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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}

EN EN

Pressure from Agriculture

Spain's utilized agricultural area amounts to 23.8 Mha, representing 47.7% of the total land area and has remained stable since 2010. The major outputs of the agricultural industry include in a decreasing order fruits (19.4%), vegetables and horticultural plants (18%), other crops/crop products (18.6%).
Eurostat

Major land use statistics for Spain

Table 1.Utilized agricultural area (abbreviated as UAA)

Spain	2005	2007	2010	2013	2016
Utilised agricultural area UAA (1000 ha)	NA	25003	23719	23495	23816
arable land (1000 ha)	NA	13197	12690	12311	12475
permanent grass (1000 ha)	NA	6820	6331	6390	6471
permanent crops (1000 ha)	NA	4810	4658	4682	4757
kitchen gardens (1000 ha)	NA	109	NA	111	114

Note:
Eurostat (FSS)

Spain's arable land has remained stable since 2010. Both the permanent grassland and crops have remained stable since 2010.

Animal distribution in Spain

Spain's live bovines and pigs have increased since 2013, while live poultry has remained stable. The livestock density index has remained stable since 2010 and is lower than the EU average of 0.8.

Table 2. Livestock statistics

Spain	2005	2007	2010	2013	2016
Livestock index	0.58	0.58	0.62	0.62	0.62
dairy cows (10^6 heads)	1.02	0.90	0.84	0.84	0.83
live bovines (10^6 heads)	6.46	6.58	6.08	5.80	6.32
live pigs (10^6 heads)	24.89	26.06	25.70	25.50	29.23
live poultry (10^6 heads)	NA	NA	200.91	205.82	203.11

Note:
Eurostat (FSS)

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

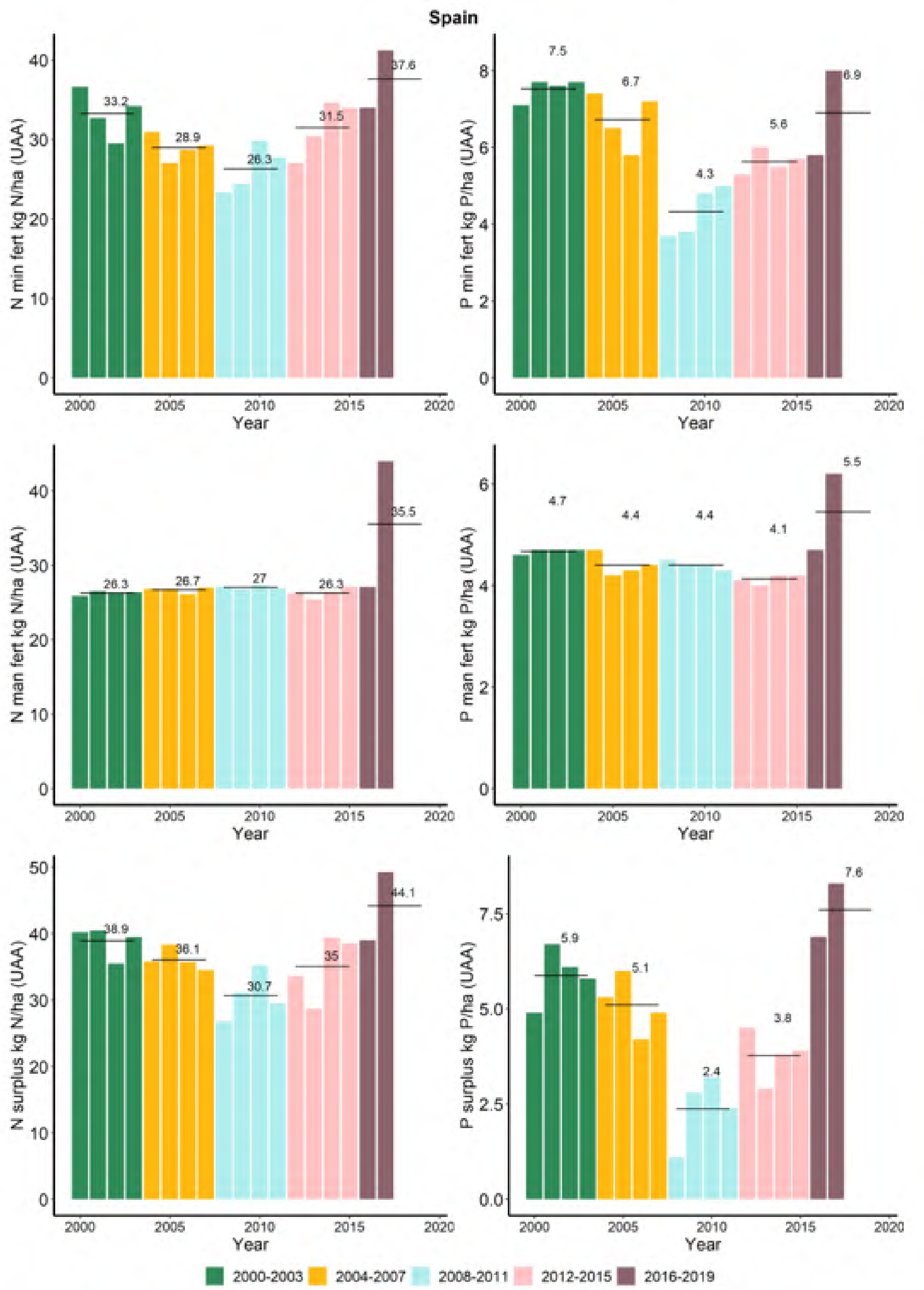


Figure 1. N and P fertilizers and gross surplus (kg/ha)

The gross nitrogen and phosphorus surpluses originate from EUROSTAT data for the years 2000-2017. N and P mineral fertilizers increased from the last reporting periods. N and P manure also increased from the last reporting period. The nitrogen and phosphorus surplus increased in average significantly from the last reporting period. In the plots: N/P min and N/P man are respectively the N/P mineral fertilizers and N/P manure.

Livestock unit - LSU /ha

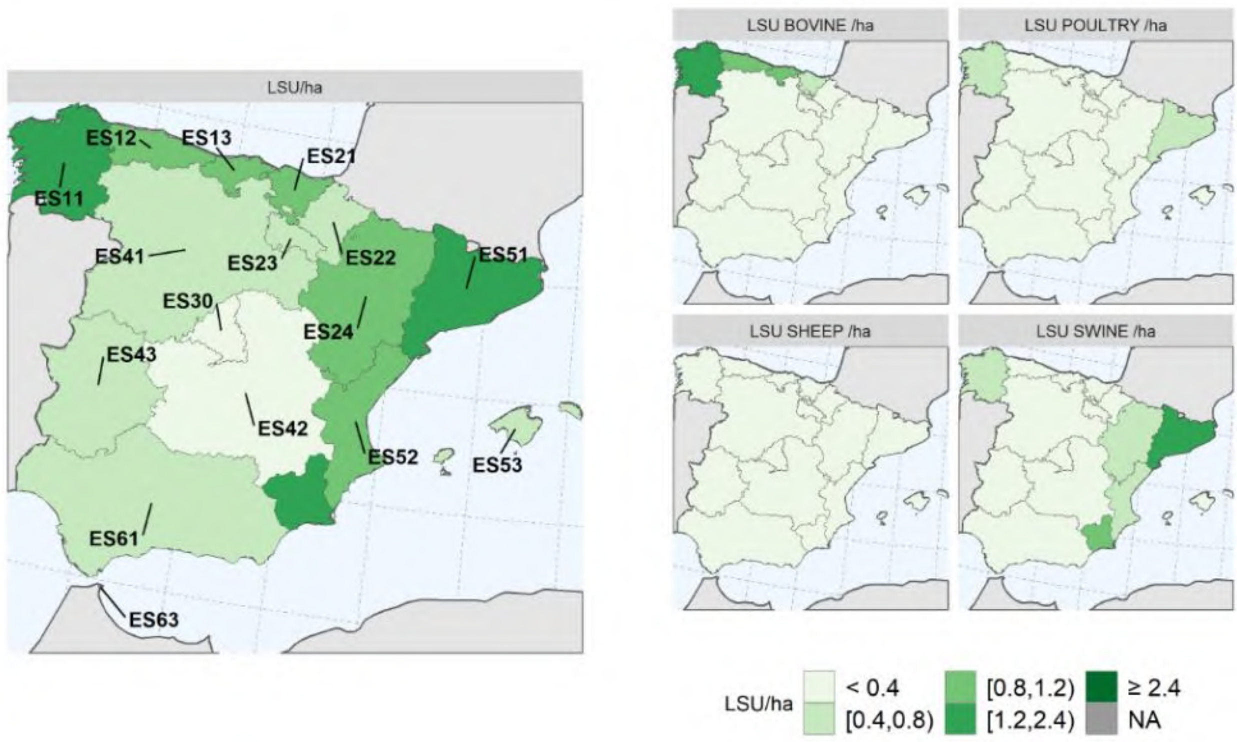


Figure 2. Map of livestock unit distribution, year 2016 (Source: Eurostat, February 2021)

Animal production is concentrated in the northern and eastern parts of the Spain (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 networks are managed in accordance with the complex Spanish framework of competences, by both the State administration, via the River Basin Confederations, and the various Autonomous Communities.

The water quality evaluation required by the Nitrates Directive has been carried using information collected from 9085 monitoring points that were active during the period 2016-2019. During the four-year period 2016-2019, data are available on the nitrate concentration of groundwaters for the 94.6 % of the stations.

The surface water monitoring data are available for 89.8 % of the stations of the network. For these stations it has been possible to calculate the trends for all of them. In addition, data available on trophic status represents 22.3 % of the stations. In Spain, the trophic state of water bodies in the river category is not assessed since, due to the characteristics of their regime and flow, with a high renewal rate that does not favour the growth of a representative potamoplankton community, it has not been considered adequate and, therefore, their assessment has been excluded from the WFD intercalibration exercise.

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	2669	1325	2096	1042	1278	1997
1a	Phreatic groundwater (deep) 5-15 m	475	345	409	268	316	354
1b	Phreatic groundwater (deep) 15-30 m	236	172	247	125	168	230
1c	Phreatic groundwater (deep) >30 m	1274	2109	1215	756	1133	1125
2	Captive groundwater	12	56	51	12	46	51
3	Karstic groundwater	112	125	139	112	94	136
9	Not specified	0	0	0	0	0	0
	Total	**4778**	**4132**	**4157**	**2315**	**3035**	**3893**

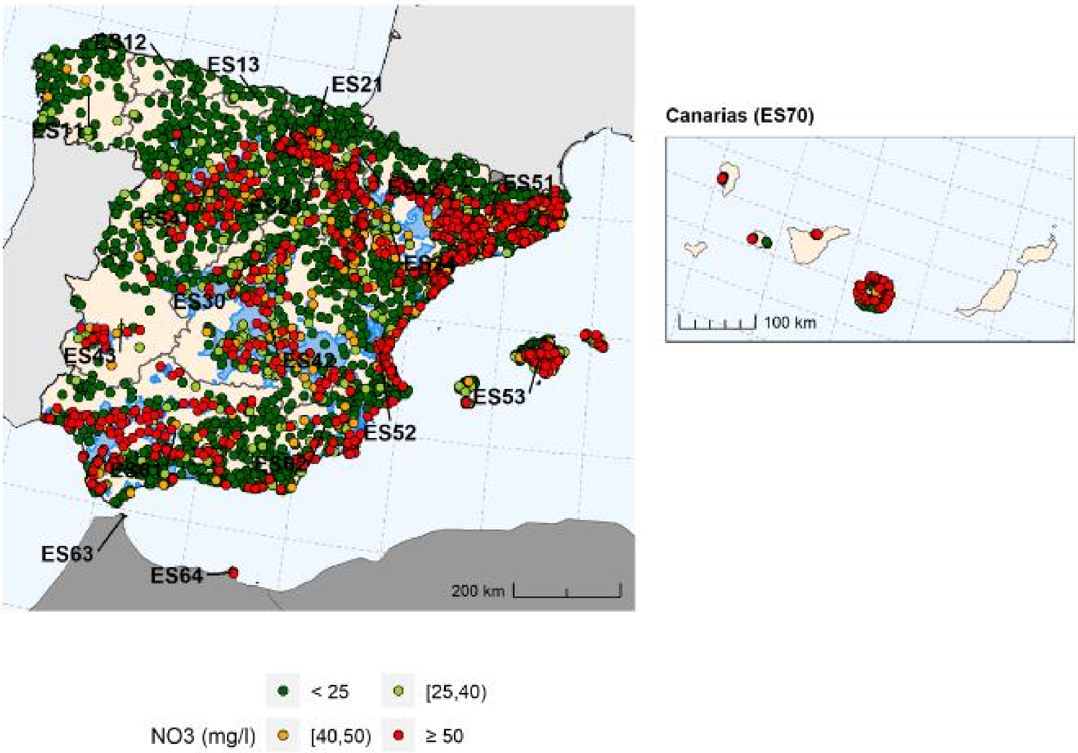
Surface water quality monitoring network

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	3065	3305	2922	1712	2489	2919	3035	13	0
5	Lake/reservoir water	665	598	603	360	427	598	475	429	465
6	Transitional water	212	136	238	94	153	106	246	209	204
7	Coastal water	419	114	356	177	220	174	407	264	351
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	**4361**	**4153**	**4119**	**2343**	**3289**	**3797**	**4163**	**915**	**1020**

Groundwater Quality

Groundwater average annual nitrate concentration



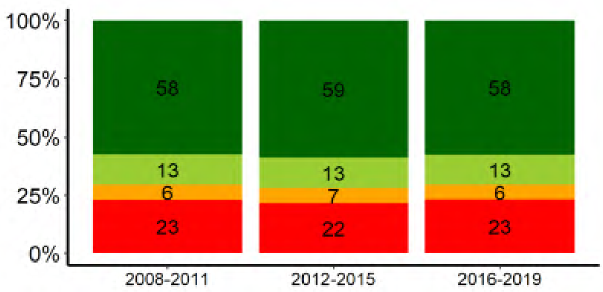


Figure 3. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). In the map in blue the NVZ.

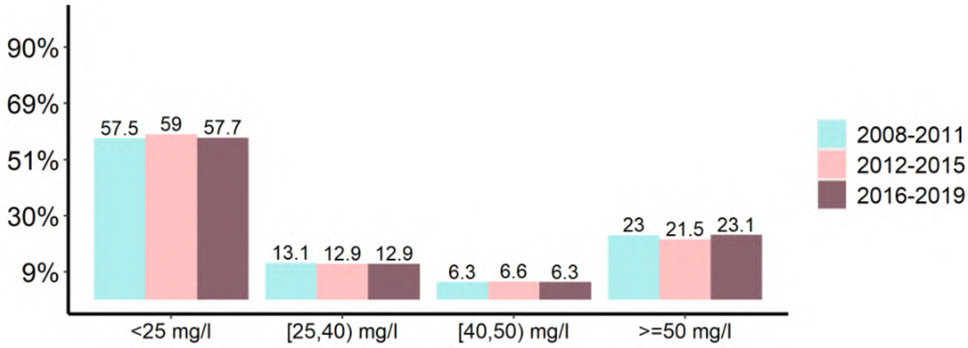


Figure 4. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis).

Groundwater average annual nitrate concentration trend

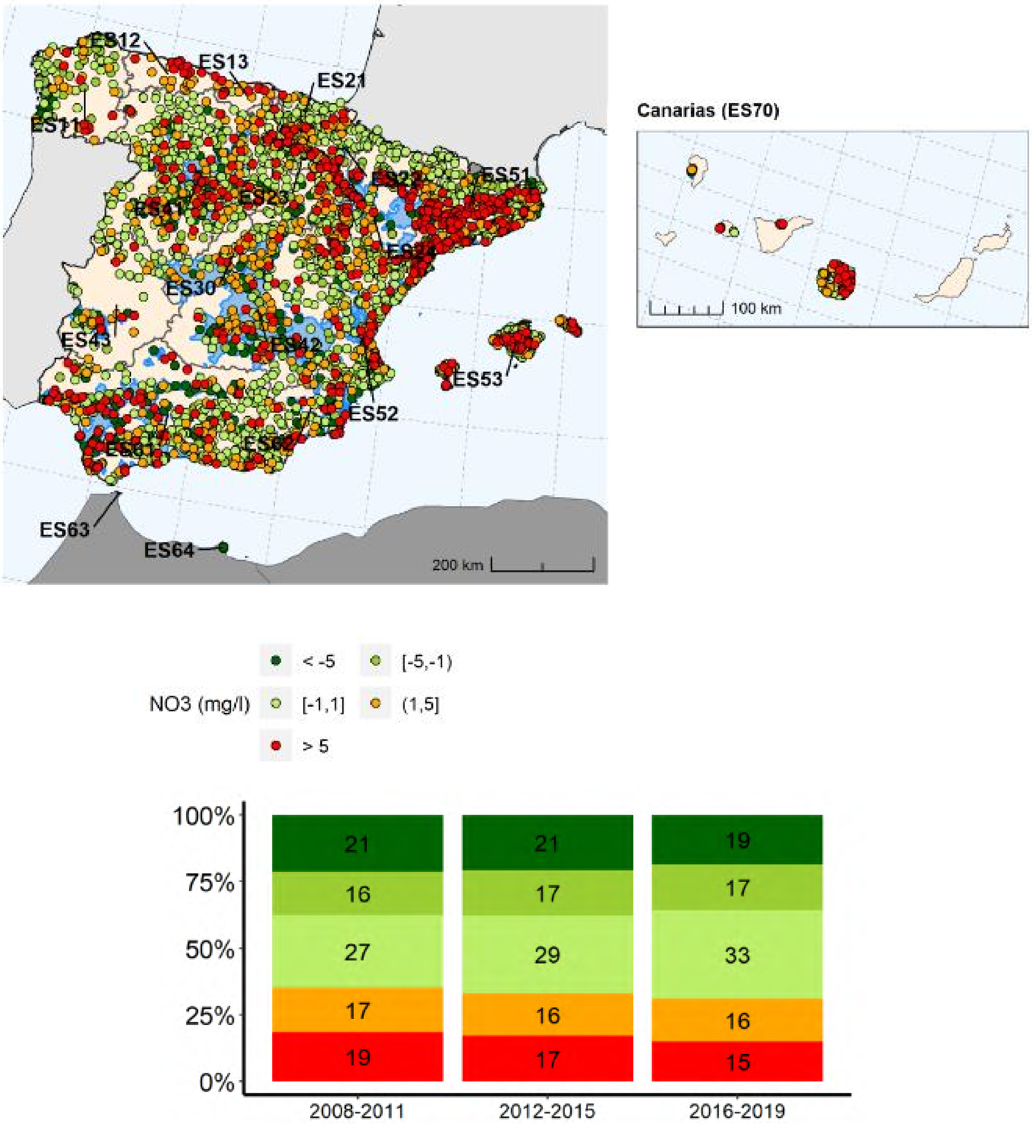


Figure 5. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). In the map in blue the NVZ.

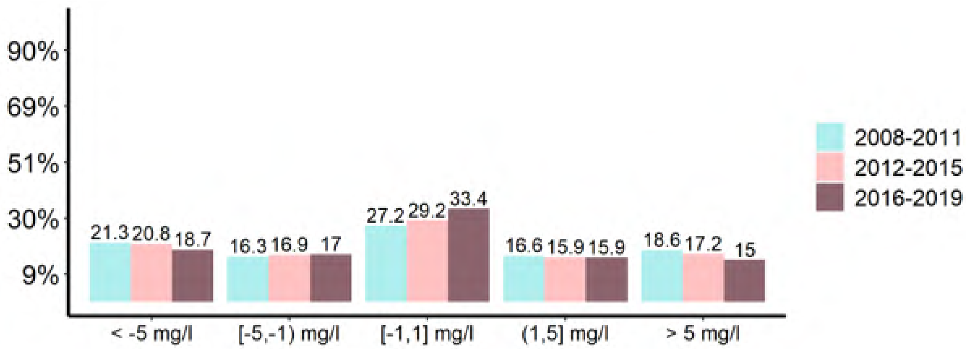
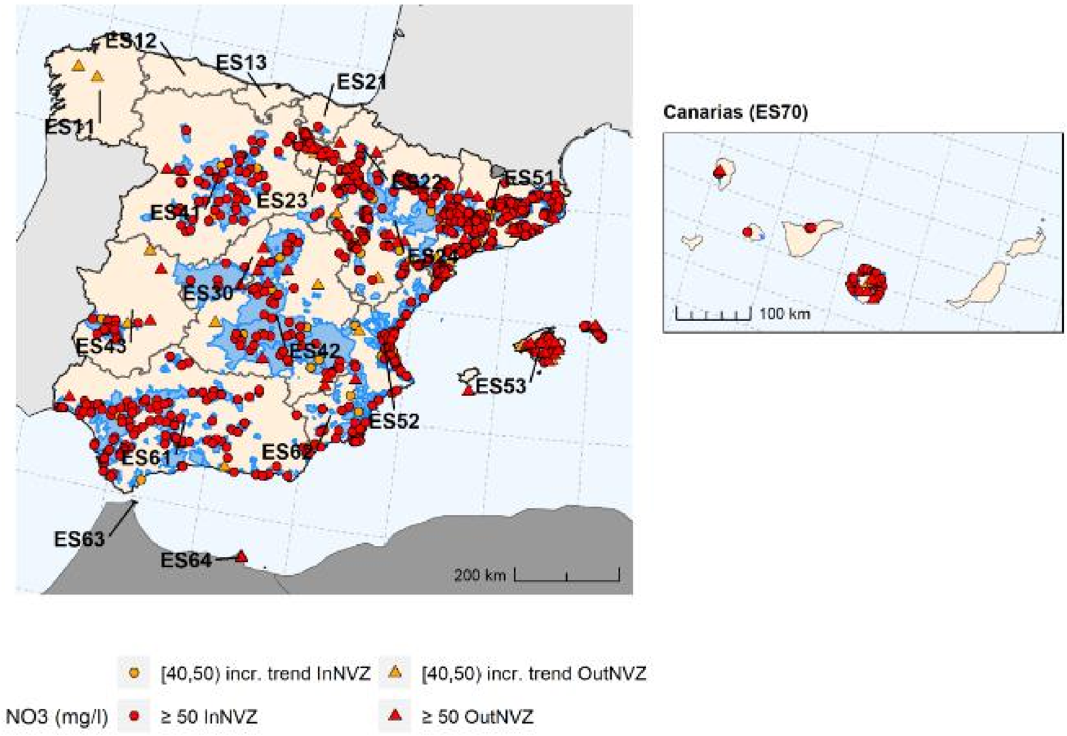


Figure 6. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis).

Groundwater hotspot



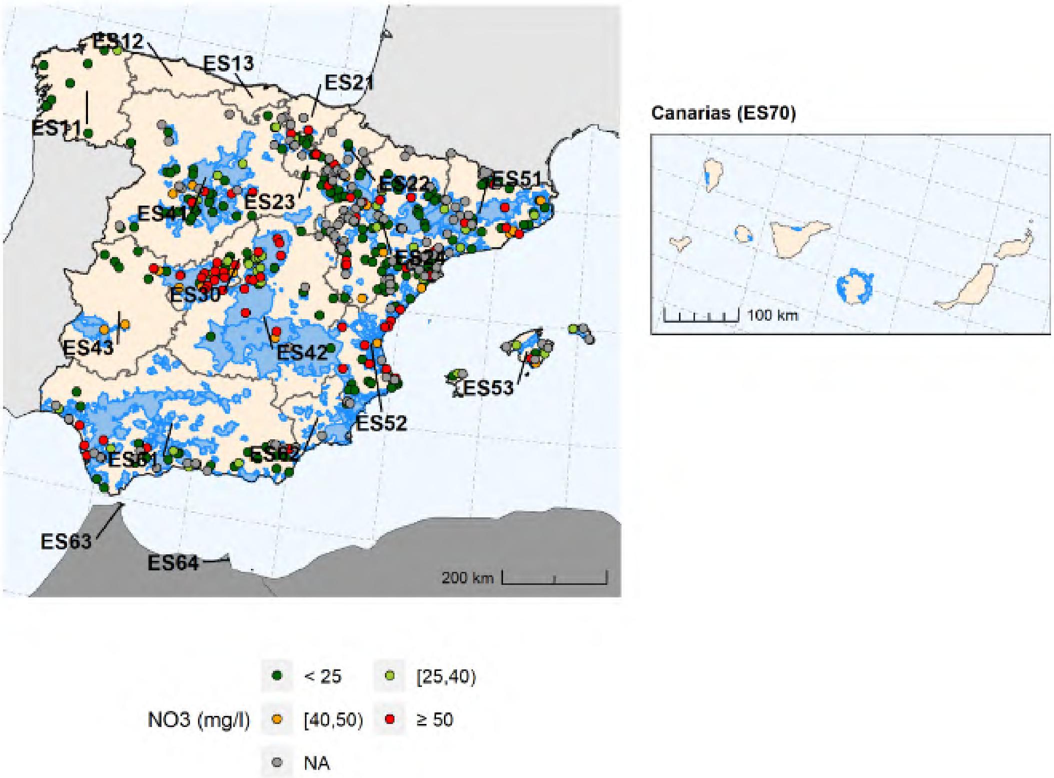
		>=40 and < 50 mg/l incr.trend		>=50 mg/l	
NUTS ID	NUTS NAME	InNVZ	OutNVZ	InNVZ	OutNVZ
ES11	Galicia	0	2	0	0
ES21	País Vasco	0	0	17	2
ES22	Comunidad Foral de Navarra	2	0	25	3
ES23	La Rioja	2	1	28	6
ES24	Aragón	17	1	91	4
ES30	Comunidad de Madrid	0	1	3	4
ES41	Castilla y León	3	2	74	2
ES42	Castilla-La Mancha	9	2	52	5
ES43	Extremadura	1	2	14	2
ES51	Cataluña	20	4	274	7
ES52	Comunidad Valenciana	7	1	48	0
ES53	Illes Balears	7	5	66	19
ES61	Andalucía	7	2	116	1
ES62	Región de Murcia	2	0	27	1
ES64	Ciudad Autónoma de Melilla	0	0	0	2
ES70	Canarias	1	3	62	6
	Total	**78**	**26**	**897**	**64**

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

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 validity 1). Only the NUTS of interest are reported.

European Commission

Groundwater stations removed



Station Type	Description	Number of removed stations		
		total removed	with measurements	with trends
0	Phreatic groundwater (shallow): 0-5 m	276	144	144
1a	Phreatic groundwater (deep) 5-15 m	50	47	42
1b	Phreatic groundwater (deep) 15-30 m	21	15	15
1c	Phreatic groundwater (deep) >30 m	140	137	118
2	Captive groundwater	3	3	2
3	Karstic groundwater	1	1	1
9	Not specified	0	0	0
	Total	**491**	**347**	**322**

Figure 8. GW removed stations map (top graph) and distribution by groundwater type (lower graph). In the map in blue the NVZ.

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. For many removed stations there is not the correct corresponding station code in the previous reporting period.

Surface Water Quality

Surface water average annual nitrate concentration

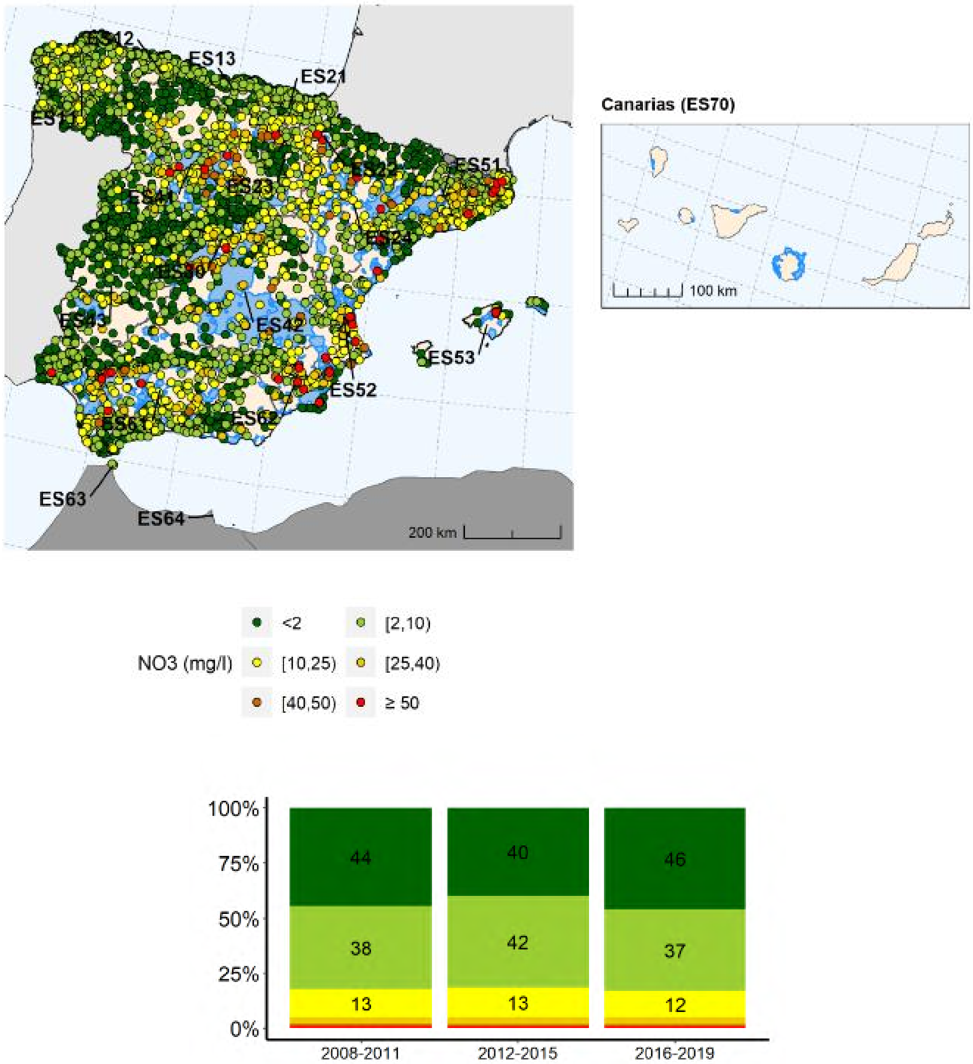


Figure 9. Spatial distribution of average NO3 annual concentration (map) and corresponding percentage of monitoring points per classes of concentration by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ

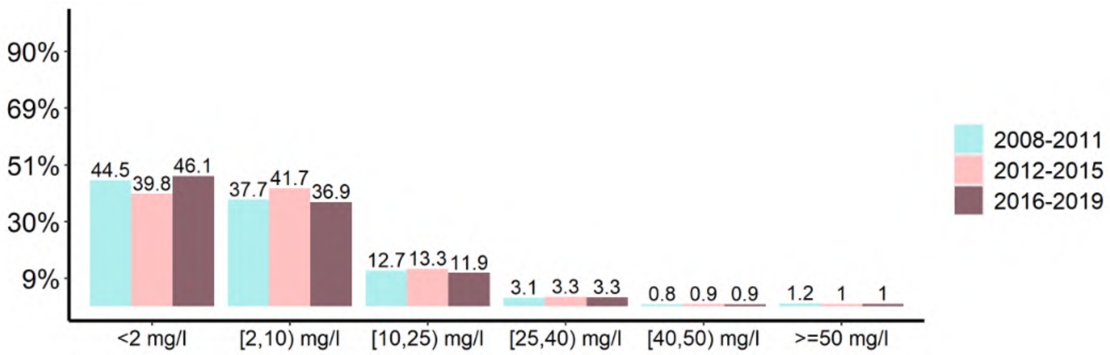


Figure 10. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual concentration (x axis)

Surface water average annual nitrate concentration trend

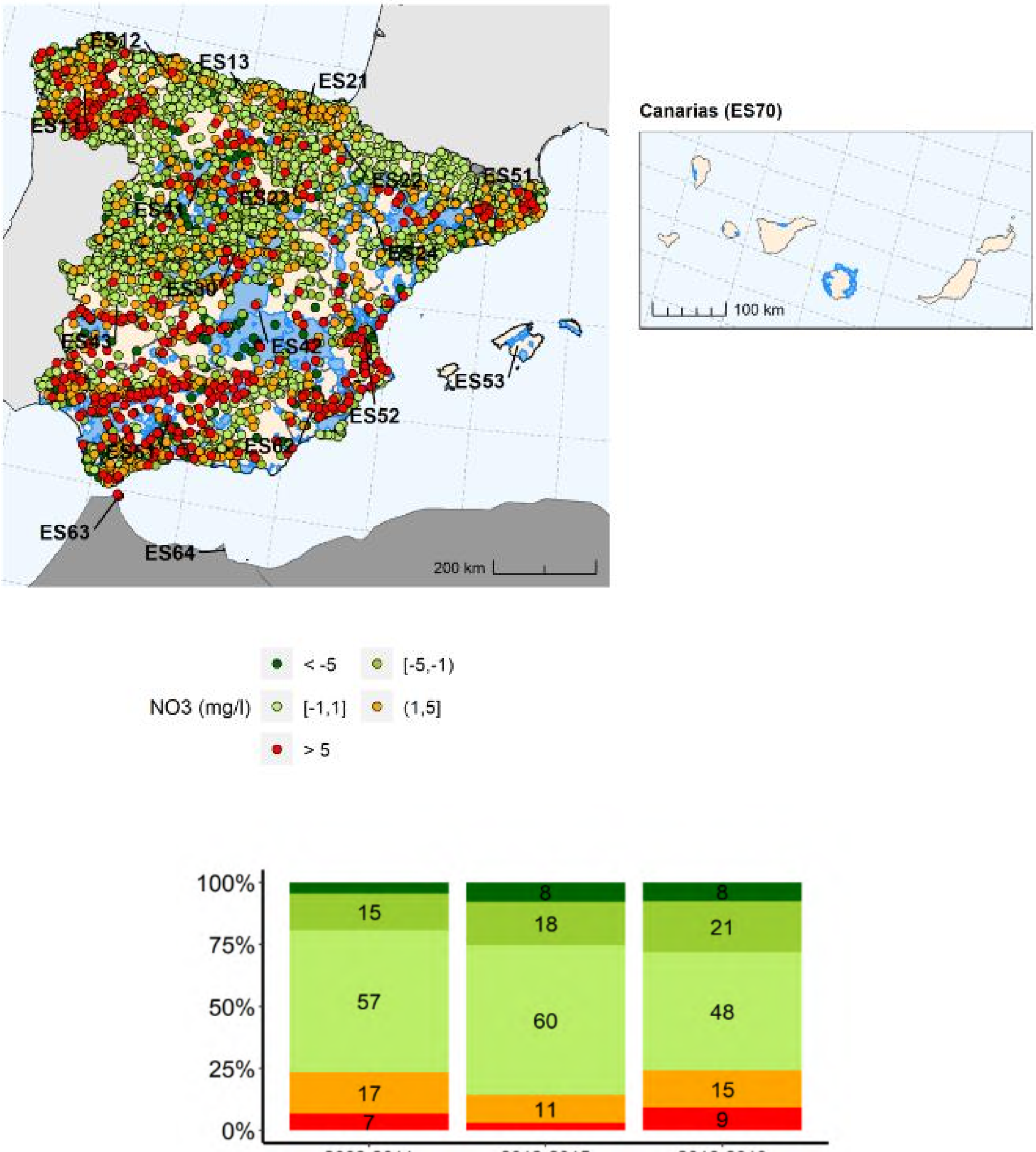


Figure 11. Spatial distribution of average NO3 annual trends (map) and corresponding percentage of monitoring points per classes of trends by reporting period (x axis). The percentages below 5% are not labelled, see the next plot for more information. In the map in blue the NVZ

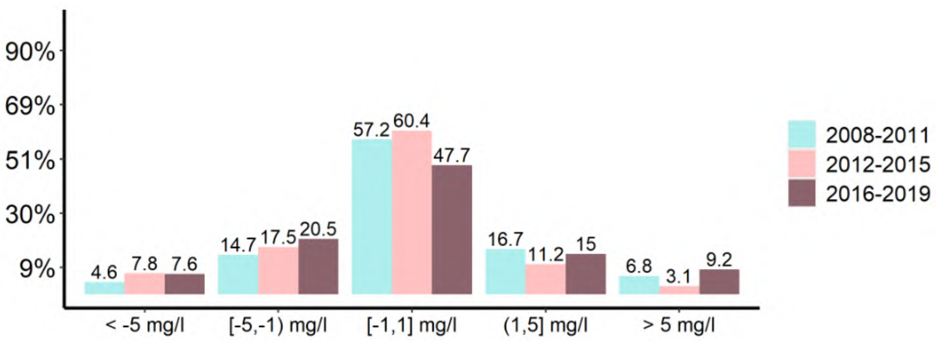
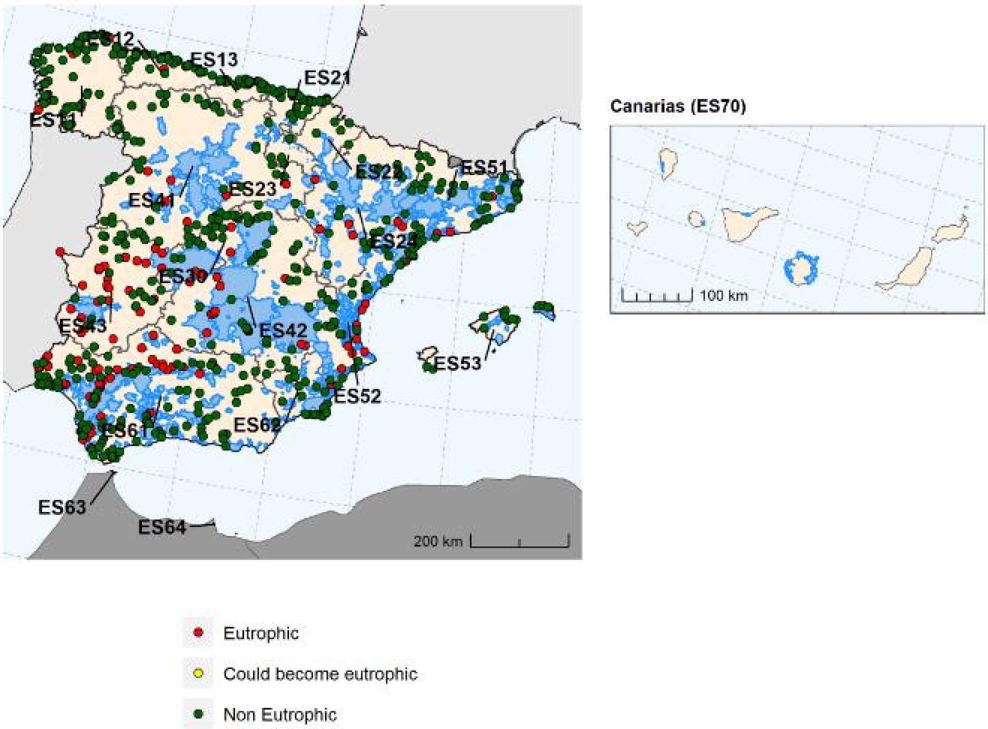


Figure 12. Comparison of percentage of monitoring points in the three reporting periods by classes of average NO3 annual trends (x axis).

Surface Water Eutrophication



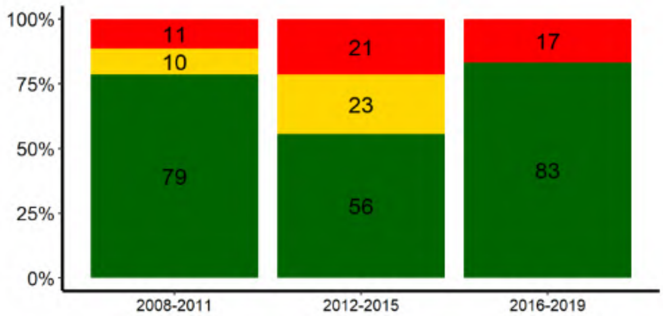


Figure 13. Spatial distribution of eutrophic status (map) and corresponding percentage of monitoring points per classes of status by reporting period (x axis). In the map in blue the NVZ.

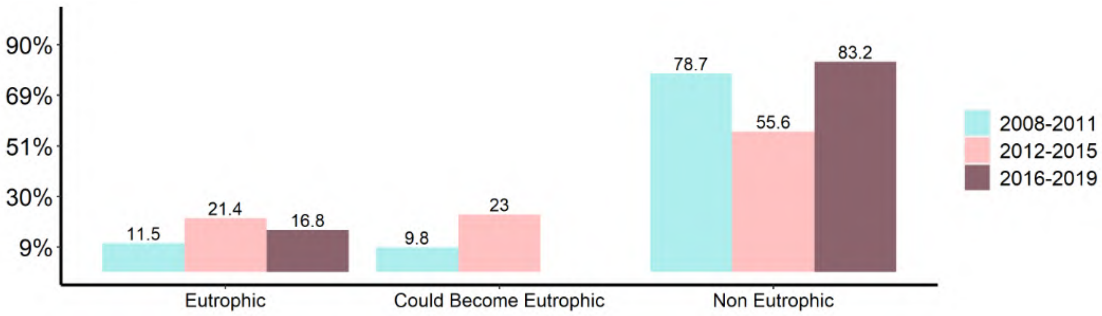
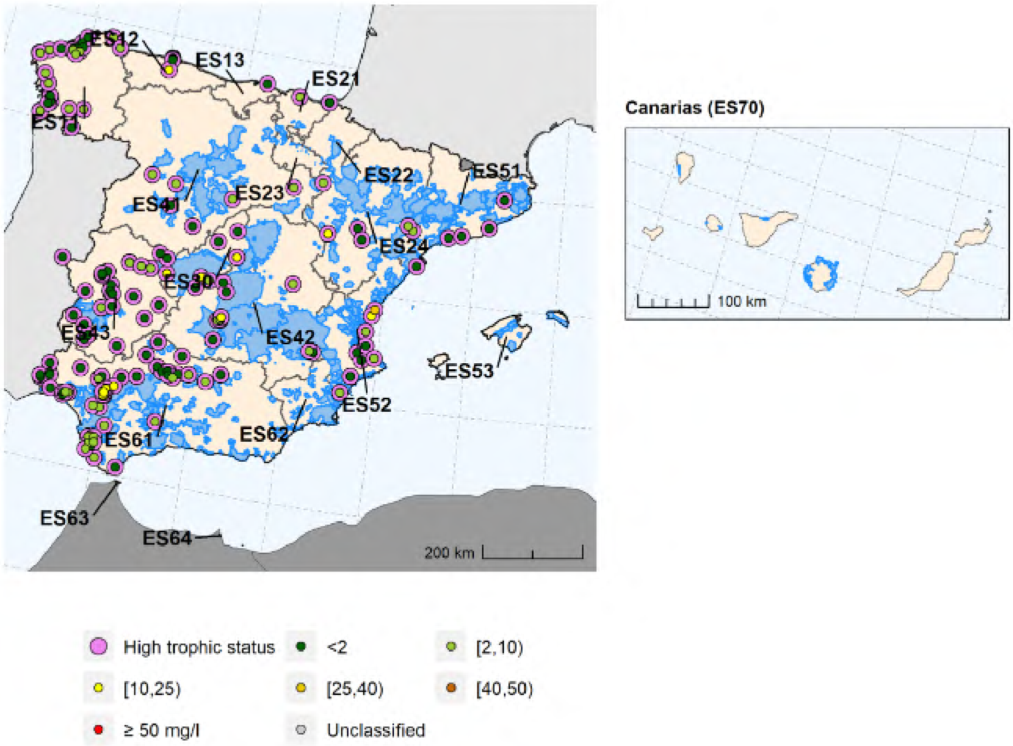


Figure 14. Comparison of percentage of monitoring points in the three reporting periods by classes of status (x axis).

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
ES11	Galicia	5	2	3	0	0	0	0	0
ES12	Principado de Asturias	1	0	0	1	0	0	0	0
ES24	Aragón	5	2	2	1	0	0	0	0
ES30	Comunidad de Madrid	3	2	0	1	0	0	0	0
ES41	Castilla y León	6	2	4	0	0	0	0	0
ES42	Castilla-La Mancha	18	7	8	3	0	0	0	0
ES43	Extremadura	23	19	4	0	0	0	0	0
ES51	Cataluña	4	3	1	0	0	0	0	0
ES52	Comunidad Valenciana	11	4	4	2	1	0	0	0
ES61	Andalucía	32	18	11	3	0	0	0	0
NO_NUTS	SALINE	63	32	27	4	0	0	0	0
	Total	**171**	**91**	**64**	**15**	**1**	**0**	**0**	**0**

Figure 15. The SW monitoring stations with eutrophic status versus the average NO3 annual concentration. In the map in blue the NVZ

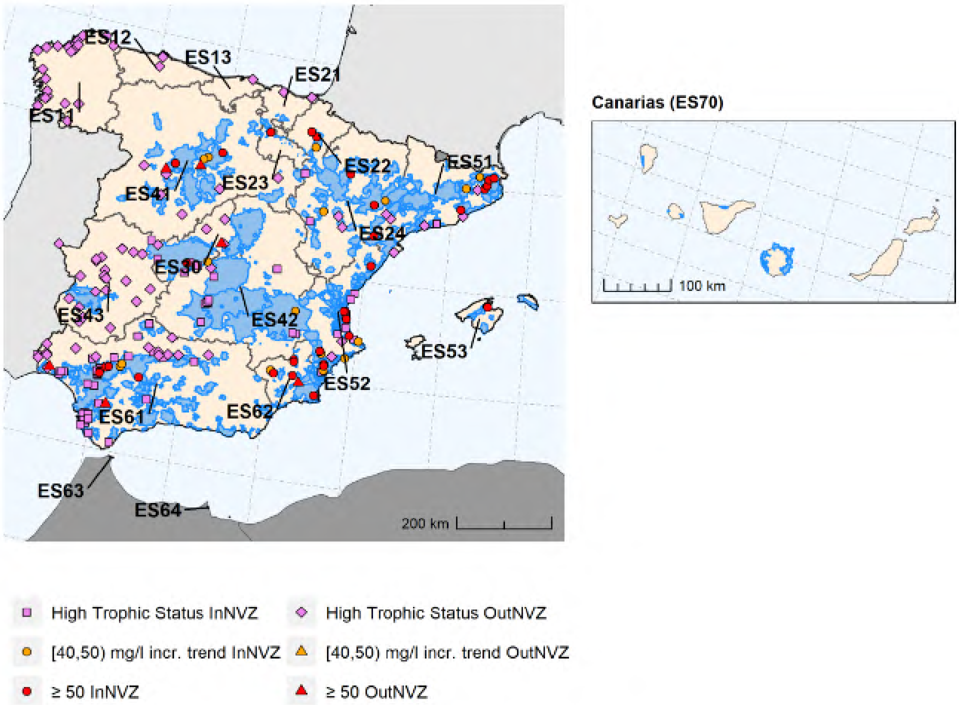
The analysis shows all the SW monitoring stations with the highest trophic status and the corresponding value of NO3 concentration. The map shows the spatial distribution of these points, and the table reports the number of stations with measurements with highest trophic status and the corresponding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

As a general rule, the ecological status of WFD water bodies has been consulted, in relation to water bodies with nutrient-related pressures, as well as the key indicators in the process and how closely they are linked with eutrophication.
The OECD criteria for the assessment of trophic status have then been applied. An attempt has been made to apply as many variables as possible, and not only chlorophyll a (taking the summer chlorophyll a value as the maximum value), i.e. assessing the rest of the parameters indicated by the method (essentially turbidity and phosphorus concentration). In some cases, only chlorophyll a was taken into account because the other parameters were considered supportive and raised doubts about their specific interpretation in each case.
To provide support, in case of doubt, other methodologies have also been applied, such as the Carlson Trophic Status Index (TSI), in accordance with the amendments made by Aizaki (1981), which uses as variables the annual average Secchi disk depth values (Sec, m) and the surface concentrations of Total Phosphorus (PT, mg/m3) and chlorophyll a (Chla, mg/m3).
Based on these values, a final assessment of the results obtained has been carried out, by expert judgement, reviewing and updating the value assigned in the eutrophication diagnosis reporting database at all points in the district.
In the case of the coastal and transitional waters of the Autonomous Community of Galicia, the water bodies with a poor or bad status, in accordance with the WFD, or with problem areas, in accordance with the OSPAR Convention, have been classified as eutrophic.
It should be noted that the methodology for assessing eutrophication has changed in this four-year period compared to previous four-year periods. Therefore, comparison of eutrophication data from the previous four-year periods with the current one should be made with caution.

		Number of stations with Trophic status		
Station Type	Description	Eutrophic	Could become eutrophic	Non Eutrophic
4	River water	0	0	0
5	Lake/reservoir water	108	0	357
6	Transitional water	55	0	149
7	Coastal water	8	0	343
8	Marine water	0	0	0
9	Not specified	0	0	0
	Total	**171**	**0**	**849**

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

Surface Water quality hotspot

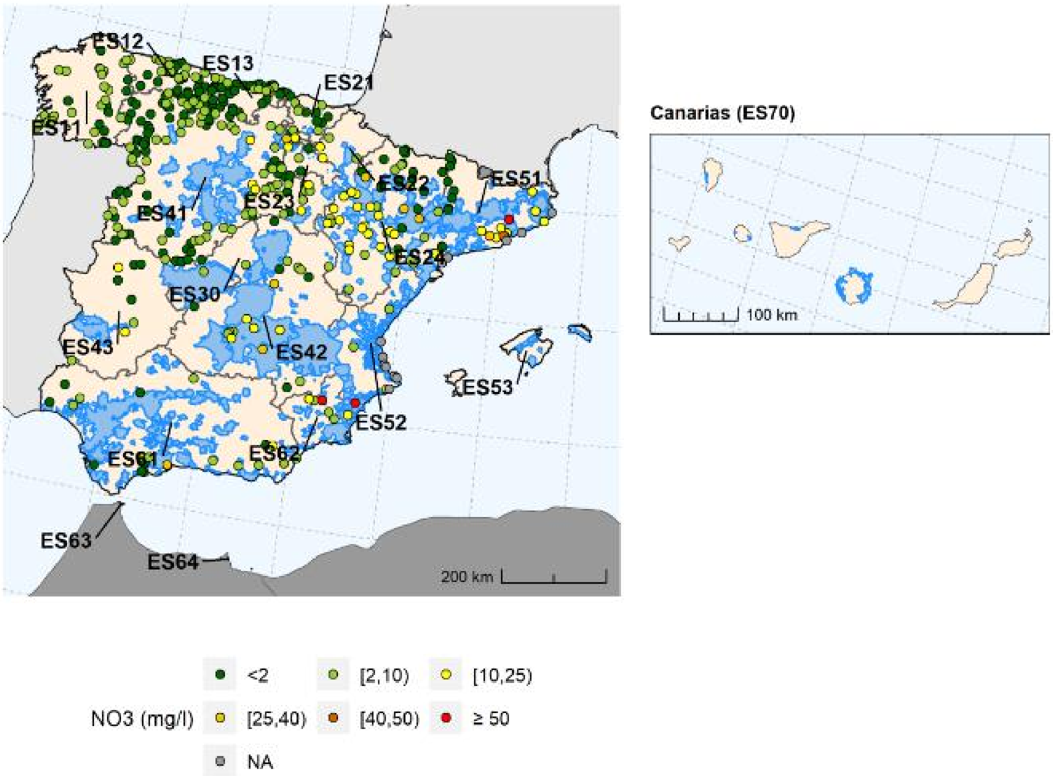


NUTS ID	NUTS NAME	High trophic status InNVZ	High trophic status OutNVZ	>=40 and < 50 mg/l incr.trend InNVZ	>=40 and < 50 mg/l incr.trend OutNVZ	>=50 mg/l InNVZ	>=50 mg/l OutNVZ
ES11	Galicia	0	5	0	0	0	0
ES12	Principado de Asturias	0	1	0	0	0	0
ES22	Comunidad Foral de Navarra	0	0	1	0	2	0
ES23	La Rioja	0	0	0	0	1	0
ES24	Aragón	2	3	2	0	3	0
ES30	Comunidad de Madrid	0	3	1	0	0	1
ES41	Castilla y León	0	6	2	0	2	2
ES42	Castilla-La Mancha	16	2	1	0	1	0
ES43	Extremadura	0	23	0	0	0	0
ES51	Cataluña	1	3	2	0	5	0
ES52	Comunidad Valenciana	9	2	4	0	10	0
ES61	Andalucía	19	13	2	0	5	2
ES62	Región de Murcia	0	0	1	0	5	1
NO_NUTS	SALINE	23	40	0	0	2	0
	Total	**70**	**101**	**16**	**0**	**36**	**6**

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. In the map in blue the NVZ.

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 validity 1). 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	361	361	199	0
5	Lake/reservoir water	36	36	15	27
6	Transitional water	6	5	6	6
7	Coastal water	53	20	53	53
8	Marine water	0	0	0	0
9	Not specified	0	0	0	0
	Total	**456**	**422**	**273**	**86**

Figure 17. SW removed stations map (top graph) and distribution by surface water type (lower graph). In the map in blue the NVZ.

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. For many removed stations there is not the correct corresponding station code in the previous reporting period.

Measures in the Action Programme

The 17 Autonomous Communities covering the whole territory of Spain established the CGAPs required by Article 4 of the Directive. In some cases, the first version of these CGAPs has been updated by the relevant legal instruments. The first CGAPs established by the Autonomous Communities were approved in the late 1990s and, since then, these instruments have been reviewed in Aragon, Asturias, Castile and Leon, Murcia, the Basque Country and Valencia. In the most recent four-year period 2016-2019, the CGAPs of Murcia and Valencia were updated. In Murcia, by means of Annex V to Law 1/2018, of 7 February 2018, on urgent measures to ensure environmental sustainability in the Mar Menor area. In Valencia, by means of Order 10/2018, of 27 February 2018, on the use of nitrogen fertilisers on farms in Valencia. In 2020, the Autonomous Community of Castile and Leon also approved Decree 5/2020, of 25 June 2020, designating the zones vulnerable to water pollution caused by nitrates from agricultural and livestock sources, and the CGAP was approved. Although this is an update after the four-year period, it is recorded to allow for a better assessment of the situation.

The degree of voluntary implementation of the CGAPs outside vulnerable zones is linked to a growing number of organic farms, conversion to that has been encouraged in recent years by the payment of aid that promotes better agri-environmental practices. In addition, the ecological conditions associated with the allocation of aid from the Common Agricultural Policy, together with the requirements of the Rural Development Programmes (EAFRD) to finance the start-up of new agricultural installations, are also examples that contribute to the implementation of good agricultural practices on a voluntary basis.

The Spanish Autonomous Communities have established and updated the corresponding APs. There are several draft publications in the process of adoption. The first official publications began in 2000 and a greater number of regulatory revisions were carried out in 2009. During the period 2016-2019, there have been amendments made in the Autonomous Communities of the Balearic Islands, Castile-La Mancha, Catalonia, Rioja, Murcia, Navarre and Valencia. In addition, adjustments to the action programmes of Aragon, the Canary Islands, Extremadura, Madrid, the Basque Country and, once again, Murcia are expected to be published shortly.

In all the Autonomous Communities, there is a lack of cost-effectiveness studies in relation to the implementation of the APs in the NVZ.

Controls

In the Autonomous Communities, except Galicia, Asturias and Cantabria, which have not designated any NVZ, nitrate pollution is monitored via the annual farm inspection. Inspections are carried out by the administrations of the Autonomous Communities, as part of the evaluation of the fulfilment of cross-compliance obligations set out under the European Common Agricultural Policy, with the average number of farms inspected nationally slightly over 4%.

Designation of NVZ

An update of the designation of vulnerable zones in Spain is ongoing. A draft version of the legislation in the process of being. The area covered by the vulnerable zones in Spain stands at 121 563.3 km2, which represents 24.0% of the national territory and which will rise to 122 965.67 km2 once the different designation rules that are currently being processed, increasing the percentage to 24.3%, are published.

Forecast of Water Quality

In Spain, forecast for the monitoring stations situated in groundwater bodies have been drawn up using to the PATRICAL (Precipitation-Contribution in Water Quality Integrated Network Sections) module developed by Pérez-Martín et al. (2014 and 2016). The model simulates the hydrological cycle and quality of the waters for medium-sized and large river basins (between 1 000 km2 and 500 000 km^2), and is integrated into a geographic information system (GIS).

The forecast for the evolution of water quality has been calculated for the monitoring station situated in groundwater bodies that exhibit the following features:

- Average or maximum nitrate concentration above 50 mg/l.
- Average or maximum nitrate concentration of between 40 and 50 mg/l and upward trend between the previous four-year period and the current period.

The results show that 1235 stations in groundwater bodies are polluted or at risk of pollution by nitrates, which represents 27.6% of the stations. 612 of them are expected to recover in 2021, with a further 82 stations expected to recover at the end of the cycle closing in 2027, which constitutes the limit set in the WFD for achieving the environmental targets. The remaining stations are expected to recover in future periods.

In the case of the stations outside of vulnerable zones that are not expected to recover by 2039, work will be carried out to include them in vulnerable zones so that they can benefit from the measures applied under the associated Action Programmes.

In the case of the 451 stations that, despite being in published or draft vulnerable zones, are not estimated to recover by 2039, additional measures will be examined to promote their recovery and will be included in the river basin management plans.

Summary

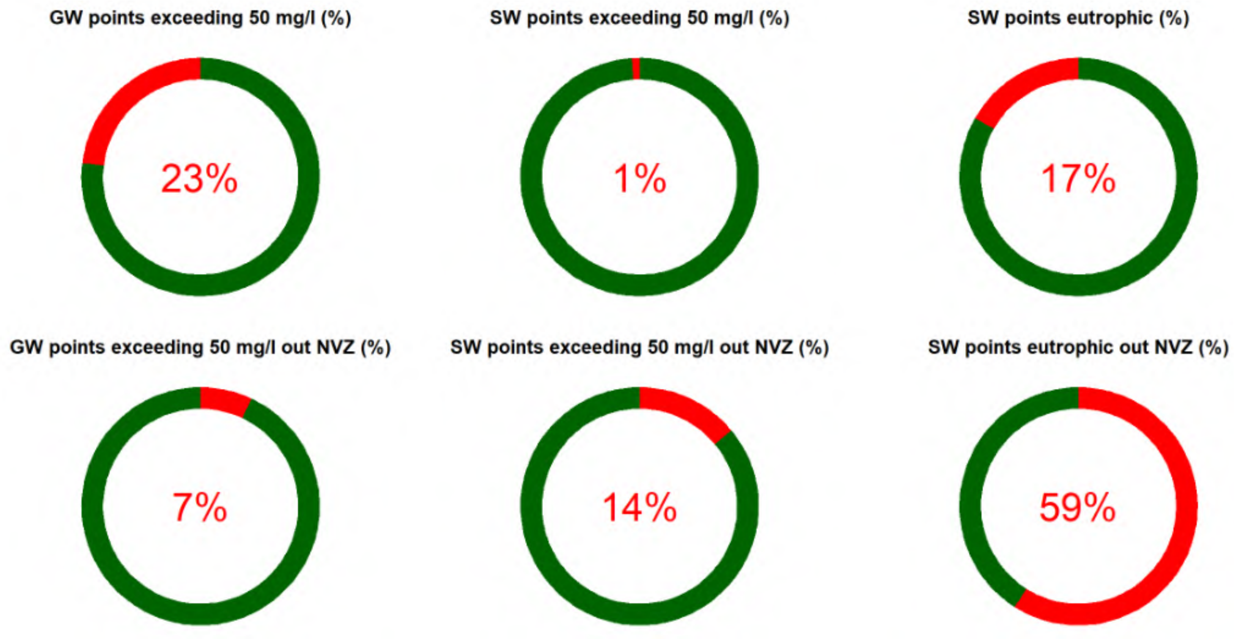


Figure 18. The summary plot for the period 2016-2019

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

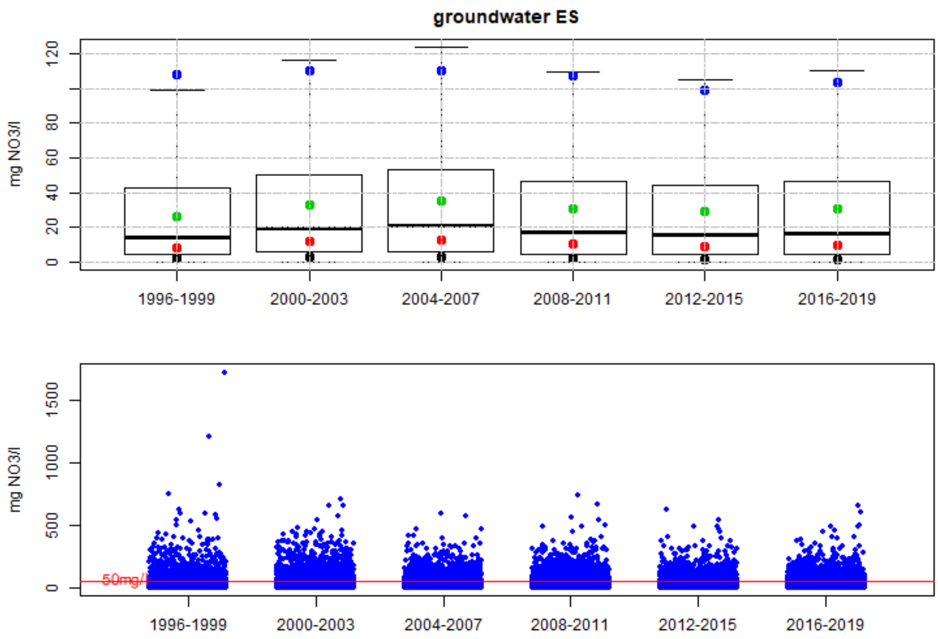


Figure 19. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period for groundwater stations. RPs represent the reporting periods, RP7 being the last period (2016-2019). The blue, red, green and black dots represent the mean of the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

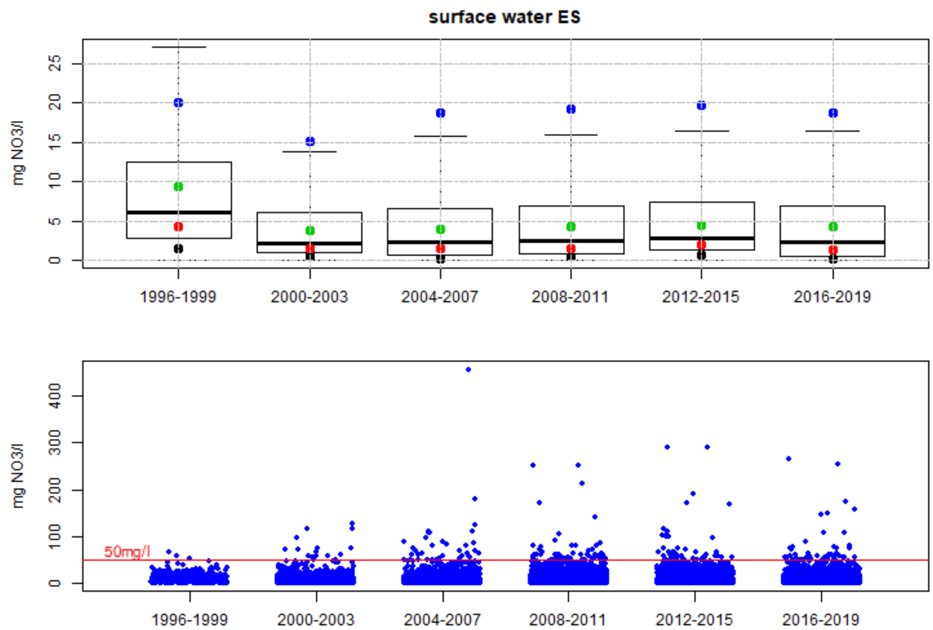


Figure 20. Time series of box whisker plots along with the distribution of the average NO3 annual concentrations for each reporting period for surface water stations. RPs represent the reporting periods, RP7 being the last period (2016-2019). The blue, red, green and black dots represent the mean of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

Conclusions and recommendations

Livestock density is lower than the EU average but some regions show high livestock densities. While the nitrogen surplus is below the EU average, there is a quite high phosphorus surplus.

There is a well-elaborated network of monitoring stations. A high number of groundwater monitoring stations shows nitrates concentrations above 50 mg/l. A high number of stations also shows an increasing trend. A high number of waters that are eutrophic are outside NVZ.

Most regions have updated their action programme during this reporting period.

The Commission recommends that Spain revises and reinforces its action programme to tackle the groundwater pollution in hot spots and revises NVZ designation to address eutrophication of surface waters where agriculture pressure is significant.