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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



Luxembourg's utilized agricultural area amounts to 0.13 Mha, representing 54% of the total land area. The major outputs of the agricultural industry, excluding services, ranked in descending order are milk (31%), forage (22%) and cattle (14.9%).
Eurostat

Major land use statistics for Luxembourg

Table 1.Utilized agricultural area (including agricultural land abroad, abbreviated as UAA)

Luxembourg	2005	2007	2010	2013	2016
Utilised agricultural area UAA (1000 ha)	NA	131	131	131	131
arable land (1000 ha)	NA	61	62	63	62
permanent grass (1000 ha)	NA	68	68	67	67
permanent crops (1000 ha)	NA	2	2	2	2
kitchen gardens (1000 ha)	NA	0	0	0	0

Note:
Eurostat (FSS)

Luxembourg's arable land has remained stable since 2005. Permanent grassland and crops were also stable.

Animal distribution in Luxembourg

Luxembourg has experienced seen a decrease in the number of pigs and poultry over last years. The livestock density index (livestock unit per hectare of Utilized Agricultural Area) has risen by 5.5% since 2013 and it is higher than the EU average of 0.8.

Table 2. Livestock statistics

Luxembourg	2005	2007	2010	2013	2016
Livestock index	1.22	1.23	1.28	1.26	1.33
dairy cows (10^6 heads)	0.04	0.04	0.05	0.05	0.05
live bovines (10^6 heads)	0.18	0.19	0.19	0.20	0.20
live pigs (10^6 heads)	0.08	0.09	0.09	0.09	0.10
live poultry (10^6 heads)	NA	NA	0.09	0.11	0.12

Note:
Eurostat (FSS)

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

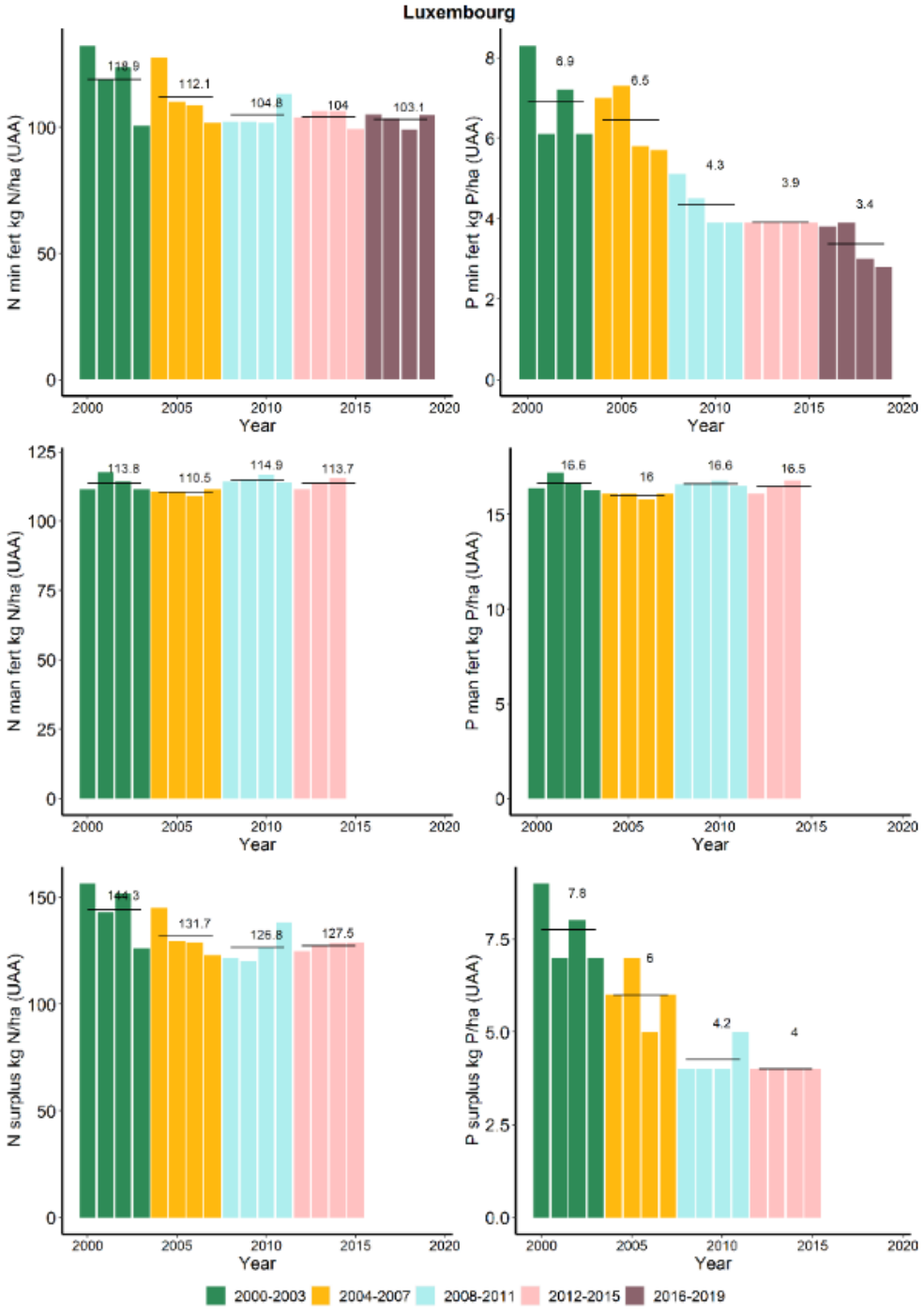


Figure 1. N and P fertilizers and gross surplus (kg/ha)

The nitrogen and phosphorus fertiliser data stem from EUROSTAT for the years 2000-2014; for the gross surplus, values are also available for year 2015. Data provided by Luxembourg have been used to complete N and P mineral fertiliser for the years 2015-2018. While the consumption of inorganic phosphorus during the last reporting period is lower than that of the previous reporting period, the consumption of manure remained stabled. The nitrogen surplus has remained stable during the period 2008-2015. In the plots: N/P min and N/P man are respectively the N/P mineral fertilizers and N/P manure.

Livestock unit - LSU /ha

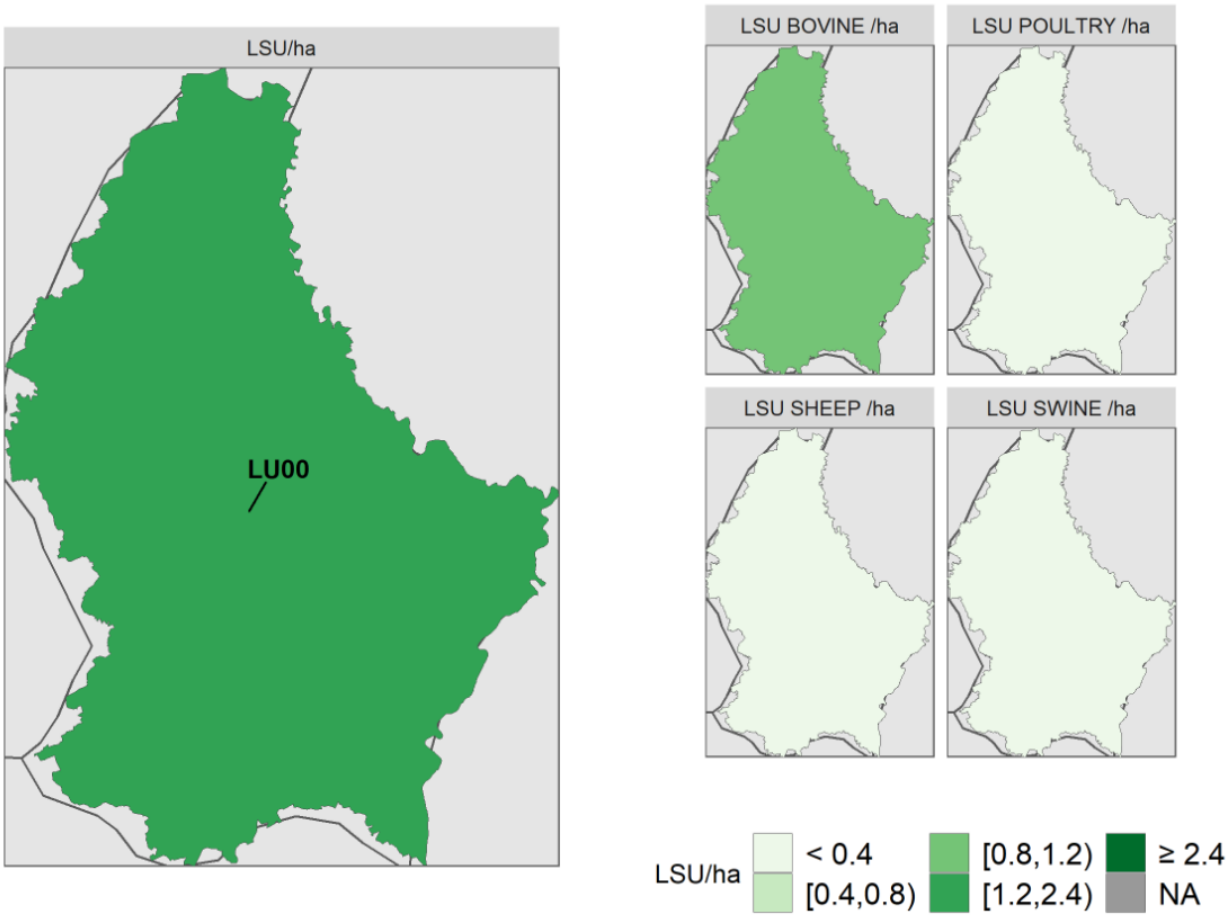


Figure 2. Map of livestock unit distribution, year 2016 (Source: Eurostat, February 2021)

Bovine represents the largest share of animal production (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 bodies are monitored regularly by the Water Management Authority. The monitoring campaigns aim fulfil the requirements of both the Nitrates Directive and the Water Framework Directive. The sampling frequency ranges is normally 20 or 13 times per year. In some years WFD stations were only monitored 4 times per year. It is also foreseen to streamline as far as possible the groundwater monitoring network with that of the WFD.

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	15	15	15	15	15	15
1a	Phreatic groundwater (deep) 5-15 m	1	1	1	1	1	1
1b	Phreatic groundwater (deep) 15-30 m	0	0	0	0	0	0
1c	Phreatic groundwater (deep) >30 m	3	0	0	2	0	0
2	Captive groundwater	0	4	4	0	4	4
3	Karstic groundwater	1	0	0	1	0	0
9	Not specified	0	0	0	0	0	0
	Total	**20**	**20**	**20**	**19**	**20**	**20**

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	16	16	16	16	16	16	16	16	16
5	Lake/reservoir water	0	0	0	0	0	0	0	0	0
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	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**

Groundwater Quality

Groundwater average annual nitrate concentration

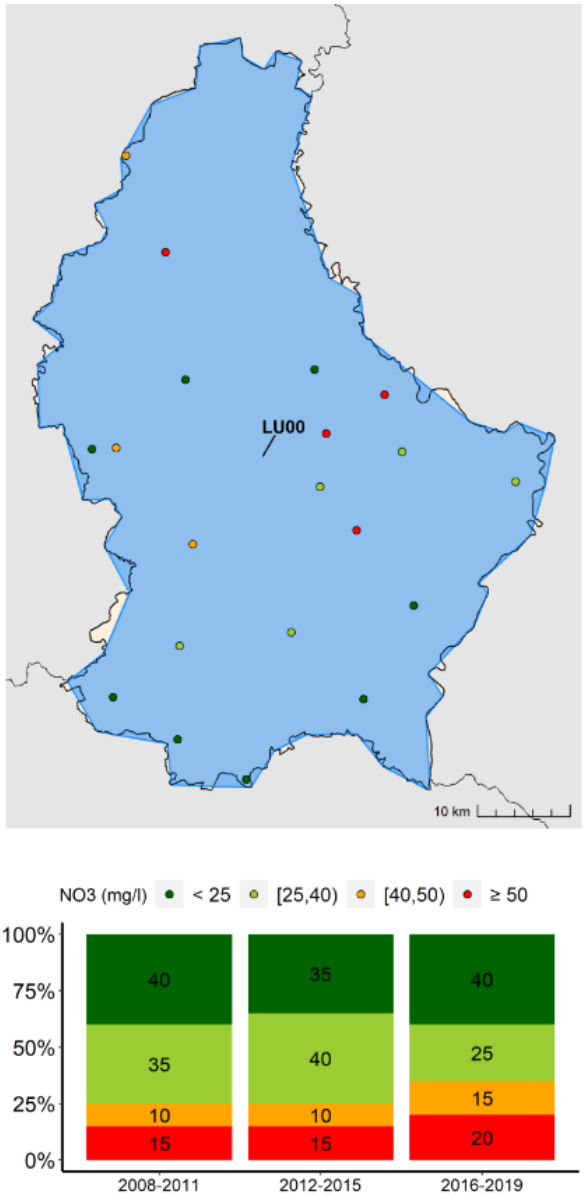


Figure 3. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis).

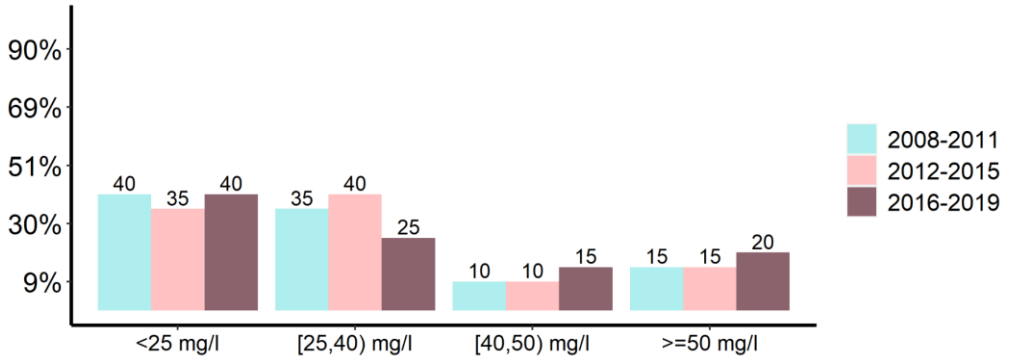


Figure 4. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Groundwater average annual nitrate concentration trend

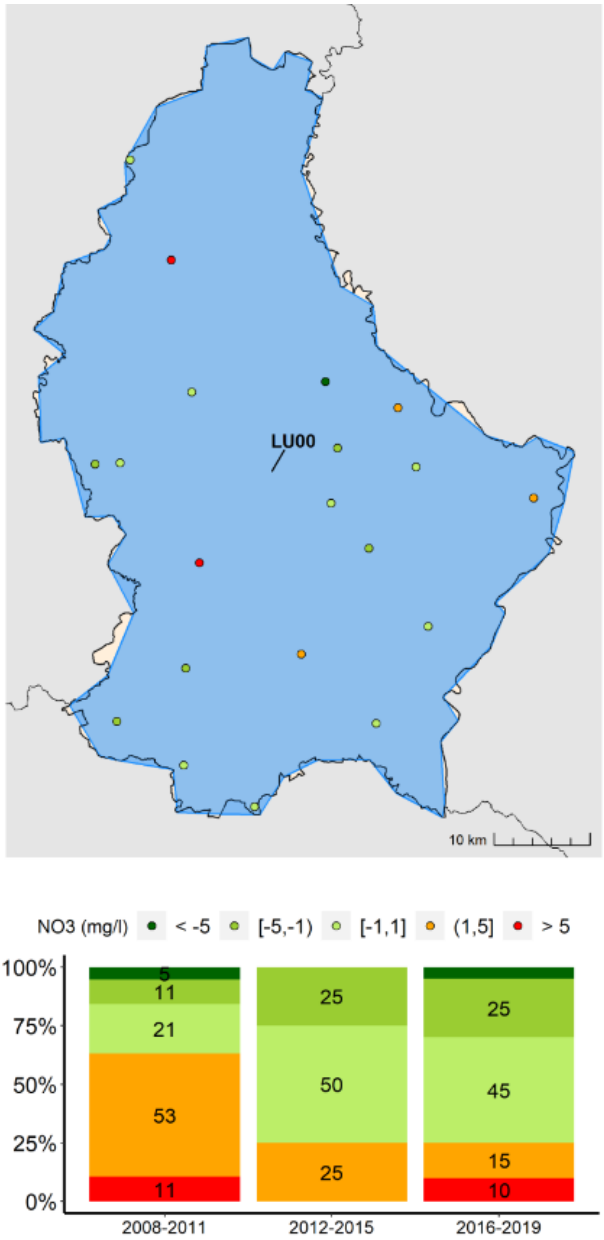


Figure 5. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information.

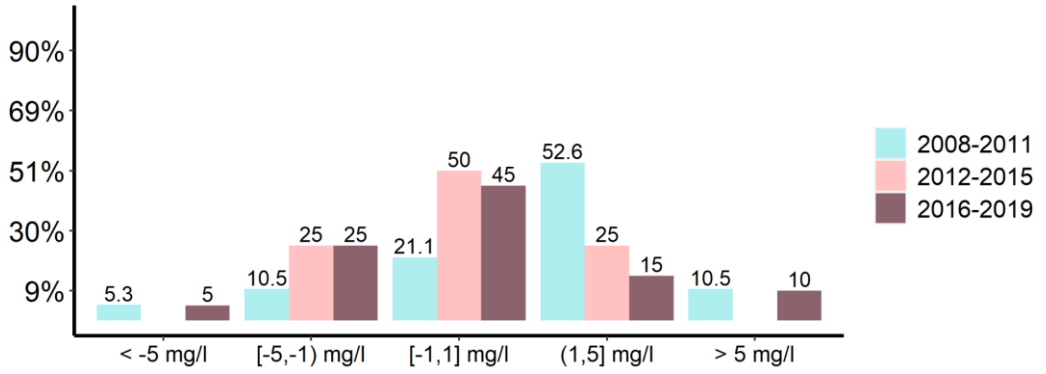
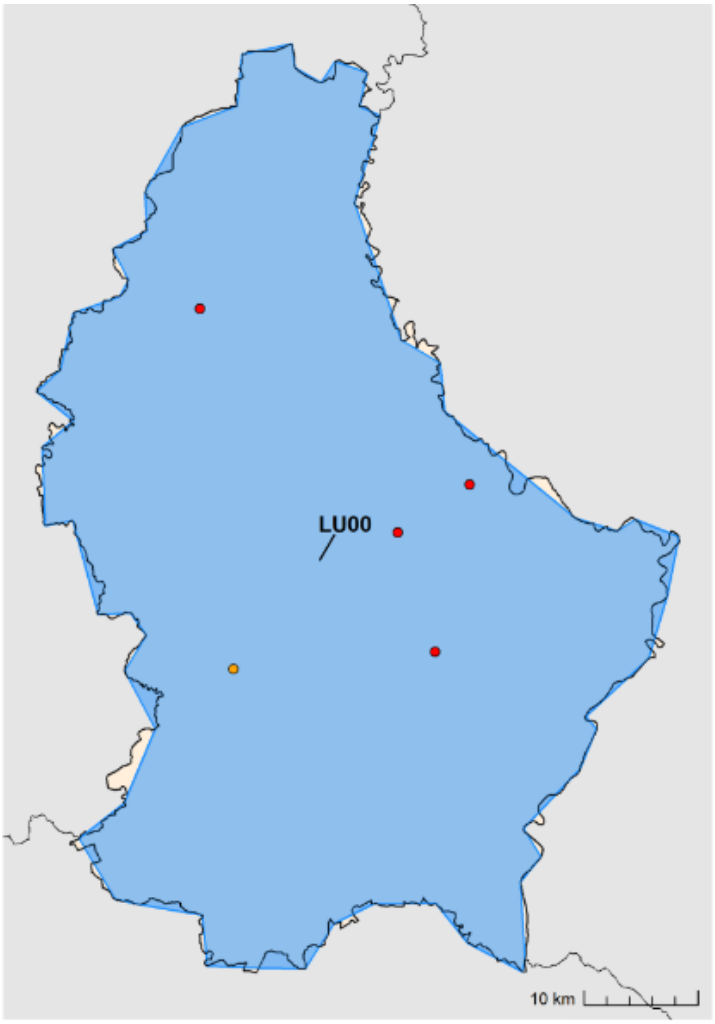


Figure 6. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis)

Groundwater hotspot



NUTS ID	NUTS NAME	>=40 and < 50 mg/l incr.trend	>=50 mg/l
LU00	Luxembourg	1	4
	Total	**1**	**4**

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 groundwater (GW) monitoring stations that have NO3 concentration in the range of 40-50 mg/l with increasing trends and those 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 Quality

Surface water average annual nitrate concentration

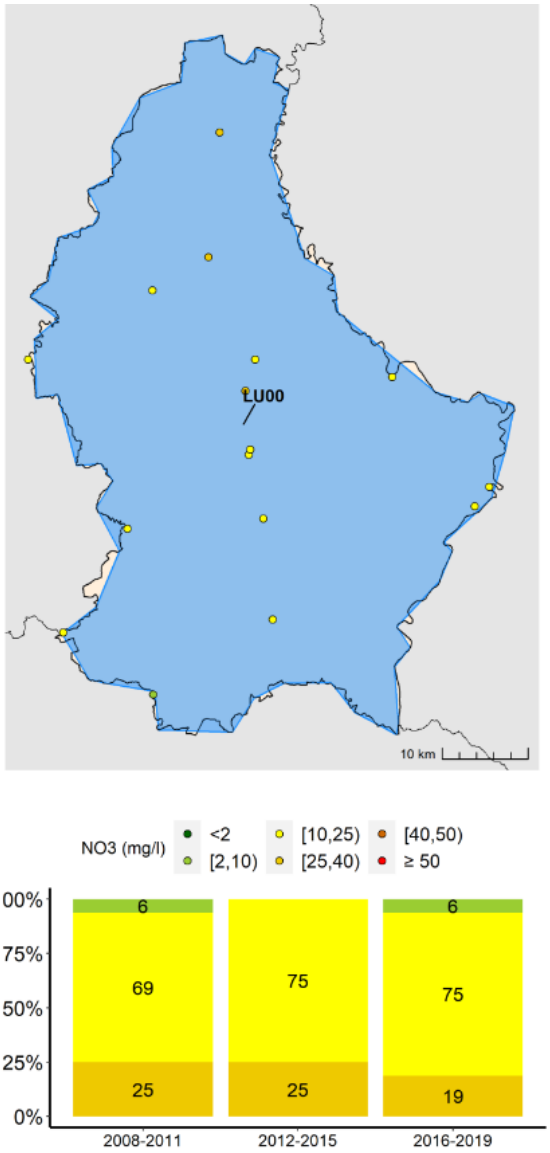


Figure 8. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis).

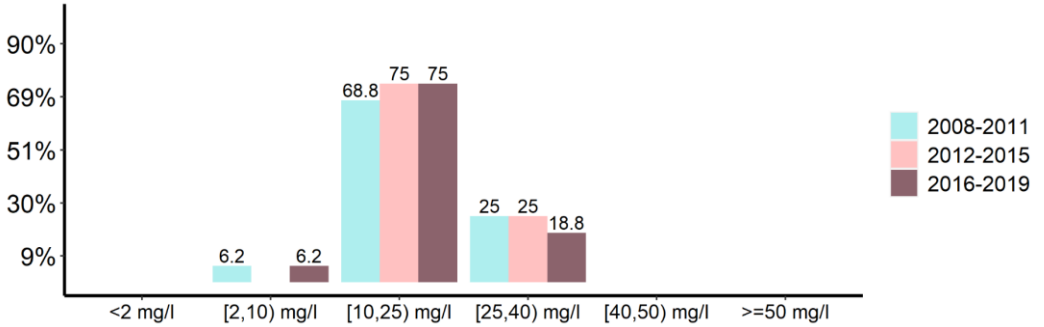


Figure 9. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Surface water average annual nitrate concentration trend

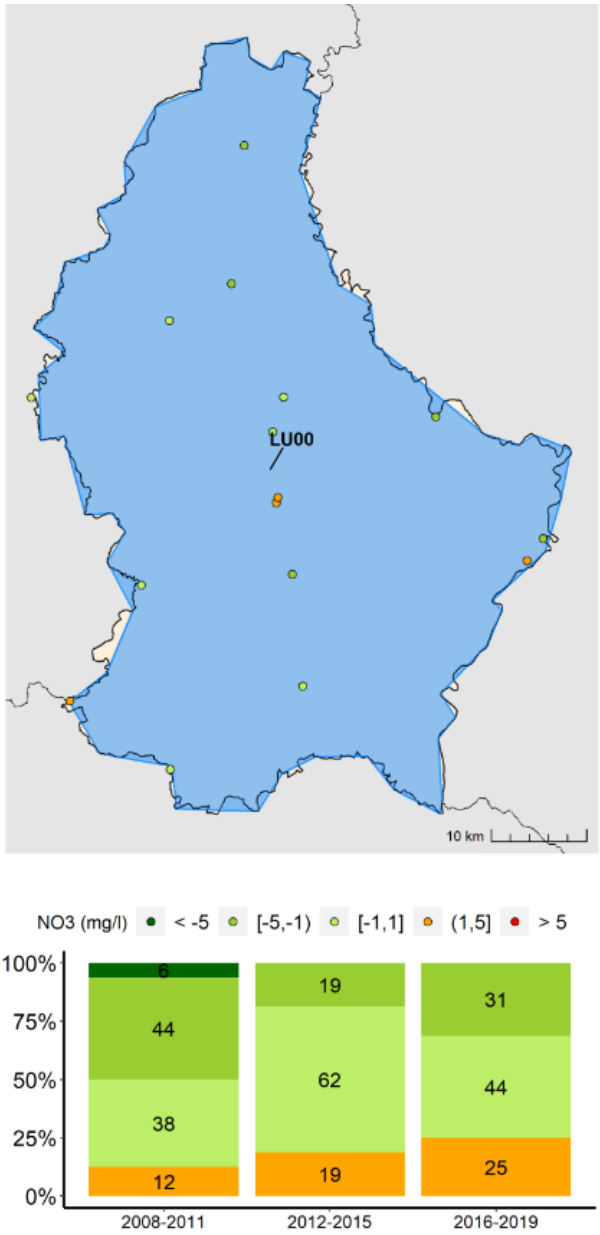


Figure 10. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis).

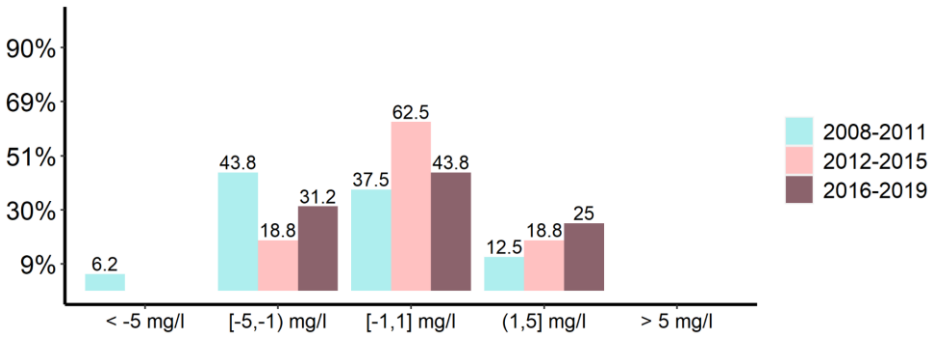


Figure 11. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis).

Surface Water Eutrophication

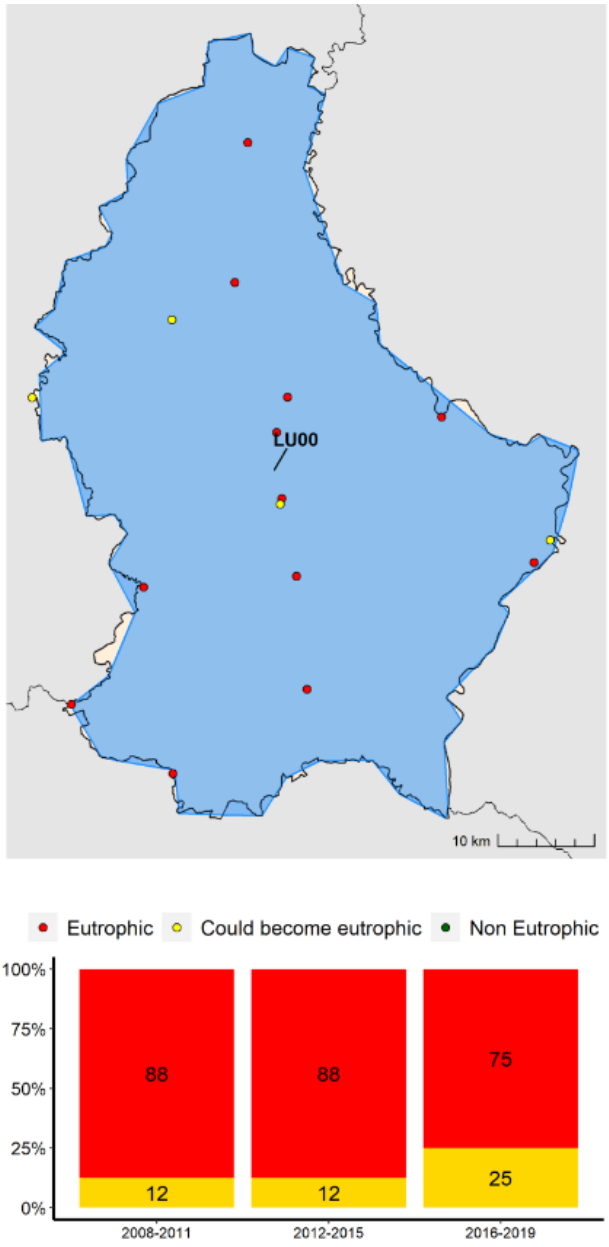


Figure 12. Spatial distribution of eutrophic status (map) and corresponding percentage of monitoring points per classes of status by reporting period (x axis).

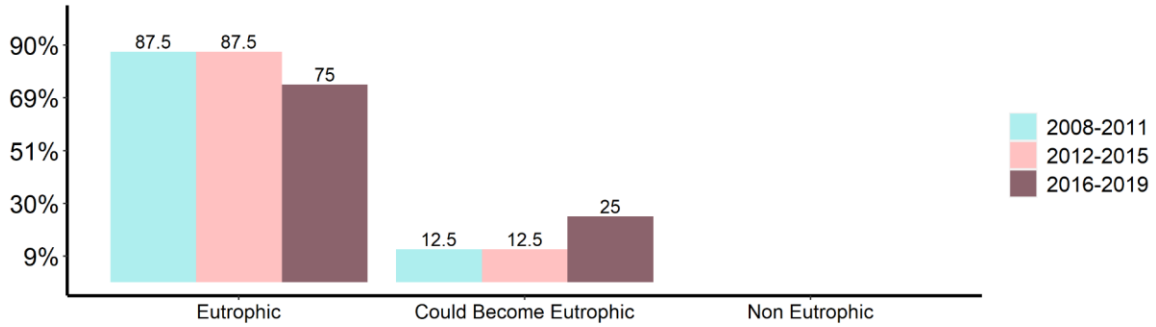
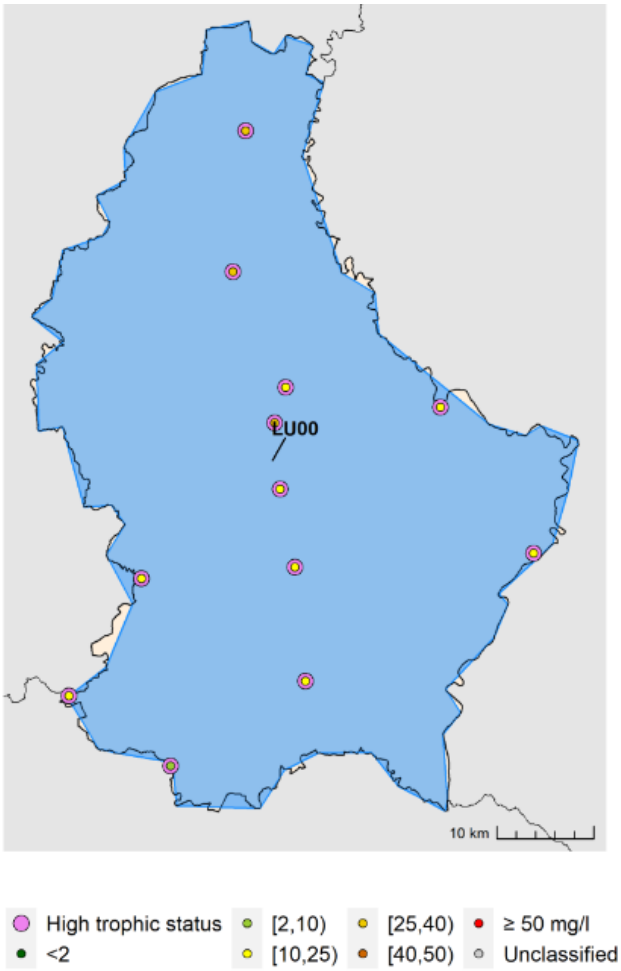


Figure 13. Comparison of percentage of monitoring points in the three reporting periods by classes of status (x axis)

The Eutrophic status vs average NO3 annual concentration



			Number of stations by classes of concentration						
NUTS ID	NUTS NAME	High trophic status	<2 mg/l	[2,10) mg/l	[10,25) mg/l	[25,40) mg/l	[40,50) mg/l	>=50 mg/l	Unclassified
LU00	Luxembourg	12	0	1	8	3	0	0	0
	Total	**12**	**0**	**1**	**8**	**3**	**0**	**0**	**0**

Figure 14. The SW monitoring stations with eutrophic status versus the average NO3 annual concentration.

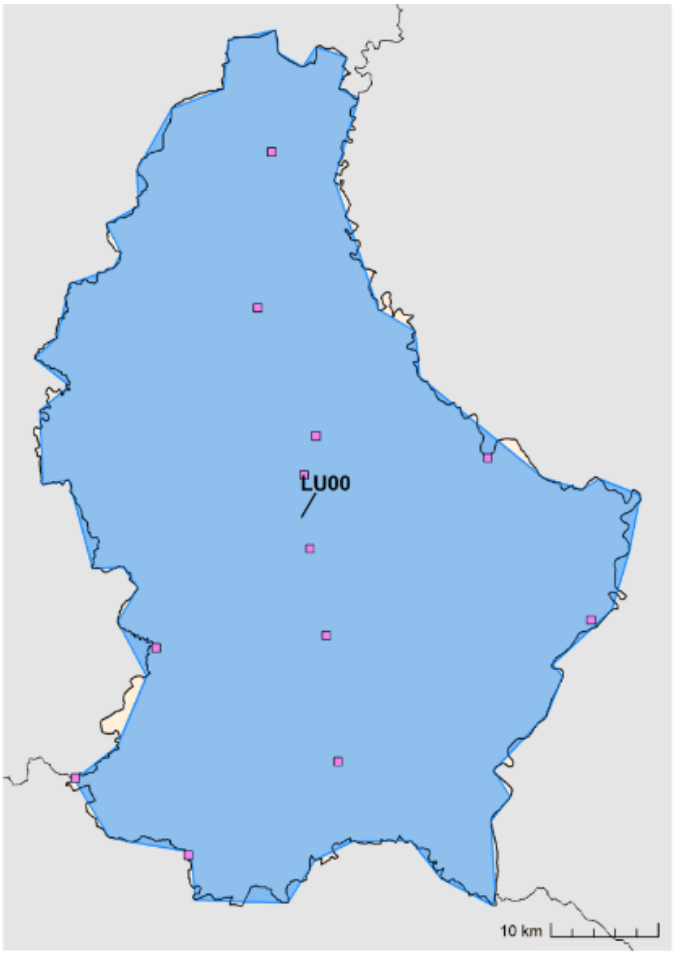
The analysis shows all the surface water (SW) monitoring stations with the highest trophic status and the corresponding value of NO3 concentration. The map shows the spatial distribution of these points, and the table reports the number of stations with measurements with highest trophic status and the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

The eutrophication evaluation has been put in place since 2005 and is based on nitrate, orthophosphate, total phosphorus concentration with the same classification criteria for all surface waters. The impact on the potential eutrophication for each determinant was evaluated, and the final assessment of eutrophication was done using the worst scoring parameter. Nitrate leads to eutrophication in only 3 of the sixteen monitoring stations while total phosphorus is deemed responsible for eutrophication in 9 stations (out of sixteen). A total of 12 stations are classified as eutrophic. An alternative method, the Kubiniok method has been put in place since 2015. In addition to the chemical parameters nitrate, ortho-phosphate and total phosphorus, this method introduces biological elements like macrophytes and diatoms. According to this classification 10 out 16 stations are classified as eutrophic. The two methods agreed on the classification for 14 stations.

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	12	4	0
5	Lake/reservoir water	0	0	0
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	**12**	**4**	**0**

Surface Water quality hotspot



NUTS ID	NUTS NAME	High trophic status	>=40 and < 50 mg/l incr.trend	>=50 mg/l
LU00	Luxembourg	12	0	0
	Total	**12**	**0**	**0**

Figure 15. 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 displays 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.
In Luxembourg, none of the surface water monitoring stations exceed the limit of 40 mg/l.

Measures in the Action Programme

The Code of Good Agricultural Practice was defined by national legislation in 2000 and has been amended several times. During the recent years a greater number of water protection zones have been delimited. In these areas stricter restrictions often apply. Recently, out of the framework of the Nitrates Directive, but with an impact on water quality, new rules were introduced in 2018 establishing protected biotopes and habitats specifically targeted certain types of permanent grassland, stagnant water with a minimum surface area of 25 m^2, springs and natural rivers. For example, fertilization is prohibited within a radius of ten meters from a spring and for ten meters on either side of the banks of the natural stream.

Controls

Administrative controls are conducted in the framework of CAP cross compliance. About 85 yearly controls were performed for this current reporting period. No information was given concerning the number of non-compliance. The report mentions about 11 cases of accidental spills of manure and of silage leachate in the neighbouring water courses.

Designation of NVZ

Luxembourg has adopted a whole territory approach.

Forecast of Water Quality

After a careful evaluation of the monitoring data, the report by Luxemburg concludes that technical improvements including manure spreading as well as the environmental legislation should lead to a significant improvement of water quality. Additionally, the enhancement of public farm advisory services may also contribute considerably to an improvement of water quality. It is expected that the ongoing monitoring along with modelling (already in place or being developed) will help explain the lack of results in certain areas.

Summary

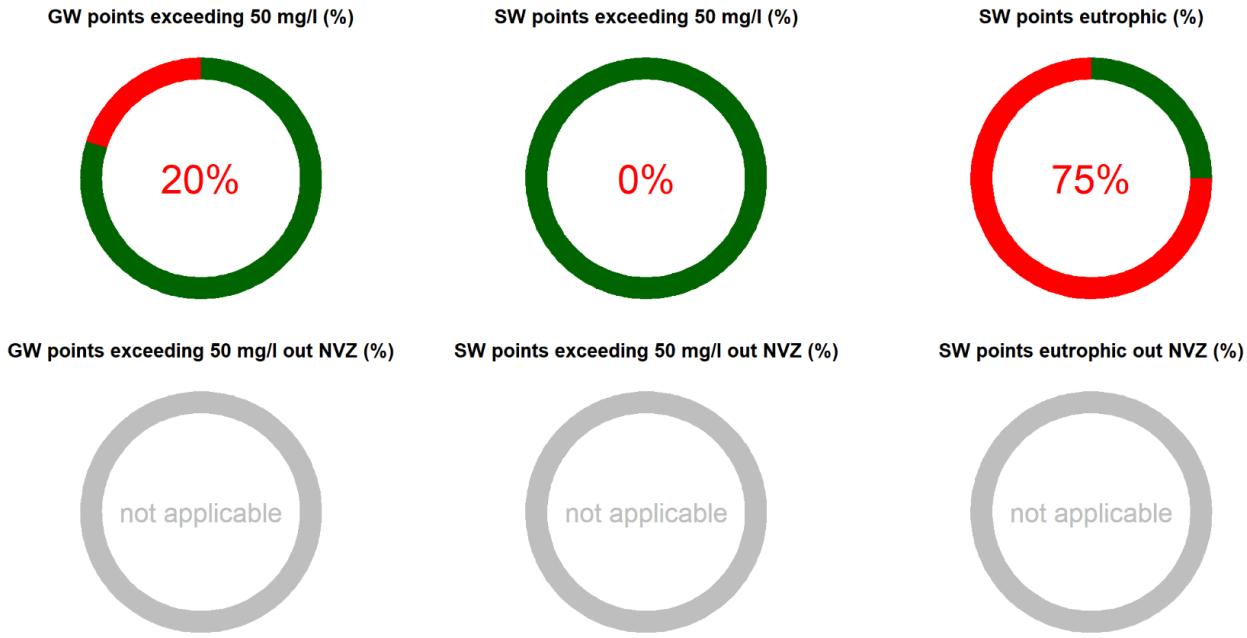


Figure 16. The summary plot for the period 2016-2019

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

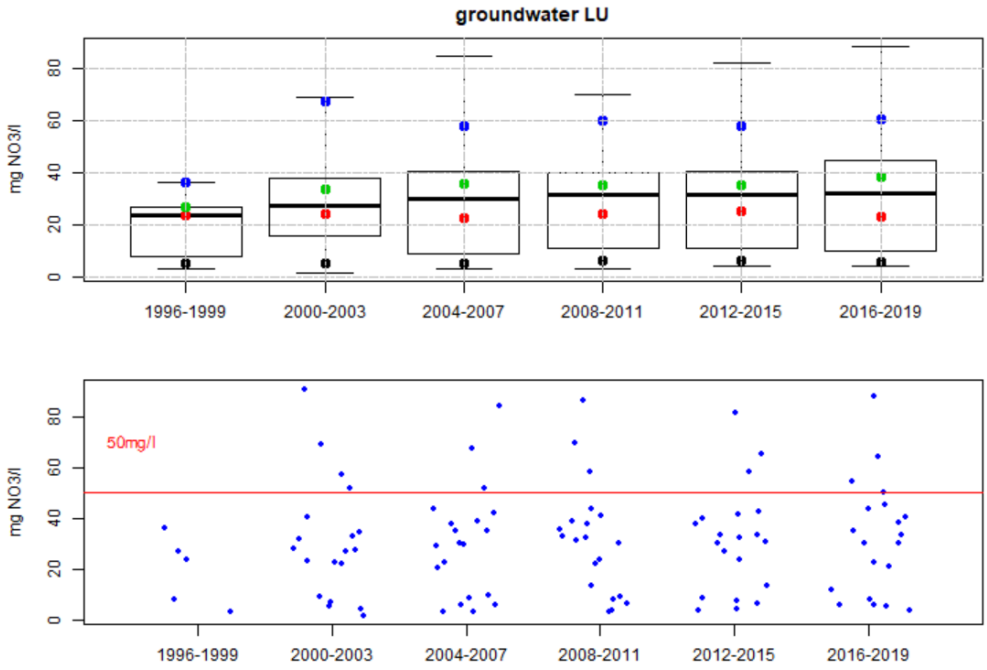


Figure 17. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period for groundwater stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

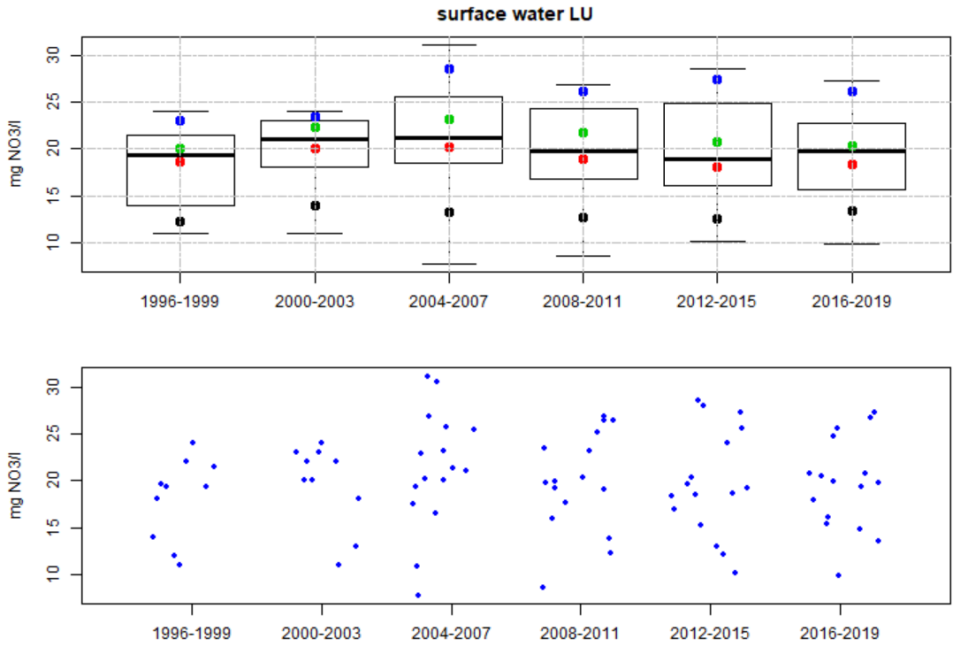


Figure 18. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period for surface water stations. The blue, red, green and black dots represent the mean of the fourth third, second and first quartiles, respectively.

Conclusions and recommendations

Livestock pressure in Luxemburg is above the EU average. The nitrogen and phosphorus surplus are not available for 2016-2019.

There is a well elaborated network of monitoring stations. Luxemburg has a high number of groundwater monitoring stations with nitrate concentrations above 50 mg/l and a high number of monitoring stations have an increasing trend. A very high number of the surface waters are found to be eutrophic.

Luxembourg updated its action programme dates in 2018.

The Commission recommends that Luxembourg reinforces its action programme to better address of ground waters polluted hot spots and surface waters eutrophication where agriculture pressure is significant.