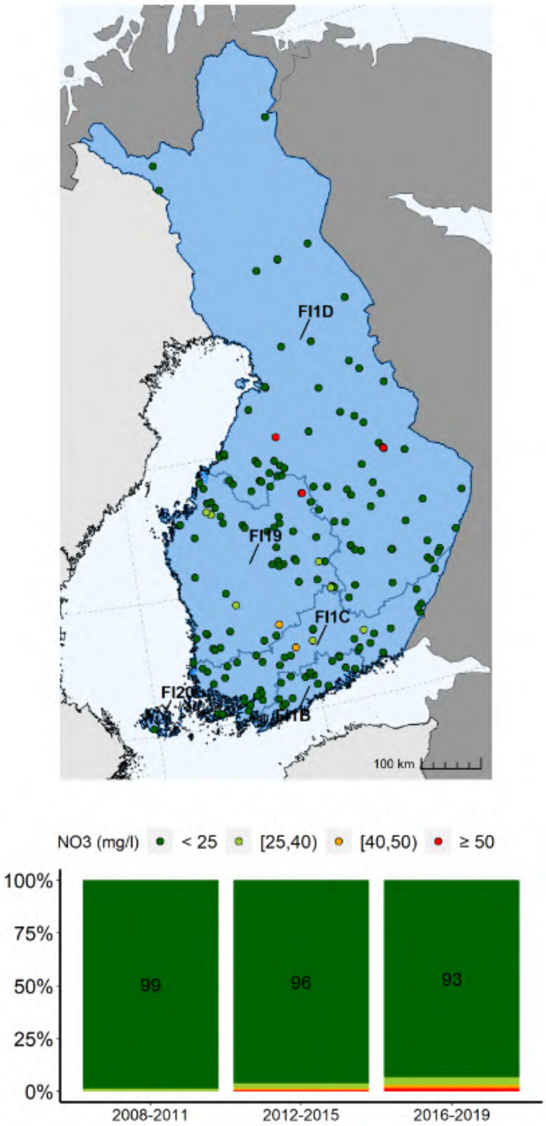


Figure 3. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

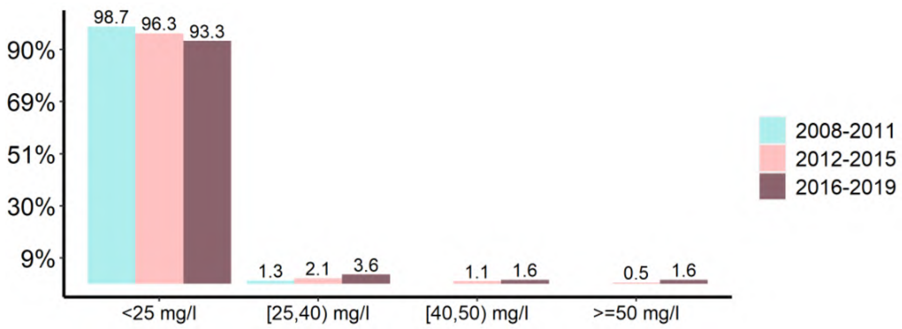


Figure 4. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Groundwater average annual nitrate concentration trend

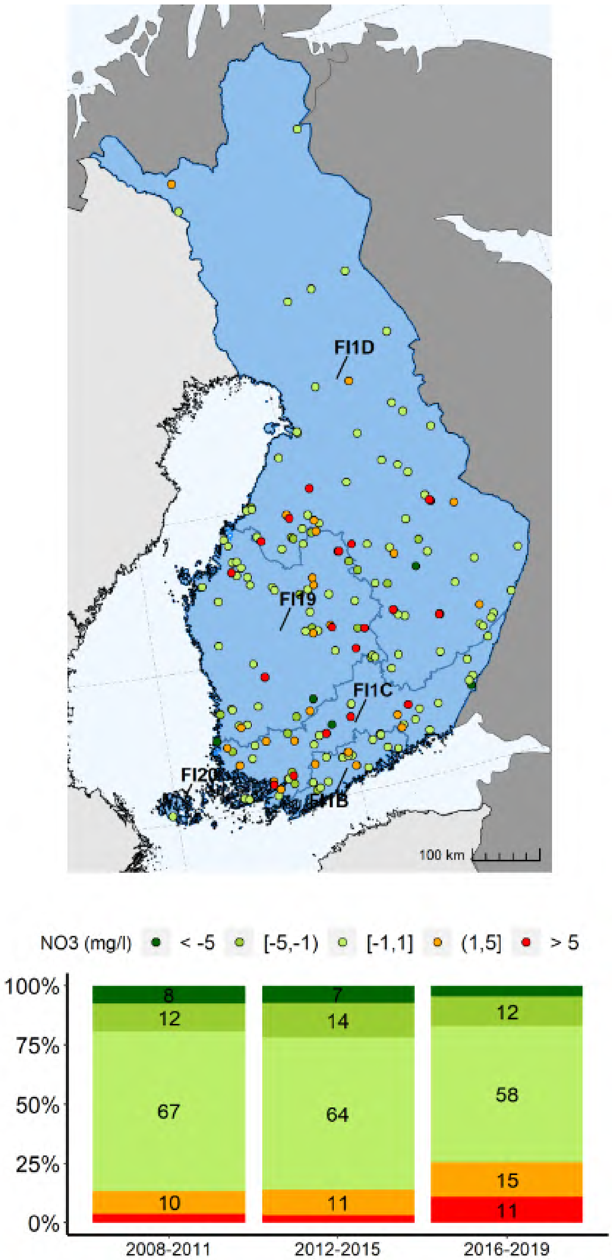


Figure 5. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

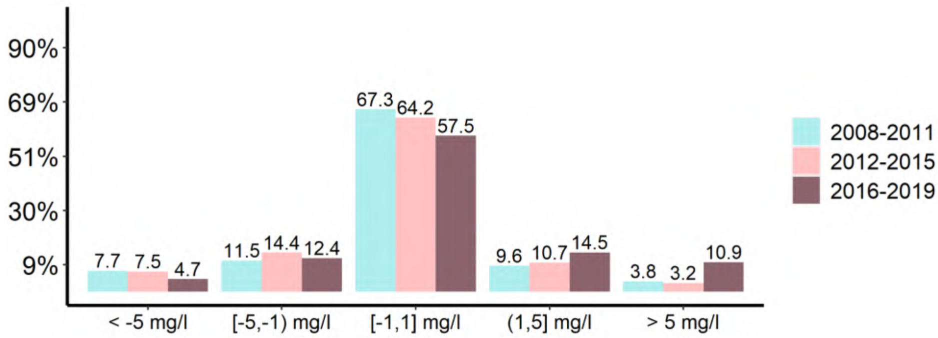
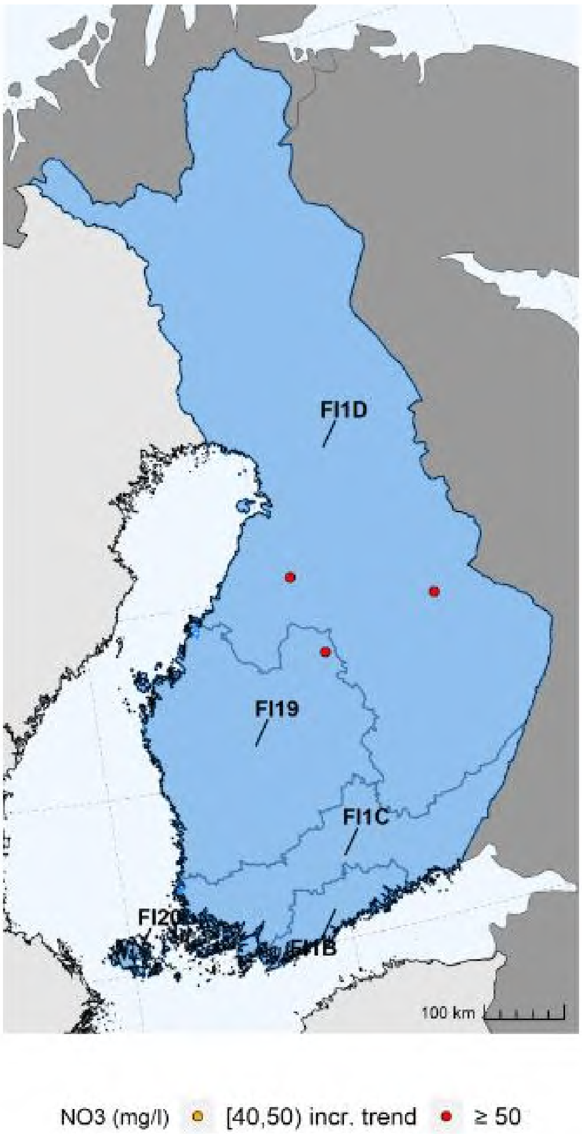


Figure 6. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Groundwater hotspot

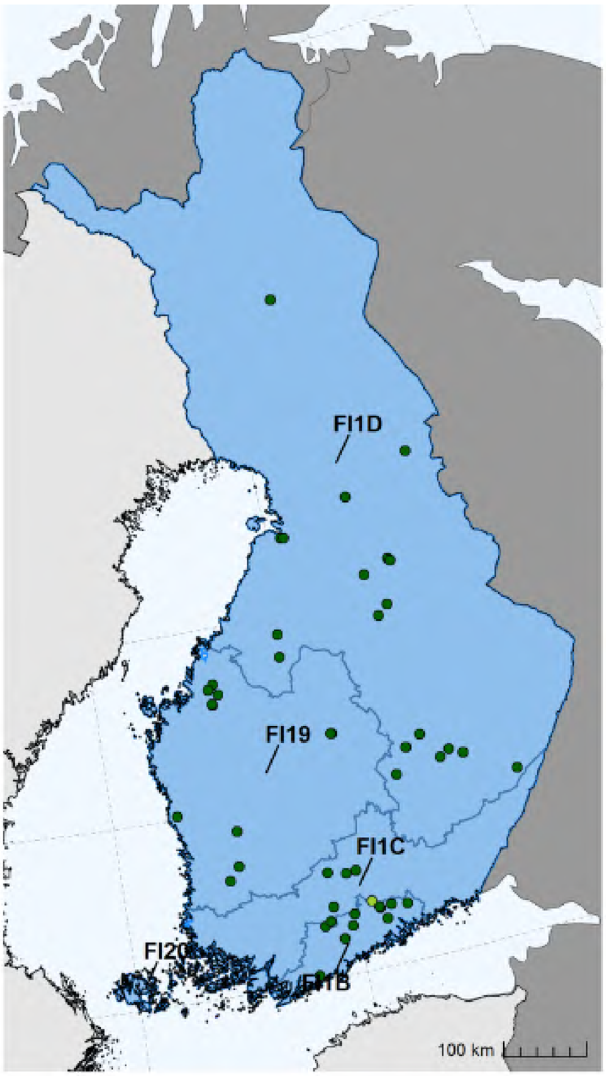


NUTS ID	NUTS NAME	>=40 and < 50 mg/l incr.trend	>=50 mg/l
FI19	Länsi-Suomi	0	1
FI1D	Pohjois- ja Itä-Suomi	0	2
	Total	**0**	**3**

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	35	35	35
1a	Phreatic groundwater (deep) 5-15 m	13	13	13
1b	Phreatic groundwater (deep) 15-30 m	3	3	3
1c	Phreatic groundwater (deep) >30 m	0	0	0
2	Captive groundwater	0	0	0
3	Karstic groundwater	0	0	0
9	Not specified	0	0	0
	Total	**51**	**51**	**51**

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

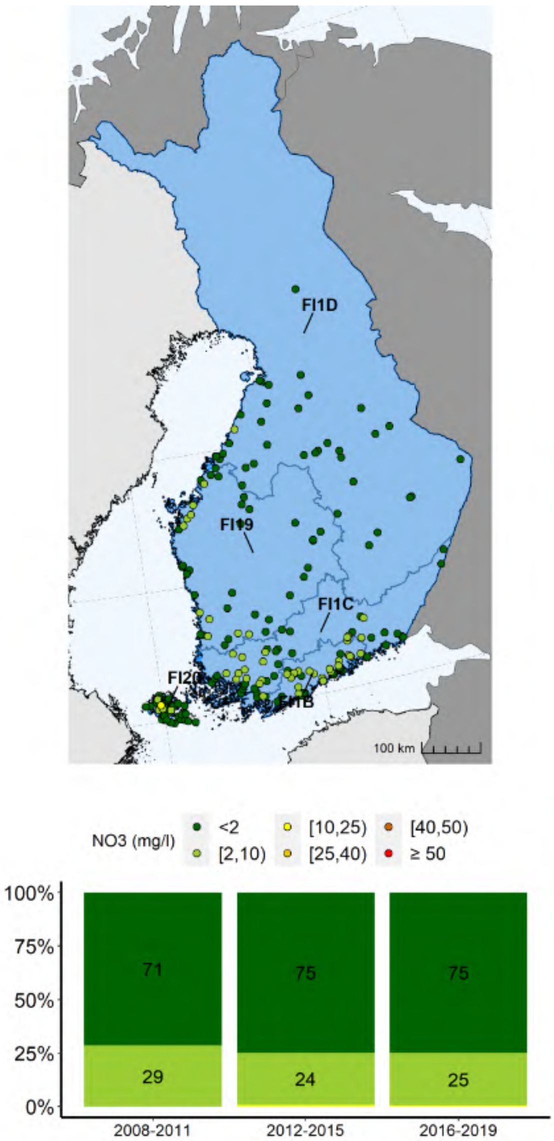


Figure 9. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis The percentages below 5% are not labelled, see the next plot for more information.

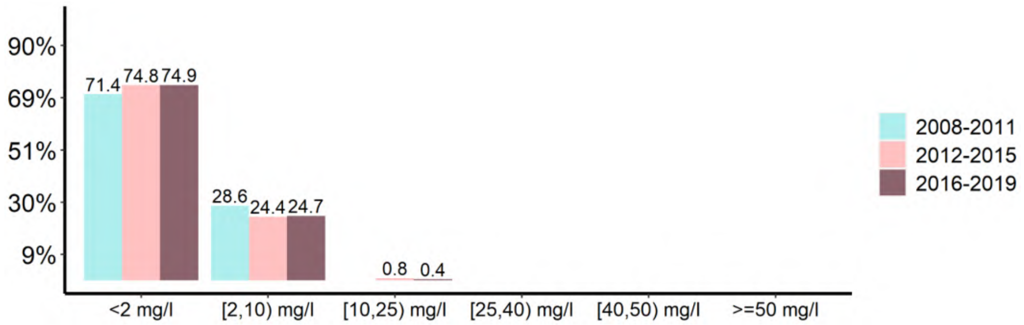


Figure 10. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Surface water average annual nitrate concentration trend

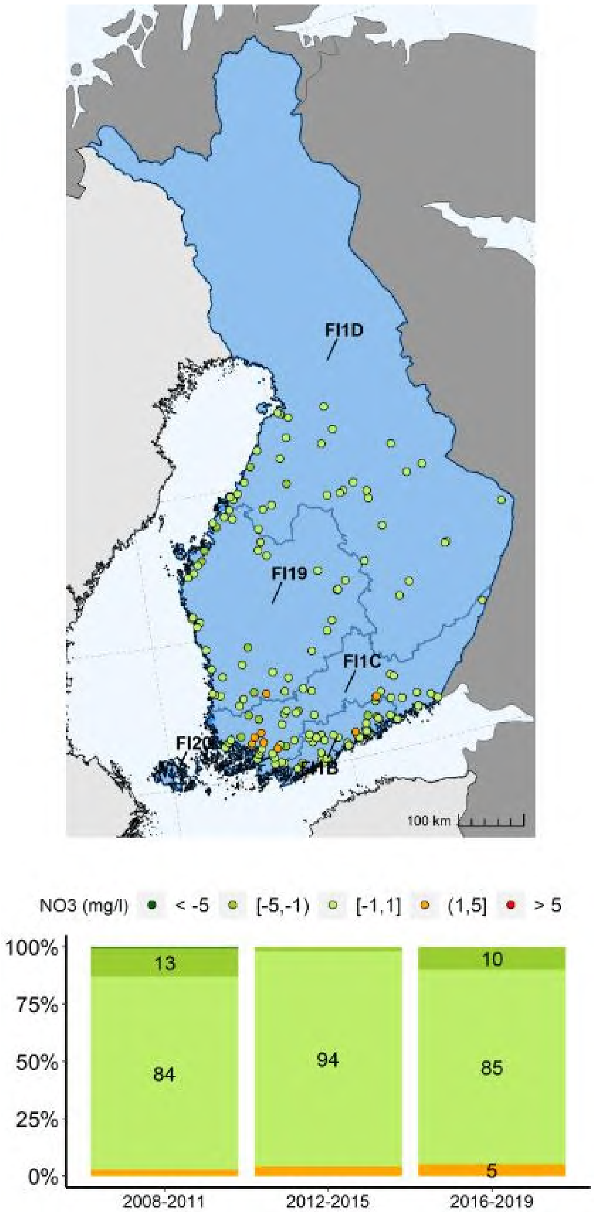


Figure 11. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

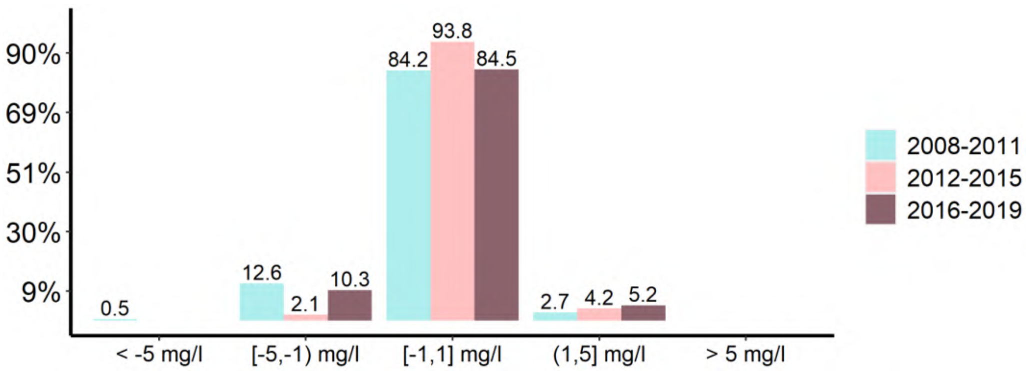


Figure 12. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Surface Water Eutrophication

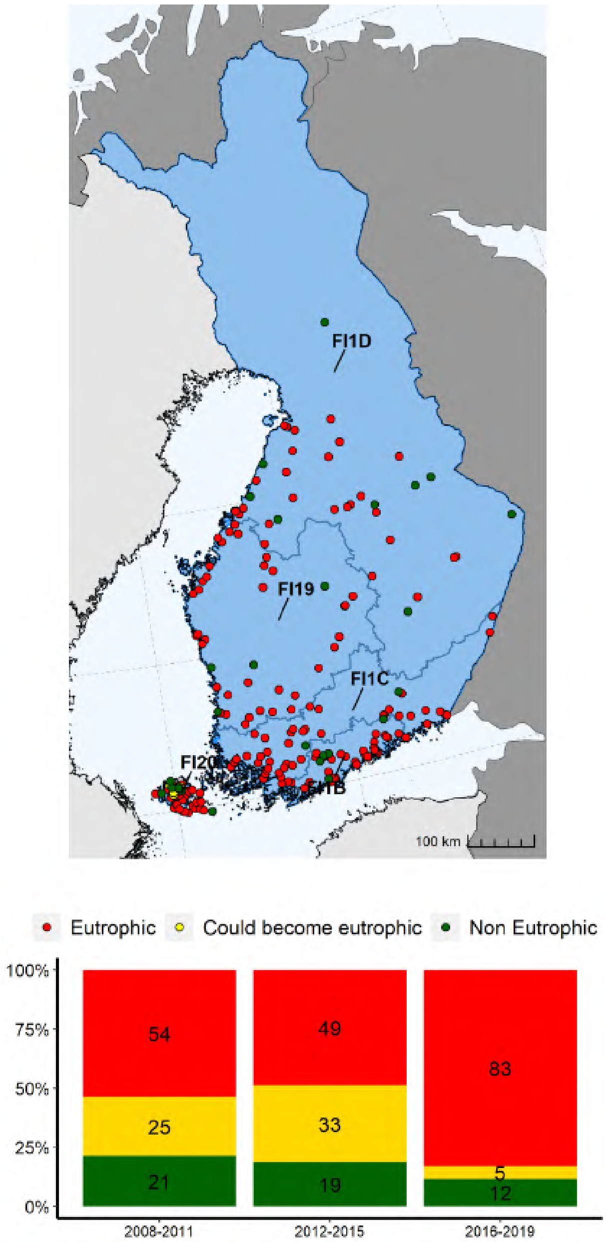


Figure 13. Spatial distribution of eutrophic status (map) and corresponding percentage of monitoring points per classes of status by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

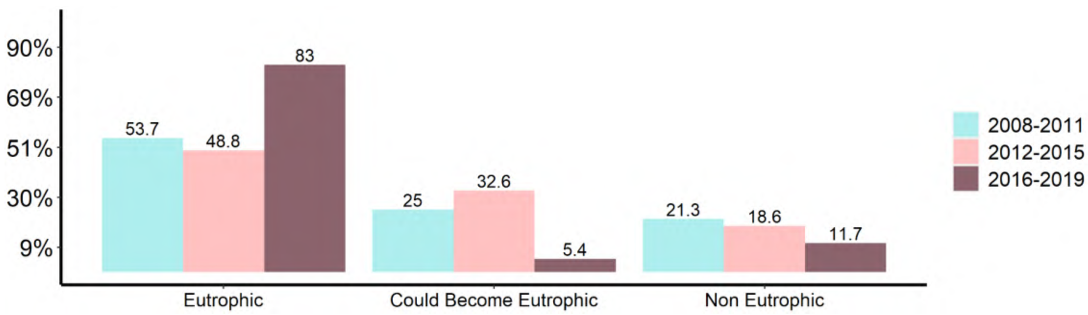
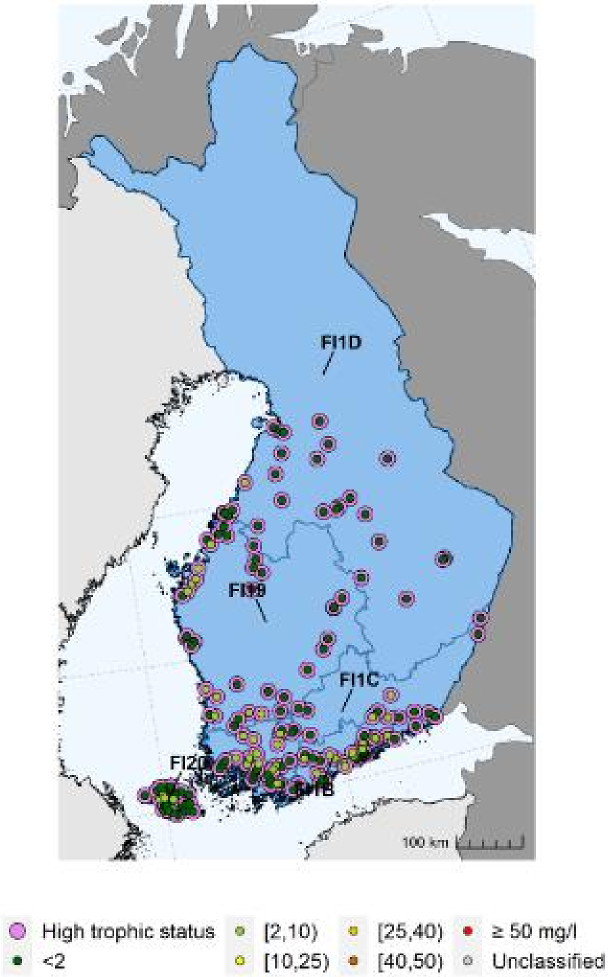


Figure 14. Comparison of percentage of monitoring points in the three reporting periods by classes of status (x axis)

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
FI19	Länsi-Suomi	29	21	8	0	0	0	0	0
FI1B	Helsinki-Uusimaa	16	5	11	0	0	0	0	0
FI1C	Etelä-Suomi	31	16	15	0	0	0	0	0
FI1D	Pohjois- ja Itä-Suomi	22	21	1	0	0	0	0	0
FI20	Åland	12	10	2	0	0	0	0	0
NO_NUTS	SALINE	75	67	8	0	0	0	0	0
	Total	**185**	**140**	**45**	**0**	**0**	**0**	**0**	**0**

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

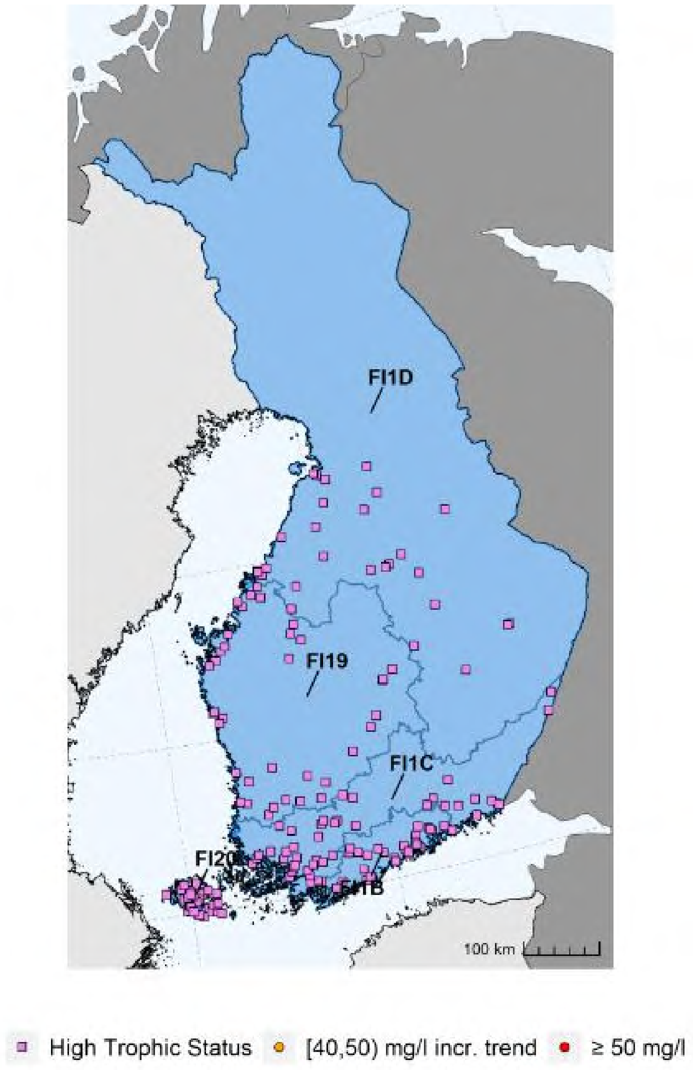
The analysis shows all the SW monitoring stations with the higher trophic status and the corresponding value of NO3 concentration. However, it is noteworthy that phosphorus concentration has also an important role for trophic status. The map shows the spatial distribution of these points, and the table 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 level of eutrophication of surface waters was assessed in the reporting period 2016–2019 in accordance with the new guidelines issued by the Commission using the ecological status classification laid down in the Water Framework Directive. The eutrophication level of surface waters has been assessed using the most recent results of ecological status classification. The results of ecological status classification will be reported to the EU in connection with WFD reporting in 2022. The results will be included in the plans of the third period of water resources management, which will be approved by the Government in December 2021. The national classification variables for lakes and coastal waters are chlorophyll-a and total nutrients. For rivers, only total nutrients are used. The results of chlorophyll in lakes and coastal waters were reported for summertime (June to September) and the other water quality variables describing eutrophication were reported as annual mean values. The results of national algae monitoring were also used in this report to assess the general eutrophication status, especially in coastal waters. The large majority of the rivers, lakes and coastal waters are eutrophic. More non-eutrophic surface water monitoring sites were found in lakes and rivers than in coastal waters.

		Number of stations with Trophic status		
Station Type	Description	Eutrophic	Could become eutrophic	Non Eutrophic
4	River water	56	0	12
5	Lake/reservoir water	54	12	13
6	Transitional water	0	0	0
7	Coastal water	75	0	1
8	Marine water	0	0	0
9	Not specified	0	0	0
	Total	**185**	**12**	**26**

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

Surface Water quality hotspot

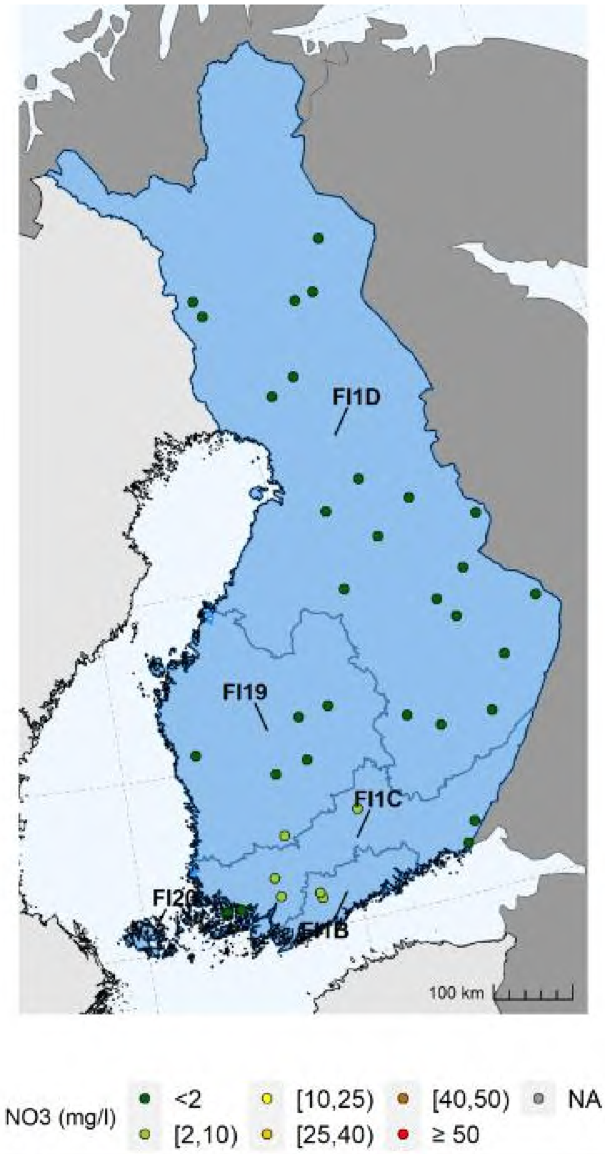


NUTS ID	NUTS NAME	High trophic status	>=40 and < 50 mg/l incr.trend	>=50 mg/l
FI19	Länsi-Suomi	29	0	0
FI1B	Helsinki-Uusimaa	16	0	0
FI1C	Etelä-Suomi	31	0	0
FI1D	Pohjois- ja Itä-Suomi	22	0	0
FI20	Åland	12	0	0
NO_NUTS	SALINE	75	0	0
	Total	**185**	**0**	**0**

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 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.

Surface Water Stations Removed



Station Type	Description	Number of removed stations			
		total removed	with measurements	with trends	with trophic status
4	River water	20	20	20	20
5	Lake/reservoir water	15	15	13	15
6	Transitional water	0	0	0	0
7	Coastal water	1	1	1	1
8	Marine water	0	0	0	0
9	Not specified	0	0	0	0
	Total	**36**	**36**	**34**	**36**

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 1998 and was revised six times from 2000 to 2015. In Finland, provisions on the code of good agricultural practice required by the Nitrates Directive (91/676/EEC) and the action programme referred to in Article 5 of the Directive are laid down in Government Decree 1250/2014. The Finnish Government approved the river basin management plans and the Finnish marine strategy in December 2015. No amendments were made to the Decree during the reporting period 2016–2019, thus Finland did not introduce new elements or made modifications to the code of good agricultural practice and action programmes during the reporting period 2016–2019. However, the action programmes will be updated by the end of 2021. A summary of the action programme is given below.

Cost effectiveness was not reported.

It is noteworthy that the Province of Aland is currently working on a specific action programme based on the targets in the form of preliminary interim targets up to 2021. There is an ongoing process of funding, carrying out, establishing, and implementing the proposals.

Table 6. Details of the Action Programme

Measure	General details in Action Programme (*)
Period of prohibition of fertiliser application	• 1 November to 31 March (section 10 of the Decree)
Restrictions for application on sloped soils	• In parts of the field with a slope of at least 15%, the application of manure, urine and liquid organic fertilizers by means other than placement is always prohibited. Other manure and organic fertilizer preparations applied to sloping parts of the arable land must be applied to the soil within twelve hours of application (section 10 of the Decree).
Restrictions for application on soaked, frozen, or snow-covered soils	• Not allowed in these situations (section 10 of the Decree).
Restrictions for application near watercourses (buffer strips)	• Nitrogen fertilizers must not be applied five meters closer to water. In the next zone of five meters from the water body, the surface application of manure and organic fertilizers is prohibited unless the field is cultivated within 24 hours of application (section 10 of the Decree).
Effluent storage works	• Not allow in groundwater areas (section 4 of the Decree)
	• Distance to flood risk area (section 4 of the Decree)
	> 50 metres from a water body, a well for domestic water supply or a spring (section 4 of the Decree)
	> 25 metres from a main ditch or streamlet (section 4 of the Decree)
Capacity of manure storage	• Other details section 4 of the Decree
Rational fertilisation (e.g., splitting fertilisation, limitations)	• Maximum mineral and manure applications by crops (section 11 of the Decree)
Crop rotation, permanent crop enhancement	• Not specified
Vegetation cover in rainy periods, winter	• 32% of crop land left bare in winter (year 2018)
Fertilisation plans, spreading records	• Manure analyses every 5 years (section 12 of the Decree)
Other measures	• Not specified
Date for application limit of 170 kg N/ha/year:	• 1 April 1998

(*) Government Decree on Limiting Certain Emissions from Agriculture and Horticulture (1250/2014) issued on 18 December 2014 entered into force on 1 April 2015

Controls

Administrative controls on the implementation of the Action Programme (AP) measures are carried out in the frame of the cross-compliance check. About 520 farmers were controlled every year. Non-conformities for analysis of nitrogen content of manure were detected for 6.3% of the case, manure storage leakage 3.8% and fertilizer usage for 3.8% of the cases.

Designation of NVZ

Finland has adopted a whole territory approach.

Forecast of Water Quality

According to the previous programme of measures of the Finnish marine strategy (2016–2021), the agricultural nitrogen load is estimated to be reduced through water management measures by an average of 5%, in different sea areas, and the phosphorus load by 7%, which is not sufficient to meet the reduction needs required by water resources and sea management. In coastal bodies of water primarily affected by agriculture, the total nitrogen and total phosphorus concentrations should decrease by approximately 30% on average, and chlorophyll concentrations by 58%, in order to achieve a good ecological status Through modeling, it was predicted that the expected increase in rainfall and nutrient leaching caused by climate change will reduce the impact of the nutrient loading reduction scheme of the Baltic Sea countries. The forecasts for the northern Baltic Sea predict an increase or lack of change in the external dissolved inorganic nitrogen load and a reduction in the dissolved inorganic phosphorus loading.

Climate change will increase the likelihood of extreme weather phenomena impacting groundwater reserves and increasing surface water levels. As a result of rising water levels and flooding, the loading of nutrient generated by agriculture might be transported to groundwater reducing or destroying the quality of groundwater in larger areas than before. The washout in wintertime poses significant risks of water quality deterioration. In addition, under climate change a longer growing season is expected, leading to higher fertilizer loads.

Long periods of drought in the summer will lower water levels, in which case groundwater quality may deteriorate in a natural manner as a result of higher concentrations of iron and manganese, as well as rising temperatures. The lowering of water levels may lead to changes in flow directions, in which case pollutants may be carried into groundwater areas from areas that were previously considered safe. More research should, however, be conducted into the impacts of climate change on groundwater reserves and groundwater quality.

Summary

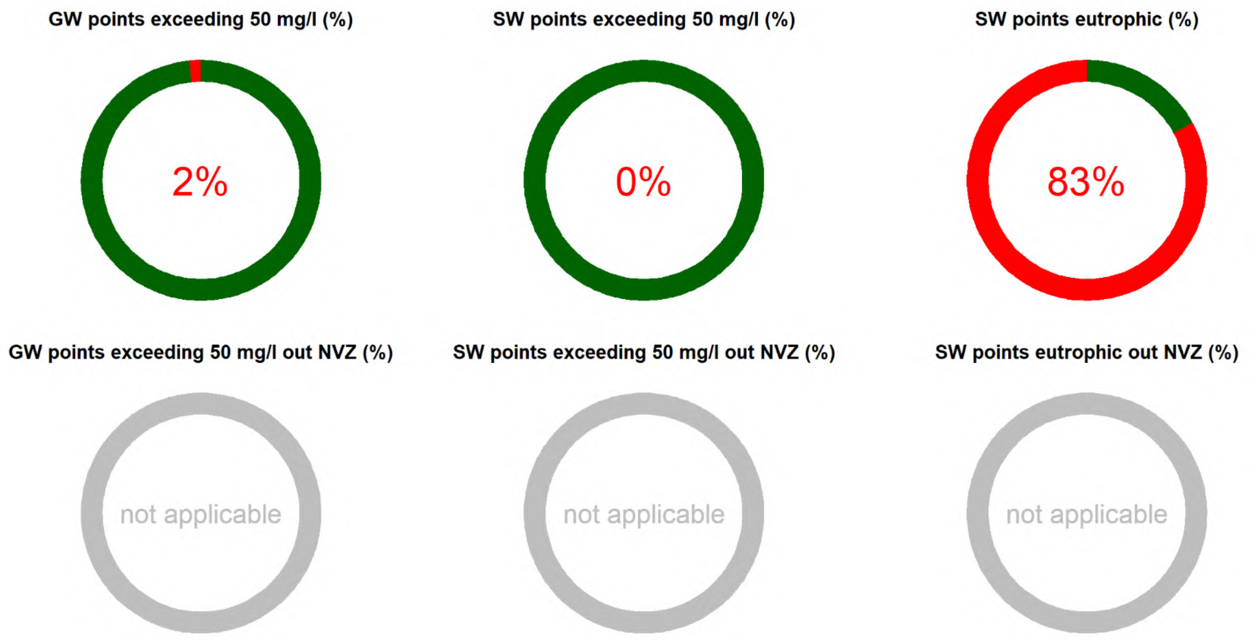


Figure 18. The summary plot for the period 2016-2019

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.

Long term analysis

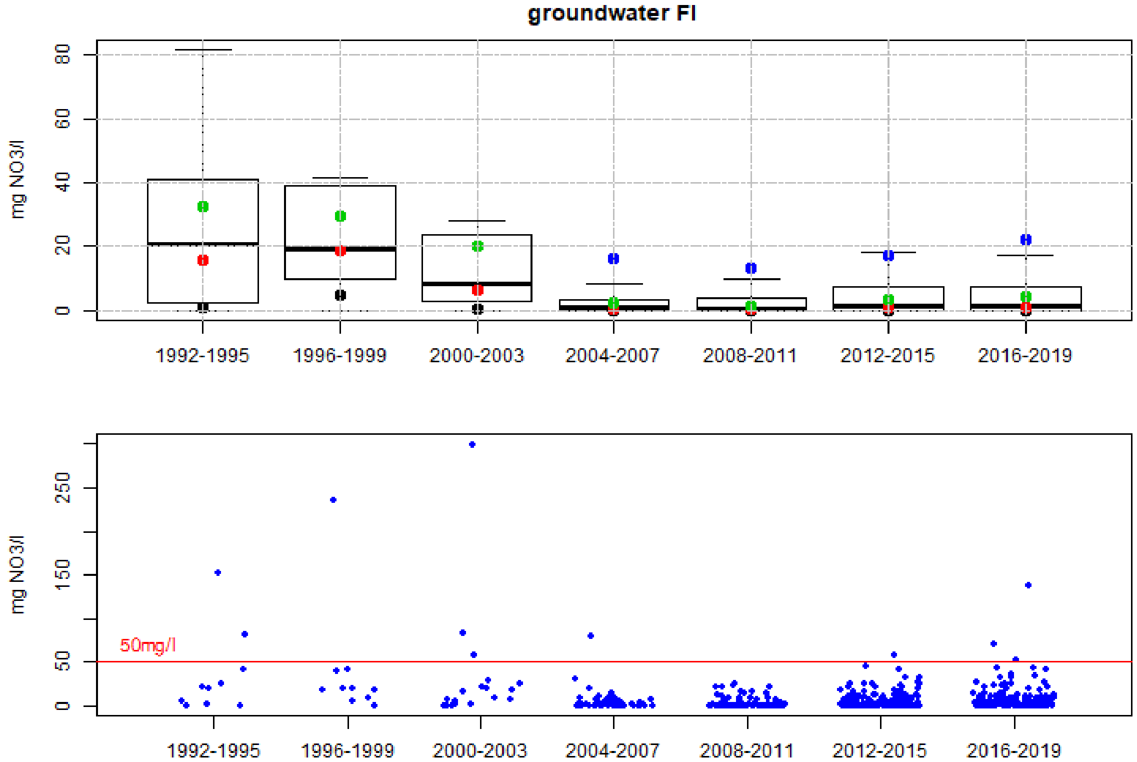


Figure 19. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for groundwater stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

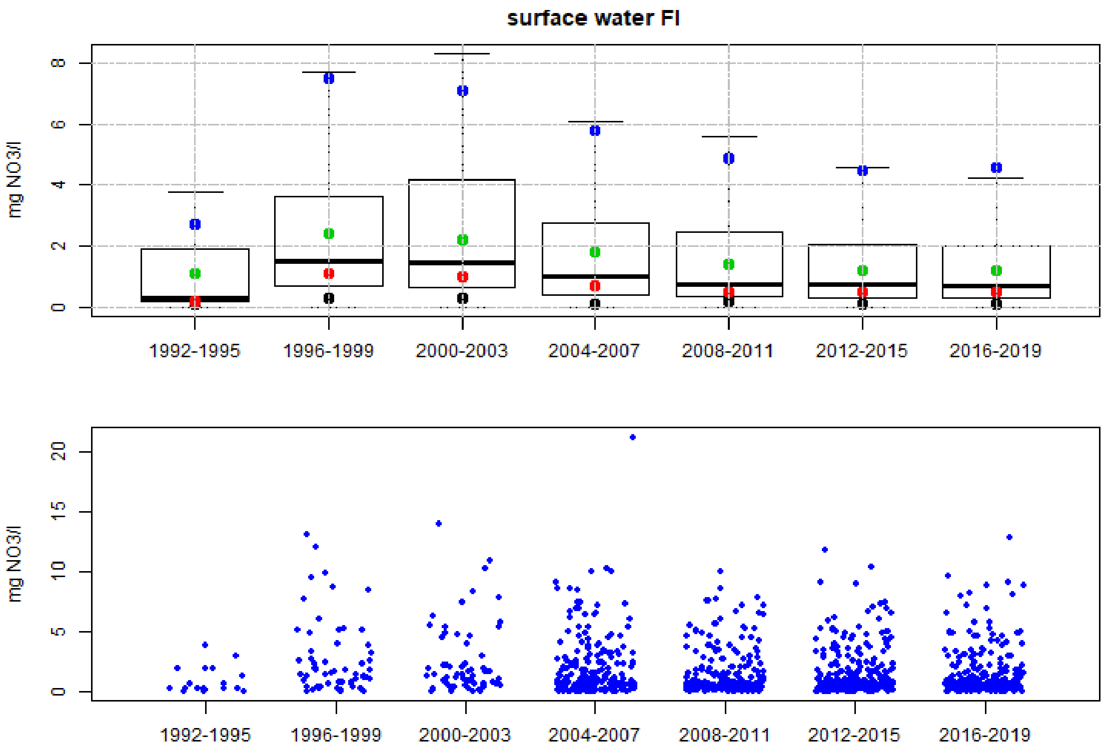


Figure 20. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period, for surface water stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

Conclusions and recommendations

Finland has a low livestock density, the surplus of nitrogen and phosphorus are close to the EU averages.

There is a well-elaborated network of monitoring stations. Groundwater quality is good. Surface waters, inland like marine waters, suffer from eutrophication, which is recorded for 83% of monitoring stations.

The current action programme was set in 2014 and will be updated in 2021.

The Commission recommends that Finland reinforces its action programme to tackle the eutrophication issues for both inland and marine waters where the agricultural pressure is significant.