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1.1 OVERVIEW OF THE QUALITY OF CONTINENTAL WATERS

At the end of 1998, the national Ministry of the Environment completed the “*Libro Blanco del Agua en España*”, or (White Paper for Water in Spain). This document was designed as a tool for assessing and guiding water management in Spain. Although Spain’s future water policy is outlined in the conclusions, the points mentioned refer only to quantitative aspects of water resources without considering the issue of quality. Nonetheless, the issue of river, reservoir, lake and groundwater pollution is taken into account in the assessment section.

Amongst the problems related to water quality, the White Paper notes, among others, problems related with Directives 91/271/EEC and 91/676/EEC. A brief summary of the main issues addressed is provided below.

Surface water and diffuse pollution.

In general, diffuse pollution produced by agricultural and livestock raising activities (e.g. application of fertilisers and pesticides in farming, organic material and toxic substances in livestock-raising activities) is addressed as a problem of surface waters. However, it should be noted that the topic of nitrate pollution is considered only in the section dedicated to groundwater pollution. Nevertheless, the section about surface waters mentions that “nitrogen input of diffuse origin in the Duero river basin represents about 80% of total nitrogen input in the river basin. In the Tagus and Guadiana river basins, pollution of diffuse origin represents almost half of total nitrogen input.”

In any case, it is recognised that there is “an important lack of studies that clearly determine the diffuse component of Spanish surface water pollution.”

Pollution of reservoirs, lakes and ponds

It is recognised that the eutrophication of Spain’s reservoirs has been studied more than that of lakes and ponds. Based on limnological and satellite studies by CEDEX (research body within the national Ministry of the Environment), the water basins with the worst quality of stored water are¹: Tagus River (68%), Inland water basins of Catalonia, (67%), coastal Galicia (64%) and the Duero River (57%). It is stated that almost half (48%) of the total volume of Spanish reservoirs is in an advanced state of eutrophication. Of this total volume of degraded water, 14% is destined to water supplies. In general, the most eutrophic reservoirs are located in the lower stretches of the principal

¹ Degraded volume with respect to total reservoir capacity in each hydrographic basin.

rivers, downstream from major urban areas. Water basins with large populations and agricultural and livestock-raising activities dominate in others, where these are, thus, the main pollution sources.

Groundwater pollution

It is recognized in the White Paper that nitrate pollution (especially nitrates derived from farming activities) is an important problem for groundwaters. According to the White Paper, nitrate pollution strongly affects the Mediterranean coast, and is particularly intense in the Maresme (Cataluña) and coastal regions of the Júcar River (Castellón and Valencia). In inland Spain, the plains of La Mancha, Ebro floodplain and some sections of the Guadalquivir Valley (Guadalquivir and Guadalete floodplains) are affected. The local presence of nitrates affects different areas of the water basins of the Duero River (central Duero region, Esla-Valderaduey and Arenales), Tagus River (La Alcarria, Tietar and Ocaña), Sur River (Campo de Níjar, Dalías and Fuente de Piedra), and Segura River (Campo de Cartagena, Guadalentín and Segura valley).

The White Paper mentions that in spite of not being a generalised problem, the severity of the situation in some regions, in which the water is used as drinking water, requires more attention.

1.2 PROBLEMS ENCOUNTERED DURING THE INVESTIGATIONS

1.2.1 Political Problems

To the known problems inherent to any study in Spain (dispersion of administrative responsibilities, multiplicity of responsible institutions) must be added the following:

- In general, the responsible authorities have been reticent about providing information, a situation that probably is due to two motives. On the one hand, the European Commission has initiated two proceedings against Spain for infractions, one of which has concluded with a firm sentence against Spain. On the other hand, tension exists between the national authorities and the autonomous regions.
- Another significant fact is that due to elections, there have been changes amongst the officials responsible for this issue at regional level. This has made it difficult to compile information.

1.2.2 Information Problems

In general, it can be said that almost all sources of information mention the problem of diffuse pollution from farming activities and the eutrophication of continental water bodies (particularly reservoirs). Nonetheless, there is a

major lack of specific studies on this topic that are comprehensive enough. The existence or non-existence of available general information, by groups of water bodies, and the most important available information sources are discussed below.

Nitrate pollution of groundwater: The most recent general study dates from 1991 and was published by the, then, national Ministry of Public Works, Transportation, and Environment (now the Ministry of the Environment): “Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y balear” (Varela Sánchez, 1991).

Nitrate pollution of surface water: No general official studies exist and no independent studies in this topic have been identified.

Eutrophication of reservoirs, lakes and ponds: As mentioned with regard to the White Paper, the pollution of reservoirs is the topic that has been most studied by government (official information from CEDEX). At the scientific level, there are two important studies on reservoir eutrophication made, respectively, by the Department of Ecology of the University of Barcelona and by Álvarez Cobelas *et al* (Water Research Centre of the National Council for Scientific Research). The latter study was published in 1991 under the title “La eutrofización de las aguas continentales españolas” (Ed. Henkel Ibérica).

Eutrophication of running surface waters: The most significant comprehensive publication is that by Alvarez Cobelas *et al*, mentioned in the previous paragraph.

Eutrophication of coastal waters: There are no official or scientific publications that generally address the problem of coastal eutrophication in Spain (see below).

General water quality in Spain (with the exception of coastal waters): The official information available is contained in the different hydrological plans for the water basins. These have recently been approved.

Therefore, there are serious information gaps that should be filled. Moreover, it is necessary to examine expressly the topic of eutrophication, whether continental or coastal.

Continental eutrophication: The non-existence of “legal” criteria makes it extremely difficult to know when continental water masses are eutrophic. OECD criteria are generally assumed but, in practice, official and non-official research groups do not follow these criteria uniformly in their assessments. Therefore, it is possible to find, for example, in hydrological plans for water basins, categories that differ from those postulated by the OECD (for example, the Ebro Basin Plan establishes the following eutrophication categories in reservoirs: hypereutrophic, eutrophic, mesoeutrophic, oligomesoeutrophic and oligoeutrophic). Not only are there discrepancies in the OECD categories, but there are even differences in the categories used by different hydrological plans. Moreover, the timing, duration and frequency of sampling seem

insufficient, even within the campaigns that are considered more adequately done.

Coastal eutrophication: To the general lack of information must be added the deficient distribution of quality monitoring networks in marine coastal waters. Moreover, the singularity of marine coastal waters requires a special approach, as described below.

Eutrophication of continental waters is usually defined by the observation of high concentrations of chlorophyll and the loss of water transparency due to the excessive proliferation of photosynthetic organisms favoured by high nutrient concentrations. In this case, based on “visual” recognition there are tabulated values that allow the classification of a system as eutrophic by the observation that certain threshold values for parameters have been exceeded (Margalef, 1983). In marine environments eutrophication is less evident.

Excessive proliferation, in this case of phytoplankton, is implied but it is never as intense as it can be in continental waters. In the marine environment, waters containing abundant organisms are considered eutrophic that would be considered mesotrophic in a continental environment, without ceasing to present extreme values for the ocean environment. In these circumstances, chlorophyll and nutrient values are high with respect to marine standards. One must always remember that organisms are more “diluted” in the marine environment. This “dilution” makes it difficult to define thresholds for chlorophyll that are common to all marine systems and define eutrophication (for the same reason, threshold values are not defined for nutrients to identify polluted regions). These parameters are highly variable at the local level and, since we are acting in the lower range of values, it is more difficult to appreciate differences. For the above reasons, expert opinion is important, which is why the text of directives indicates the need to consult experts, either personally or through their work, in order to understand how eutrophication occurs in a given marine environment.

2 **PROCEDURES FOR DESIGNATING SENSITIVE AREAS AND VULNERABLE ZONES AND APPLICATION OF CRITERIA ESTABLISHED IN DIRECTIVES**

2.1 **INTRODUCTION**

2.1.1 ***Incidence of the Hydrological Planning Process on the Application of Directives 91/271/EEC and Directive 91/676/EEC.***

The period of transposition and application of Directives 91/271/EEC and 91/676/EEC has coincided with an especially intense period of hydrological planning, as can be seen in the following table. The starting point is the approval of the 1985 Water Act, which triggered a slow succession of steps, aimed at renewing the existing water planning patterns. Thus, this process has a considerable political content, and is yet to culminate, 15 years after approval of the Water Act, with the approval of the National Hydrological Plan.

Table 2.1 *Hydrological Planning in Spain*

<i>Year</i>	<i>Event</i>
1985	<ul style="list-style-type: none"> Approval of the Water Act of 1985
1986	<ul style="list-style-type: none"> Incorporation of the Kingdom of Spain into the EEC. Development of the Water Act of 1985 by means of the Royal Decree of hydrological Planning and Royal Decree of water public domain.
1988	<ul style="list-style-type: none"> Publication of the basic documentation on hydrological plans and draft of the proposals of Hydrological Plan Guidelines
1991	<ul style="list-style-type: none"> Promulgation of Directives 91/271 and 91/676
1992	<ul style="list-style-type: none"> Approval of the Inland Catalanian Basins (CIC) Hydrological Plan Guidelines
1993	<ul style="list-style-type: none"> Approval of Hydrological Plan Guidelines for the Ebro, Norte, Duero, Tajo, Guadiana and Guadalquivir basins.
1994	<ul style="list-style-type: none"> Approval of the Hydrological Plan Guidelines for the Sur and Segura basins. The Water Council approves proposed hydrological plans for the Norte and CIC.
1995	<ul style="list-style-type: none"> The Water Council approves the hydrological plan proposals for the Duero, Guadiana, Guadalquivir and Sur. Formal transposition of Directives 91/271 and 91/676 Emission of the National Plan for WasteWater Treatment, in which sensitive regions are determined.
1996	<ul style="list-style-type: none"> The Water Council approves proposed hydrological plans for the Ebro basin.
1997	<ul style="list-style-type: none"> The Water Council approves proposed hydrological plans for the Tajo, Segura and Júcar basins.
1998	<ul style="list-style-type: none"> The planning process culminates with the approval of hydrological plans by Royal Decree 1664/1998 of the Ministerial Council.
1999	<ul style="list-style-type: none"> Publication of orders governing the normative content of plans

Sources: Libro blanco del agua. Ministry of the Environment (December 1998) and personal development.

2.1.2

Monitoring Networks

It is necessary to have a clear idea of the existing water quality monitoring networks in Spain and their degree of development, as these influence the application of the Directives under study.

Marine/coastal waters: In the marine environment, data are scant and monitoring networks are much less developed than for continental surface and ground waters. At present, most of the autonomous communities have networks for surveillance of the quality of beaches. These networks analyse microbiological parameters and the state of the beach is characterised qualitatively with respect to its public use. Although this can give us some indication – the beaches declared deficient are usually so because of the presence of nearby landfills – data from these networks are of little use within the context of this study. With respect to the monitoring of the quality of marine/coastal waters, we only know of the development of the following sampling networks: Catalunya (Junta Sanejament, 1997), Andalucía (Consejería de Medio Ambiente, 1997), Galicia (CCCMM, 1998) and Basque Country (AZTI, 1996). Most of them sample at least nutrients and chlorophyll.

Groundwaters: The Network of Observation of Groundwater Quality (ROCAS) was initiated in 1970. It controls the evolution of different physical and chemical parameters (among them nitrates) and currently has 1650 points.

Surface waters: The various quality monitoring networks are described in the *Table 2.2*.

Table 2.2 **Surface Water Monitoring Networks**

COCA: Quality Monitoring Network of surface waters, in existence since 1962. This network does not have a specific infrastructure. At present this network has 408 stations in inter-community water basins and 45 in peninsular intra-community water basins and monitors 40 parameters (among them phosphates, nitrates and nitrites). The data from this network are used to prepare the General Quality Index (GQI) ¹	Currently part of the ICA Network (Integrated Water Quality Network), which also includes the Automatic Alert Stations (EAA)
COAS: Official Surface Water Monitoring Network. Monitors urban water supplies and makes it possible to perform pre-drinkable analyses.	
ICHTHYOFAUNA: Network to determine the suitability of water to for fish population, which monitors 140 river sections.	

Table 2.3 summarises the situation, by water basin, of different monitoring networks for continental waters.

¹ **GQI: General Water Quality Index.** This index proposes to define, by a simple numerical scale from 0 to 100, estimated from 23 analytical parameters, the level of general quality of the water stretch in question. In Spain, the network that meets this objective is the COCA Network.

Table 3.3 *Monitoring Network in the different basins*

<i>River basin</i>	<i>Area (Km²)</i>	<i>N° of stations of the COCA network</i>	<i>Density of stations of the COCA network (1/Km²)</i>	<i>N° of stations of the ROCAS network</i>
Norte	40.650	106	1/383	133
Duero	78.9601	37	1/2134	92
Tagus	55.810	55	1/1015	130
Guadiana	60.210	54	1/1115	119
Guadalquivir	63.240	35	1/1807	168
Sur	17.950	16	1/1122	282
Segura	19.120	14	1/1366	182
Júcar	42.900	25	1/1716	106
Ebro	85.560	66	1/1296	138
Inland Catalonia	16.490	44	1/375	300
Coastal Galicia	13.130	4	1/3283	-
Total Peninsula	494.020	456	1/1083	1650

Source: Libro Blanco del Agua en España. 1998. Ministry of the Environment

According to official data (White Paper), the Spanish continental water monitoring networks meet the minimum requirements for the number of stations, but do not satisfy the criteria of density and locations recommended by the European Environment Agency in November 1995 (ETCIW, 1995). Therefore, it seems that the ICA Network should be improved for the following reasons:

- The existing network covers only some sections of rivers or reservoirs in which there are declared uses, but it does not cover all those that have no specific uses, for which it often is necessary to have information.
- The sampling frequencies are insufficient in some cases and, consequently, do not provide adequate data for carrying out adequate statistical monitoring.
- In relation to new regulations and international agreements, the number of parameters sampled is sometimes insufficient.

As for the ROCAS Network, the White Paper observes that there are also deficiencies. Among them are aquifers that are not monitored for different reasons, such as the non-existence of wells or observation soundings, or the lack, on occasions, of means for sampling. There are also deficiencies in sampling frequency.

2.2

PROCEDURES FOR DESIGNATING SENSITIVE AND LESS SENSITIVE AREAS (DIRECTIVE 91/271/EEC)

Directive 91/271/EEC requires Member States to designate Sensitive Areas, in conformity with the criteria of Annex II, by no later than 31 December 1993 (art. 5). The two Spanish laws implementing the Directive are:

- Act 11/1995, 28 December, established applicable standards for the treatment of urban waste water (Official Journal: BOE n° 312, 30 December 1995) and
- Act 509/1996, 15 March, developed Act 11/1995, 28 December, which established applicable standards for the treatment of urban wastewater (Official Journal: BOE n° 77, 29 March 1996).

When identifying the institutions that should be responsible for the application of this Directive, it is necessary to consider the constitutional division of power between national and autonomous governments with respect to matters concerning water and the environment. The following table shows the territorial entities authorised to carry out the obligations of designating sensitive areas in accordance with the division established in Act 11/1995.

Table 2.4 *Territorial entities responsible for the obligations established by Directive 91/271/EEC*

Declaration of Sensitive Areas	Superficial fresh waters: Natural freshwater lakes and other surface freshwater bodies.	Waters pertaining to "inter-community" (shared by two or more autonomous communities) water basins (1)	Central government (Ministry of the Environment) after an audience with the autonomous communities and local entities involved.
		Waters pertaining to "intra-community" (a single autonomous community) water basins (2)	Autonomous Community
	Coastal, marine, and estuary waters		Autonomous Community (3)
Declaration of Less Sensitive Areas	Coastal, marine, and estuary waters		Autonomous Community (3)

(1) Water basins: Norte, Ebro, Duero, Tagus, Guadiana, Guadalquivir, Júcar, Segura and Sur.

(2) Water basins: Coastal Galicia, Inland Catalonia, Balearic Islans and Canary Islands.

(3) Only Galicia, Asturias, Cantabria, País Vasco, Cataluña, Valencia, Murcia, Andalucía, Balearic Is. and the Canaries

The Spanish government initiated, at the same time that the first actions for the application of Directive 91/271 were put into practice, the process of defining sensitive areas in collaboration with the autonomous communities (within the context of the Environmental Sectoral Conference). The result of this effort was the preparation of a list of sensitive areas in 1993, before the Directive had been transposed into Spain.

Later, the sensitive areas and urban population centres of more than 10,000 e.p. discharging effluents into sensitive areas were delimited in the National Plan for WasteWater Management and Treatment. Although the basic content of the plan was published in the Official Bulletin on 12 May 1995, it did not include the list of Sensitive Areas.

Recently, a resolution of 25 May by the Secretary of State for Waters and Coasts of the Ministry of the Environment, published in the BOE of 30/6/98, formally declared the sensitive areas located in inter-community water basins. The declaration of such areas is the responsibility of the Ministry of the Environment because more than one autonomous community is involved. Therefore, sensitive areas located in intra-community water basins (coastal Galicia, inland basins of Catalonia and Balearic Is.) and sensitive areas declared in several coastal areas of Galicia, Cantabria, the Basque Country, Catalonia, Valencia, Murcia, Balearic Is. and the Canaries, have not been officially reported. Likewise, Less Sensitive Areas have not been officially reported. The only exception to this is the Autonomous Community of Andalucía, where a recent decree was issued declaring the sensitive areas, normal areas, and less sensitive areas of the coastal waters and intra-communitary water basins of this Autonomous Community (Decree 54/1999 of 2 March. Official Journal: BOJA n° 35, 23 March 1999).

Only the sites listed in State Resolution of 25 May 1995 and the Andalusian Decree that can be considered as officially designated.

The annual report of the Ministry of the Environment ("Medio Ambiente en España, 1997"), published in 1998, contains a summary of the report on the state of wastewater treatment in Spain ("Informe de síntesis sobre el estado de depuración en España", December 1997) prepared for the European Commission by the Ministry of the Environment. This report makes a "pseudo-official" description of all the sensitive and less sensitive areas designated in each autonomous community, including the sites not listed in the official regulations (see above).

The information processed by the Spanish authorities relevant to the designation of Sensitive Areas is not known. The only specific document accessible has been the synthesis report of the state of wastewater treatment in

Spain mentioned. According to this document, the Sensitive Areas classified in Spain can be grouped as follows:

- I. Water bodies with scant water exchange, in which nutrient accumulation can occur. In these areas nutrient elimination, mainly phosphates, will probably be necessary: These are mainly water reservoirs at risk of eutrophication and destined for human water supply.
- II. Estuaries, bays and other marine waters with poor water exchange or a large nutrient input: This group includes confined areas of special protection, such as the Albufera of Valencia, Mar Menor in Murcia, Bahía de Palma, Ría de Pontevedra, Ría de Pasajes, Marismas de Santoña, etc.
- III. Superficial continental waters destined for the production of drinking water: This group includes some water bodies cited in the first section (reservoirs), as well as many of the fluvial watercourses of Catalonia that have been declared sensitive.
- IV. Areas of high environmental value, in which all types of polluting effluents should be avoided, including organic and nutrient contaminants: these include Doñana National Park, Tablas de Daimiel and Lagunas de Ruidera.

According to data of the “Manual de Política Ambiental Europea: la UE y España” (Manual of European Environmental Policy: the EU and Spain, 1999, IPAE and Mapfre), the following types of sensitive areas have been declared in each autonomous community:

<i>Autonomous Communities</i>	<i>Sensitive Areas</i>
Andalucía	7 type I-III and 3 type IV
Aragon	9 type I-III
Asturias	2 type I.III
Baleares	3 whole islands
Cantabria	3 type II
Castilla-León	38 type I-III
Castilla-La Mancha	7 type I-III and 2 type IV
Cataluña	24 type I-III and 18 type II
Extremadura	12 type I-III
Galicia	1 type II
Madrid	15 type I-III
Murcia	1 type II
Pais Vasco	3 type II
La Rioja	3 type I-III
Valenciana	7 type I-III, 8 type II and 1 type IV

As can be seen, groups I and III are closely related. This shows that special attention is given to surface waters intended for human consumption, whether running or collected in reservoirs.

The following table shows the relationship between the criteria of the Directive and groups of sensitive areas specified by the Ministry. It should be noted that this is a mere preliminary approach to the application of the criteria, for the subsequent analysis of the implementation of Directive 91/676/EEC raises some controversy regarding the information provided in the table.

Table 2.5 *Relation between the Criteria of the Directive and the Categories of Sensitive Areas Designated by the Spanish Authorities*

<i>Criteria established by the Decree and Directive</i>		<i>Groups of sensitive areas that have been declared</i>
a) Lakes, ponds, estuaries, reservoirs and marine waters that are eutrophic or may become eutrophic in the near future if protection measures are not adopted	1° Lakes and watercourses that flow into lakes, ponds, reservoirs, and closed bays that have poor water exchange, thus predisposing to nutrient accumulation	Water reservoirs at severe risk of eutrophication and generally destined to human water use.
	Estuaries, bays, and other marine waters with poor water exchange or that receive a large amount of nutrients	Confined areas of special protection, such as the Albufera of Valencia, Mar Menor in Murcia, Bahía de Palma, Ría de Pontevedra, Ría de Pasajes, Marismas de Santoña, etc.
b) Superficial continental waters destined for drinking water that may have a nitrate concentration superior to the limits established by the dispositions of RD 927/1988 (RAPAPH).		Reservoirs at risk of eutrophication for public water supplies, as well as many fluvial watercourses in Catalonia declared sensitive
c) Water bodies in which treatment is needed in addition to secondary treatment required by article 5 of this decree in order to reach compliance with the stipulations of the community standard		Areas of high environmental value, in which all types of polluting effluents should be avoided. Doñana National Park, Tablas de Daimiel and Lagunas de Ruidera.

The effective designation of Vulnerable Zones has been greatly delayed in Spain, due, among other reasons, to the delay in the transposition of the Directive. Royal Decree 261/1996, 16 February, which incorporates the Directive into Spanish legislation, was drafted two years and two months after concluding the period of transposition established by the Directive (20/12/93). The timeline for execution established by this decree has not respected the periods established by the Directive. Thus, as regards vulnerable zones and their review, there is a notable discrepancy, as shown in the table below:

Table 2.6 *Requirements of Directive 91/676/EEC and Act 261/1996*

<i>Requirement</i>	<i>Directive 91/676</i>		<i>Act 261/1996</i>	
	Article	Period of execution	Article	Period of execution
Designation of vulnerable zones	3	20/12/93 (*)	4	12/02/97
Completion of the review of designations	3	21/12/97	4	12/02/91

(*) Coincides with the transposition period.

In practice, the implementation of the Directive was carried out between 1996 and 1998

Directive 91/676/EEC requires Member States to:

- Identify, in accordance with the criteria of Annex I, waters affected by nitrate pollution of agricultural origin or which could be affected by this pollution if appropriate measures are not taken (art.3, 1)
- Designate as vulnerable zones all known land surfaces of the territory draining into the polluted waters or waters at risk from pollution (article 3,2).

Given the constitutional division of responsibility for matters related to water, agriculture and the environment, the implementation of the Directive was carried out by both central and autonomous governments and entities associated with them. The following table shows schematically the territorial entities authorised to carry out the work in accordance with the division of responsibility established in the Spanish Constitution between the State and Autonomous Communities (Royal Decree 261/96).

Table 2.7 Territorial entities responsible for the obligations established by article 3 of Directive 91/676/EEC

Identification of waters affected by nitrate pollution	Surface fresh waters, natural freshwater lakes and other surface freshwater bodies.	Waters pertaining to “inter-community” (shared by two or more autonomous communities) water basins (1)	State (Ministry of the Environment)
	Groundwaters		
		Waters pertaining to “intra-community” (a single autonomous community) water basins (2)	Autonomous Community
	Coastal, marine, and estuary waters		
Designation of vulnerable zones			Autonomous Community

(1) Water basins: Norte, Ebro, Duero, Tagus, Guadiana, Guadalquivir, Júcar, Segura and Sur.

(2) Water basins: Coastal Galicia, Inland Catalonia, Balearic Is. and the Canaries.

(3) Only Galicia, Asturias, Cantabria, the Basque Country, Catalonia, Valencia, Murcia, Andalucía, Canaries and Balearic Is.

In practice, the procedure for designating Vulnerable Zones has been the following:

General Coordination

General Sub-directorate of Treatment and Quality Monitoring of Waters, of the General Directorate of Hydraulic Works and Water Quality (Ministry of the Environment).

1. Identification of the waters affected:

- Inter-community water basins:

The identification of waters affected by nitrate pollution has been carried out by the Ministry of the Environment and co-ordinated by the General Subdirectorate of Treatment and Quality Monitoring of Waters of the General Directorate of Hydraulic Works and Water Quality.

The basin authorities of the inter-community water basins were also responsible for identifying surface waters affected by nitrate pollution (lakes and reservoirs included). With regard to surface waters, the Geological-Mining Technological Institute of Spain (ITGME) is responsible for this identification, except in the case of groundwater bodies pertaining to the Duero and Tagus river basins, which are the responsibility of the corresponding basin authority.

- Intra-community water basins and coastal areas

The identification of the surface freshwaters that are affected and belong to the autonomous communities has been carried out by the responsible authorities within each community: the autonomous water basin authority.

The identification of eutrophic coastal areas was left aside, and it seems to receive attention only when it is necessary to respond to demands for information by the European Commission.

2. Remission to the autonomous communities of the "identification of bodies of water affected by nitrate pollution," when it is the responsibility of the Ministry of the Environment.
3. Preparation of reports by autonomous communities in order to justify the designation or non-designation of Vulnerable Zones and, in the affirmative case, to delimit their extension.
4. Designation of Vulnerable Zones or declaration of their non-existence.

With respect to points 3 and 4, it is necessary to mention that not all autonomous communities have prepared reports identifying the areas that should be designated as vulnerable zones. In fact, some autonomous communities have declared vulnerable zones without having reports justifying it. As for the designation or declaration of the non-existence of such areas, it is necessary to take into account that some autonomous communities have not officially acknowledged (that is, by publication of the announcement in the official bulletin) the existence or non-existence of vulnerable zones.

Criteria established by the Directive for the identification of waters affected by nitrate pollution

Below, a comparative table is given of the criteria established in the Directive and Act 261/91. Aspects that differ are indicated in boldface type, although these differences are not substantial.

Table 2.8 Criteria defined in Directive 91/676/EEC and Act 261/91

<i>Criteria of Annex I of the Directive</i>	<i>Criteria of the Royal Decree (article 3)</i>
<p>Superficial fresh waters, particularly those use or destined for use as drinking water, which present or could present, if action is not taken in conformity with article 5, a nitrate concentration higher than that established in accordance with Directive 75/440/EEC.</p> <p><i>(50 mg/l NO₃)</i></p>	<p>Surface waters that present, or could present if action is not taken in accordance with article 6 of the present disposition, a nitrate concentration higher than the limits established in annex number 1 of the Regulation of Public Administration of Water and Hydrological Planning, approved by Decree-Act 927/1988, modified by Decree-Act 1541/1994 of 8 July.</p> <p><i>(50 mg/l NO₃)</i></p>
<p>Groundwater that contain more than 50 mg/l of nitrates, or that could come to contain them if action is not taken in conformity with article 5.</p>	<p>Groundwater with a nitrate concentration of more than 50 mg/l, or that could exceed this limit if action is not taken in conformity with article 6.</p>
<p>Natural freshwater lakes, other natural freshwater bodies, estuaries, coastal waters and marine waters that are eutrophic and could become eutrophic in the near future if action is not taken in accordance with article 5. (*)</p>	<p>Reservoirs, natural lakes, ponds, estuaries, and coastal waters that are eutrophic and could become eutrophic in the near future if action is not taken in conformity with article 6. (*)</p>
<p>CONSIDERATIONS TO TAKE IN ACCOUNT WHEN APPLYING THESE CRITERIA</p>	
<p>1. Physical and environmental characteristics of the waters and land.</p>	<p>Limnological characteristics of aquatic ecosystems and environmental factors of the tributary water basins and, <i>particularly, point nitrogen emissions, such as waste-water effluents and their contribution to the nitrate content of the waters.</i></p>
<p>2. Current knowledge of the behaviour of nitrogen compounds in the environment (water and soil).</p>	<p>Current scientific knowledge of the behaviour of nitrogen compounds in aquatic, <i>atmospheric</i>, edaphic and lithological media.</p>
<p>3. Current knowledge of the effect of actions carried out in compliance with article 5.</p>	<p>Current knowledge of the possible effects of measures foreseen in article 6 of this Royal Decree.</p>

(*) In this Directive the concept of eutrophication refers only to nitrogen.

The criteria detailed in Annex I of the Directive and in article 3 of the Royal Decree serve to identify bodies of water affected by pollution. Following their logical sequence, at the time of identification, it is necessary to determine what surface waters are destined (or will be destined) to the production of drinking water, and what surface waters present a nitrate content of more than 50 mg/l (or that could come to contain this if measures are not taken). Besides, freshwater bodies of water, natural or artificial, estuaries, coastal waters and marine waters that are eutrophic or could become eutrophic should also be determined. Once these waters have been determined, it is necessary to apply the factors indicated in the Annex (physical and environmental characteristics of the water and land, knowledge of nitrogen behaviour, etc.).

As established in the Royal Decree, the identification of surface and groundwater bodies, as well as reservoirs and lakes, located in the territory of the inter-community water basins is the responsibility of the Ministry of the Environment. However, the Ministry limited itself, in general and with respect to surface and groundwater, to determine what bodies of water present or could present values in excess of the limit of 50 mg/l and to exchange information about the agricultural use of the soil. Therefore, the question of determining the aquifer vulnerability, the quantification of agricultural sources of nitrates, etc., remains under the authority of the autonomous communities. This fact has influenced the decision of some autonomous communities to not designate vulnerable areas.

In general, we can affirm that the general documentation generated by institutions dependent on the Ministry of the Environment for the application of the Nitrates Directive (ITGME and Basin Authorities) has been little developed.

For example, the ITGME report for the Autonomous Community of Castilla-La Mancha, which identified underground bodies of water affected by nitrate pollution, presents discrepancies with the report prepared by the ITGME itself at the request of this autonomous community to determine what areas should be declared vulnerable. The second report was more exhaustive and presented more hydro-geological units affected by pollution.

Another example supporting this idea is the combined report prepared by the ITGME and the Water Board of the Balearic Islands, which served to identify affected waters and to propose vulnerable zones. The comparison between the part of this report in which affected waters are identified and reports prepared by other autonomous communities makes this evident.

In the two cases in which the ITGME reports have had the greatest quality (Castilla-La Mancha and the Balearic Islands), Co-operation Agreements had been subscribed between the ITGME and the autonomous communities involved.

On the other hand, ITGME reports sometimes do not seem to have taken into account earlier official information, as in the case of the Varela Report of 1991.

As for surface waters, the identification of bodies of water affected by nitrates made by the basin authorities also present deficiencies and discrepancies. For example, with regard to reservoirs, the identification of affected waters by the Segura Basin Authority, communicated to the autonomous community of Murcia by the Ministry of the Environment, stated expressly: "With respect to reservoirs, natural lakes, ponds, estuaries and coastal waters, the Basin Authority does not have information that complements that of the ITGME." This highly ambiguous phrase clearly contrasts with the Hydrological Plan of the Segura River basin, which expressly mentions that the eutrophication of the reservoirs of this basin is produced in all of them by agriculture, with the exception of the Argos reservoir.

Another significant fact that has influenced the effective designation of the areas has been the decision to apply this Directive, preferably to groundwater and, among these, only those destined to the production of drinking water. Various reports by autonomous communities (for example, Navarra), as well as telephone conversations with officials from the autonomous regions, indicate that the criteria used to declare vulnerable zones were established by consensus with ITGME and include the following:

- **That the water was destined to human water supplies**
- That hydro-geological vulnerability existed
- That the source of pollution was agricultural.

2.4

ANALYSIS OF THE APPLICATION OF CRITERIA FOR DESIGNATION OF SITES UNDER DIRECTIVES 91/271/EEC AND 91/676/EEC.

As mentioned, the selection of Sensitive Areas occurred prior to that of Vulnerable Zones in Spain. This allows for the assumption that there has not been effective co-ordination between the respective bodies in charge of implementing the Directives. Moreover, the earlier classification of Sensitive Areas seems to have biased, to a large extent, the posterior designation of Vulnerable Zones. In fact, just a quick overview of the areas finally classified clearly shows that Directive 91/271/EEC has been aimed at protecting various kinds of surface waters and some coastal waters, whilst Directive 91/676/EEC has been directed to protecting groundwater.

It is difficult to reach clear conclusions on the application of the criteria to designate Sensitive Areas under Directive 91/271/EEC, since the information on which such designations are based has not been available. Nonetheless, given that the two Directives have common criteria (e.g. eutrophication, nitrate content over 50 mg/l in surface waters, etc.), part of the information available that is relevant to the determination of Vulnerable Zones has also been useful for identifying Sensitive Areas. This has also allowed for the analysis of the application of the criteria under both Directives and the overall suitability of their implementation in Spain. These issues are addressed in

subsequent sections of this report, starting with Directive 91/676/EEC, for which more information has been available.

2.4.1

ANALYSIS OF THE APPLICATION OF CRITERIA FOR THE DESIGNATION OF VULNERABLE ZONES UNDER DIRECTIVE 91/676/EEC

A detailed assessment of the application of the criteria based on the information used by the relevant administrations to identify affected waters, and on the designations made, shows the following results:

Criterion A.1 of Annex I: Surface waters that contain, or may contain if no adequate measures are adopted, nitrate concentrations over 50 mg/l. Particular attention, although not exclusively, must be paid to waters intended for the abstraction of drinking water.

- **Identification of affected bodies of water:** watercourses affected by nitrate pollution from agricultural sources have been identified only within three autonomous communities. These are Andalusia (Report by the Guadalquivir Basin Authority), Aragon and Castilla y Leon (Report by the Ebro Basin Authority, for both). In the region of Murcia, according to data of the Segura Basin Authority, nitrate concentrations over 50 mg/l had been recorded in several sampling points of the Segura River in campaigns ranging from 1982 to 1994.

It is not known whether the provisions under article 6,1,a) i) of the Directive were taken into account (i.e. monthly nitrate pollution control during one year in sampling stations within surface waters, with increased sampling frequency in flooding periods). Nonetheless, it should be noted that the main deficiencies identified for the Spanish Water Quality Control networks are generally related to the sampling frequency and the scarcity of stations in some areas.

- **Designation of Vulnerable Zones:** None of the autonomous communities has designated zones under this criterion. Even Andalusia, where a number of rivers have been identified as affected by agricultural nitrate pollution. In this community, there are Vulnerable Zones that include these rivers, but, according to conversations with relevant officials, the designation was decided mainly to protect groundwater.

Criterion A.2 of Annex I: Groundwater that contain or may contain, if adequate measures are not taken, nitrate concentrations over 50 mg/l. This criterion is not restricted by the intended use of water.

- **Identification of affected bodies of water:** This has been the prevailing criterion in Spain. Specific reports were produced by the ITGME (governmental groundwater research body, national) and

the Ebro and Duero Basin Authorities to assess pollution of aquifers (by hydro-geological units, HU). Affected HUs were identified in all autonomous communities but Galicia, Asturias, Cantabria, and Madrid. In Galicia (Norte I Basin), there is no water quality control network, for aquifers are generally not relevant in that region. Information on agricultural land use (1992 data) from the national Ministry for Agriculture was also used in the reports

It has to be mentioned that the ITGME reports were not exhaustive, and that the identification of affected bodies of groundwater was not complete. Indeed, important aspects within the scope of "identification" (e.g. determination of aquifer vulnerability and nitrogen polluting load), as set up in Annex I.B of the Directive, were left to the Autonomous Communities. Some of these have not had, on their own, the resources to complete the identification of affected groundwater.

The provisions under article 6,1,a) ii) of the Directive seem to have been observed (i.e. regular pollution control during one year in sampling stations that are representative within the HU). Specific campaigns for the identification of affected groundwater bodies were undertaken in all of the Spanish Basins in spring and autumn of 1995 and 1996. Nonetheless, it should be borne in mind that the ROCA monitoring network is not comprehensive in certain areas and that the resources are scarce to sample with the frequency required.

- **Designation of Vulnerable Zones:** The effective designation of Vulnerable Zones by the autonomous communities has followed this criterion, although only partially. In fact, according to the information provided and the regulations issued (e.g. in Navarra and La Rioja), and to conversations with regional officers (e.g. Aragon), it had been agreed with ITGME that *"the aquifers affected by pollution should be intended for drinking water"*.

Criterion A.3 of Annex I: Surface freshwater lakes, other freshwater bodies, estuaries, coastal waters and marine waters considered to be or to become eutrophic if action is not taken. (Nitrate from agricultural sources is the only eutrophication factor considered).

- **Identification of affected bodies of water:**
 - A) **Eutrophication of reservoirs:** In general, phosphorus is considered to be the limiting factor. This is the case of the Norte, Guadiana, Júcar and Guadalquivir Basins, where no reservoirs have been considered as affected. The Norte Basin, for instance, states that reservoirs are not affected by pollution from agricultural sources. In the Guadalquivir Basin, a preventive criterion has been applied; the basin authority has

identified 8 eutrophic reservoirs in which 20 to 30% of the total nitrogen load is considered to be of agricultural origin.

The Duero Basin is the only one where the limiting factor for eutrophication is not clearly acknowledged, although it is stated that it may be nitrogen rather than phosphorus. The Tagus Basin Authority simply states that reservoir pollution is not considered to be of agricultural origin.

The Segura and the Sur Basin Authorities appear somewhat evasive. The former just affirms not to have complementary data to those of the ITGME regarding eutrophication, while the latter only states that nitrate concentrations are below 50 mg/l in all reservoirs.

Access to the relevant information from Inland Catalonia, the Balearic Islands and the Canary Islands Basins has not been possible.

- B) Eutrophication of lakes and lagoons:** any Basin Authority but those of Segura and Guadalquivir have not addressed this issue. The Segura authority mentions that complementary data to the ITGME ones are lacking; and the Guadalquivir authority, once again being preventive, identified 8 natural wetlands that were included in the Draft Hydrological Plan for the basin as being affected by pollution from agricultural sources.
- C) Eutrophication of estuaries, coastal and marine waters:** the inter- ministerial working group for the implementation of the Directive did not address this issue, which was considered as “not relevant”. Any specific information has been prepared after the requirement of the European Commission. So, in late September 1998, the national Ministry of the Environment required information on coastal eutrophication from coastal autonomous communities. According to the information supplied by this Ministry (dated 25 January 1999), Andalucia, Asturias, Catalonia and Galicia declared not to have any coastal eutrophication, and data were not yet available from the Balearic and Canary Islands, Cantabria, Murcia, Valencia and the Basque Country.

However, during the search for this report it has been possible to know that Galicia, Asturias Cantabria, the Basque Country and Andalucia are currently investigating coastal eutrophication under the OSPAR Convention. In turn, mediterranean regions such as Valencia and the Balearic Islands are also addressing coastal eutrophication. The relevant

information from Murcia, Catalonia and the Canary Islands has not been accessible.

Criterion B of Annex I: When applying the criteria within part A of Annex I, the following factors should also be taken into account:

1. The physical and environmental characteristics of the waters and the land
2. Current knowledge on the behaviour of nitrogen and nitrogen compounds on the environment (water and soils)
3. Current knowledge on the effectiveness of Action Programmes and Monitoring Programmes

- 1. The physical and environmental characteristics of the waters and the land:** This criterion was incorporated into Spanish legislation as follows:

“Limnology of aquatic ecosystems and environmental factors within source basins and, in particular, point nitrogen emissions such as waste water effluents and their contribution to the content of nitrates in water”.

In consistency with the definition of “pollution” provided by the Directive, the text underlined is considered unnecessary. However, it shows, to a certain extent, the concern of the Spanish authorities not to place excessive pressure upon the agricultural sector. Furthermore, when transposing the Directive, the State authorities were aware that the relative contribution of the various possible sources to water pollution by nitrates was not quantified. Indeed, the State officers in charge of the Directive stated that the allocation of relative percentages of nitrogen load to agriculture and wastewater effluents was a difficult task, and that they had commissioned a study to quantify the various inputs (meeting held in May 1999).

Anyway, despite the identification of affected bodies of water being the responsibility of the Ministry of the Environment, the assessment of the nitrogen load of agricultural origin applied to soils was left to the autonomous communities. (The reports by ITGME and the Basin Authorities just mentioned the nitrogen concentrations recorded in the various types of water bodies, and overlapped general information on agricultural land use provided by the Ministry of Agriculture and dated in 1992). The national authorities applied this criterion only for reservoirs, for which it was generally stated that the limiting factor of eutrophication was phosphorus.

- 2. Current knowledge on the behaviour of nitrogen and nitrogen compounds on the environment (water and soil):** This criterion was incorporated into Spanish legislation as follows:

“Current scientific knowledge on the behaviour of nitrogen compounds in water, *atmosphere*, soil and lithological environments”.

The incorporation of “atmospheric environments” into the Spanish law seems to respond, once again, to the concern of trying to quantify the different nitrogen sources, including “natural” ones.

This criterion can be considered as comprising aspects such as aquifer vulnerability, the effects of labour and fertilising in crop yields and in soil and groundwater pollution. Despite being the responsibility of the Ministry of the Environment, the complete identification of affected bodies of water relevant to these factors was left to the autonomous communities.

3. Current knowledge on the effectiveness of Action and Monitoring Programmes.

It has not been possible to apply this criterion, given the limited experience both in terms of programme implementation and time length to show clear and contrasting results.

To sum up, it is possible to conclude that:

1. In general, Directive 91/676/EEC has been applied covering only groundwater, and particularly that intended for the abstraction of drinking water. This implies that the application of criteria has been biased. Indeed, the criterion regarding coastal eutrophication was not regarded, and the provisions of the criterion established in Annex I.A.2 of the Directive, related to groundwater, was partially applied, since Vulnerable Zones have been classified only where such waters were intended for the abstraction of drinking waters.

To this end, it should be noted that Directive 91/676/EEC is aimed at the protection of human health, but also at preserving living resources and water ecosystems (6th “Whereas”). So, pollution is defined as follows (art. 2,j):

“the introduction, direct or indirect, of nitrogen compounds of agricultural origin into water environments that may result in prejudice to human health, the living resources of the aquatic ecosystem, damage recreation sites or disturb other legitimate uses of waters”.

2. The criteria within part B of Annex I have largely determined the effective designation of Vulnerable Zones. In fact, the majority of autonomous communities that have not classified such zones, regardless of the identification of affected bodies of water by the Ministry within their territory, have based their non-designation on issues such as lack of knowledge on aquifer vulnerability or the

behaviour of nitrogen in soils. This is the case of Extremadura, Navarra and La Rioja. The two latter regions have implemented action programmes to address the information gaps that have been detected.

2.4.2

ANALYSIS OF THE APPLICATION OF CRITERIA FOR THE DESIGNATION OF SENSITIVE AREAS UNDER DIRECTIVE 91/271/EEC.

The information analysed regarding the selection of Sensitive Areas in Spain is scarce. The only specific report that has been available ("Informe sobre el estado de la depuración en España", of 1997) does not mention the kind of information processed for the designation of such areas. It is not known whether specific reports aimed at the selection of sites for classification were produced. (In fact, the Directive is, in this sense, less precise than Directive 91/676/EEC, which requires the identification of affected waters prior to designation).

No matter the amount of information available, it is possible to state that the determination of Sensitive Areas was rather quick, since Spain decided to follow the timing set up in the Directive. This is consistent with the fact that the status of wastewater treatment in Spain at the time was very deficient and, therefore, it was necessary to address the existing situation seriously. The first implementation stage (December 1998) was referred, in particular, to wastewater treatment in Sensitive Areas. This is why a preliminary classification of such areas was carried out in 1993, with the final proposal being issued in 1995, including the agglomerations affected by the Directive (> 10.000 h-e). The proximity of the deadline for the implementation of treatment in these areas, and the enormous investment and construction works required for that, seem to have led, at the time, to the selection of as few sites as possible and, within these, with so few affected agglomerations as possible.

The specific information produced for the enforcement of this Directive has not been obtained for the purposes of this report. Consequently, the analysis of the application of the relevant criteria has been based on:

- The information produced for the implementation of Directive 91/676/EEC.
- The designation of Sensitive Areas.
- General information processed for the elaboration of the present report (Hydrological Plans, etc.).

A,a) Surface freshwater lakes, other freshwater bodies, estuaries, coastal waters and marine waters considered to be or to become eutrophic if action is not taken.

This criterion is applicable both to continental and coastal wetlands (lakes and lagoons), and to reservoirs, estuaries (including “rías”), and coastal waters.

Surface freshwater lakes: In Spain, classified Sensitive Areas include two inland wetlands (Las Tablas de Daimiel and Lagunas de Ruidera, in Castilla-La Mancha). These were already protected under nature conservation Acts. In addition, as already mentioned, there is a large information gap regarding eutrophication of natural wetlands in Spain.

Reservoirs: Over 71 reservoirs have been classified as Sensitive Areas in Spain, and most of them are intended for the abstraction of drinking water. However, according to the information contained in their respective Hydrological Plans (Basin Management Plans), not all of them show, in principle, the eutrophication status to which the designation is aimed at (e.g. the Santa Ana reservoir, classified in Aragón, is oligotrophic according to the Ebro Basin Plan). Moreover, a number of reservoirs presenting severe eutrophication according to different sources of information have not been designated (e.g. Mequinenza reservoir, also in Aragon and hipereutrophic in the Ebro Basin Plan). Anyway, the use or purpose of the stored volume to obtain drinking water has largely determined the designations.

Coastal wetlands: Overall, 12 coastal wetlands have been designated (2 in Andalucía, 6 in Valencia, 3 in Cantabria and 1 in Murcia). As for inland wetlands, their existing designation for nature conservation has largely determined the classification also as Sensitive Areas.

Estuaries and coastal waters: In Spain, 11 sites fall under this classification (2 in Catalonia, 1 in Galicia, 3 in the Basque Country, and 5 in Valencia), together with the Balearic coasts. However, it is not possible to link all these designations to criterion A,a), since it has been after the recent specific requirement by the European Commission, regarding the designation of Vulnerable Zones, that the Spanish authorities have started to address coastal eutrophication in sufficient degree.

A, b) Surface freshwaters intended for the abstraction of drinking water that contain, or may contain if adequate steps are not taken, nitrate concentration over 50 mg/l.

This criterion applies both to watercourses and reservoirs.

In Spain, 52 watercourses (14 in Castilla y León, 2 in Aragón, 1 in Valencia, and 35 in Catalonia), and over 71 reservoirs, most of them intended for the abstraction of drinking water, have been designated as Sensitive Area. However, according to information from Basin Authorities specific to the identification of waters affected by nitrate pollution relevant to Directive 91/676/EEC, there are no reservoirs with over 50 mg/l of nitrates, or likely to reach this level. In addition, watercourses with more than these nitrate concentrations seem to exist only in Castilla y León, Aragón, and Andalucía. These watercourses, identified under Directive 91/676/EEC, do not coincide with any of the Sensitive Areas classified.

A, c) Sites where additional treatment (to secondary treatment) is required in order to comply with other Council Directives.

In consistency with the previous considerations, it seems that this criterion has been applied to all the types of water bodies described (i.e. inland or coastal wetlands, watercourses, reservoirs, “rías”, estuaries, and coastal waters). This is certainly the case of two of the Sensitive Areas designated: Grazalema Nature Park and Cazorla National Park (Andalucía).

These designations seem to be aimed at compliance with Directive 76/160/EEC, regarding the quality of bathing waters and Directives 79/409/EEC y 92/43/EEC, regarding the protection of wild birds and the rest of the wildlife species and their habitats.

Consequently, according to the bodies of water effectively designated as Sensitive Areas, the following conclusions can be reached:

1. **Reservoirs:** Directive 91/271/EEC has been applied mainly regarding reservoirs. Provided that the information produced for the implementation of Directive 91/676/EEC is accurate, no reservoirs have been classified under criterion A.b): Surface waters with nitrate concentrations over 50 mg/l that are intended for the abstraction of drinking water. Regarding the remaining criteria, no final conclusion can be reached as to whether any of them has been prevailing.

Indeed, according to the information available, the following designations have been made:

- Eutrophic reservoirs intended for the abstraction of drinking water. For example, Barrios de Luna reservoir, in Castilla y León (Eutrophic according to the Duero Basin Plan).
 - Eutrophic reservoirs NOT intended for the abstraction of drinking water. For example, Brovales reservoir, in Extremadura (Eutrophic according to the Guadiana Basin Plan, and intended for irrigation according to the Inventory of Spanish Dams 1991).
 - NON eutrophic reservoirs intended for the abstraction of drinking water. For example, Sotonera reservoir in Aragón (Mesotrophic according to the Ebro Basin Plan).
 - NON eutrophic reservoirs NOT intended for the abstraction of drinking water. For example, Santa Ana reservoir, in Aragón (Oligotrophic according to the Ebro Basin Plan, intended for power generation according to the Inventory of Spanish dams 1991).
1. **Surface watercourses:** Provided that the information produced for the implementation of Directive 91/676/EEC is accurate, no watercourses have been classified under criterion A.b): Surface waters with nitrate concentrations over 50 mg/l that are intended for the abstraction of drinking water. Therefore, the criteria applied must have been either the “eutrophication status” or criterion A.c).

2. **Continental and coastal wetlands:** The criterion of “eutrophication status” is likely to have been applied to these types of water bodies. Nonetheless, their previous designation for nature conservation appears to have been prevailing. Therefore, designation must be owing to criterion A.c).
3. **Estuaries and coastal waters:** In this case the criterion of “eutrophication status” is also likely to have been applied. Nonetheless, it is most likely that their designation was linked to compliance with the Directive regarding the quality of bathing waters, with the prevailing criterion thus being A.c).

CONCLUSIONS REGARDING THE RELATIONSHIP BETWEEN VULNERABLE ZONES AND SENSITIVE AREAS IN SPAIN, TAKING INTO ACCOUNT COMMON STANDARDS.

Even though the Directives were approved in the same year, in Spain priority was given to the Directive 91/271/EEC. This fact is supported by a transposition of both Directives, made in 1996. When transposing Directive 91/271/EEC, the schedule established was followed, unlike Directive 91/676/EEC.

For this reason, there has not been an effective co-ordination of procedures for assigning Vulnerable Zones and Sensitive Areas. Yet a previous definition of Sensitive Areas has largely influenced the later assignment of Vulnerable Zones. Thus:

- Sensitive Areas have covered surface water (basically reservoirs aimed at producing drinking water) and a few coastal waters, even though in the latter case this was not owing to existing knowledge of coastal eutrophy but to a wish to protect some areas of high environmental value.
- Vulnerable Zones cover groundwater (not provided for by Directive 91/271/EEC) and, within this type, only those bodies of water intended for the abstraction of drinking water.

This implies that criteria of the Directives have been used in the following way:

Directive 91/676/EEC: The application of criteria has been biased.

The identification of affected bodies of water did not address coastal eutrophication at all.

In addition, the criterion regarding the eutrophication of freshwater bodies has also been obviated, since such a status has been far too conclusively attributed to phosphorus, in the case of reservoirs (it should be borne in mind that many of them had already been designated as Sensitive Area).

Although some watercourses were identified under the criterion of nitrate concentration over 50 mg/l in water bodies intended for the abstraction of drinking water, none of them has been effectively designated. The only exception is Andalucía, but these were classified as Vulnerable Zones for the rivers were all linked to affected groundwater bodies.

In summary, the prevailing criterion has been the presence of nitrate concentrations over 50 mg/l in groundwater. Nevertheless, this has been applied only partially, since designation has been effective just when the body was intended for the abstraction of drinking water.

Finally, the criteria within part B of Annex I of the Directive have largely determined the designation of Vulnerable Zones. In fact, the

majority of autonomous communities that have not classified Vulnerable Zones, despite the fact of having identified waters within their territory, have based their decision not to designate on existing information gaps regarding aquifer vulnerability or nitrogen behaviour in soil or water. This has been the case, by means of a public statement, of Extremadura, Navarra and La Rioja (the two latter have already implemented an action programme to address the lack of knowledge identified).

Directive 91/271/EEC: The classification of Sensitive Areas was made in a rather short time, owing to the proximity of the deadline for implementation of wastewater treatment in such areas (December 1998). In addition, designation was aimed at the lowest possible number of sites, and in particular at those not including urban agglomerations affected by the Directive.

As a consequence of this process followed by the relevant Spanish authorities, clear conclusions regarding the criteria that have determined the designations are very difficult to reach. In general, the authorities aimed at protecting waters intended for the abstraction of drinking water, regardless of their nitrate concentrations being equal or below 50 mg/l. Particular coverage was provided to reservoir, even when these did not show any eutrophication.

Besides, a number of inland or coastal wetlands were designated. For these, the prevailing designation criterion must have been their existing classification for nature conservation. Finally, the designation of coastal waters seems to have addressed compliance with the Directive on the quality of bathing waters, rather than coastal eutrophication itself.

Nonetheless, the coverage of Vulnerable Zones and Sensitive Areas in Spain is insufficient. Indeed, the information processed in this report has led to the identification of:

- 34 clear Vulnerable Zones under Directive 91/676/EEC, and 37 sites that should be thoroughly investigated.
- 44 clear Sensitive Areas under Directive 91/271/EEC, and 51 sites to be further investigated.

These figures do not include a number of rivers and reservoirs for which a variety of quality problems have been identified that might be relevant to the designations, but that require detailed investigation out of the scope of this report. The information on these water bodies is general (i.e. mention of urban effluents with no more data). Therefore, to propose these water bodies either as black or grey areas requires investigations on water abstraction points, pollutants, etc.

Finally, some outstanding information gaps have been identified that may have hampered the correct implementation of both Directives in Spain. Consequently, thorough and comprehensive studies should be carried out for the Spanish territory on the following subjects:

- Areas requiring the extension of the coverage and the increase of the sampling frequency of the existing monitoring networks.

- Eutrophication of reservoirs: a standard method should be implemented and regularly applied by all the Basin Authorities in order to achieve homogeneous studies for the whole of Spanish territory. This is the basis to monitoring eutrophication trends, and also to identify the effects of factors such as the local conditions and the implementation of wastewater treatment in water quality.
- Eutrophication of coastal areas.
- Eutrophication of wetlands.
- Aquifer vulnerability to pollution.
- Pollution loads on effluents to water bodies and the respective contribution of the likely sources.

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This chapter presents the results of the assessment of Vulnerable Zones and Sensitive Areas by the Spanish authorities, and the Zones and Areas identified as requiring designation or further investigation. The findings are shown individually for each of the 17 autonomous communities. Data for the autonomous cities of Ceuta and Melilla, in Northern Africa, are not available.

The sections on the regions have been organised so that the information is clear and manageable. The structure is as follows:

1. **General Description of the Autonomous Community:** Water Basin, economic activities and another relevant comments.
2. **Designated Sensitive Areas and Vulnerable Zones (both official and unofficial):** This paragraph contains:
 - A short description of the works carried out by the various authorities to identify and to designate the areas involved.
 - The Zones and Areas designated, both official and unofficial.
3. **Suggested designations (black and grey areas):** This includes the findings of the analysis of official and alternative information relevant to the designation of sites under both Directives.

The information is presented in tables that include a brief justification of the reasons behind each of the suggestions made. These comments include the relevant documentary reference with a number in brackets, and the full list of bibliography is listed at the end of the section. The written information is complemented with two maps showing the official and unofficial designations (Map A) and the suggested ones (Map B).

It should be noted that the extension of the suggested designations (and in some cases that of the effectively classified sites) is only approximate. However, the sites have been drafted after combining information on agricultural land use (e.g. irrigated land, livestock raising activity, etc.), nitrate concentrations and/or eutrophication status of water bodies and other relevant information specific for the location of sites.

Due to the large number of areas identified (166), and the information gaps existing to this respect in Spain, it has not been possible to include an assessment of runoff patterns and other relevant characteristics of catchments or sub-catchments. Nonetheless, the report does provide a general and homogeneous overview for the whole of the Spanish territory.

Regarding the division between official and unofficial designations, the latter are non-existent under EU law. However, both have been considered as “designated areas”, since specific regulations exist or are being produced within the Spanish legal system. Their condition of “official” or “unofficial”

designations has been stated, and they have been shown in a different way on the maps.

Finally, it is worth noting that the majority of reservoirs identified in this report fall under the provisions of Directive 91/271/EEC. Indeed, candidate reservoirs under Directive 91/676/EEC have only been included when agricultural sources of pollution were clearly identified.

2 *ANDALUCIA*

2.1 *GENERAL DESCRIPTION*

Total area: 87,268 Km²

Water basins: **Guadiana River** (covers 11.57% of Andalucía)
Guadalquivir River (90% of the basin is located within Andalucía)
Sur River (entirely within Andalucía)
Segura River (covers than 2% of Andalucía)

Economic activities: Intensive agriculture in Almería, Granada and the section of the Guadalquivir, where it is concentrated around provincial capitals. The most intensive agriculture is found in the provinces of Sevilla, Jaén and Granada; whilst Córdoba, Cádiz and Huelva are less intensive. Mining activities take place in Huelva. The service sector includes mass tourism throughout the entire coast of Andalucía, particularly the Mediterranean coast.

2.2 *DESIGNATED SENSITIVE AREAS AND VULNERABLE ZONES*

2.2.1 *Vulnerable zones*

The bodies of water affected by nitrate pollution were identified by the State because the Autonomous Community of Andalucía only has intercommunity water basins (7) and (8). The Autonomous Community of Andalucía did not prepare reports to delimit the extension of Vulnerable Zones¹. Therefore, it has not been possible to ascertain the reasons why some water masses affected by nitrates have failed to be regarded as Vulnerable Zones. The trophic status of Andalucía's coast is currently being studied within the framework of the OSPAR Agreement.

2.2.2 *Sensitive areas*

Identification of sensitive areas was included in the National Plan for Wastewater Treatment, but it was not officially made public until May 1998 (Resolution of 25 May 1998). In January 1999, the Autonomous Community of Andalucía enlarged the list of sensitive areas.

¹ According to a telephone conversation with one of the responsible technicians.

2.2.3

Coastal Sensitive Areas and Vulnerable Zones

The data used by the environmental authorities responsible for declaring the areas are unknown. Since 1990, a network of coastal stations (personal communication) has been operating in the Community to monitor the quality of marine coastal waters. Yet these data seem not to have been used to establish possible polluted areas. Our decision to declare certain zones as vulnerable and/or sensitive is based on these data. In this Autonomous Community, the trophic status of the Andalucía coast is being studied for the application of the OSPAR agreement.

ANDALUCÍA

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL VULNERABLE ZONES.

1. Guadalquivir Valley (Seville, Córdoba and Jaén)
2. Antequera aquifer
3. "Vega de Granada" plains
4. Atlantic coast (Cadiz)
5. Mediterranean coast (Almeria, Granada and Málaga)

OFFICIAL SENSITIVE AREAS.

6. Sierra Boyera Reservoir (River Guadiato)
7. Puente Nuevo Reservoir (River Guadiato)
8. Canales Reservoir (River Genil)
9. Cubillas Reservoir (River Cubillas)
10. Grazalema Nature Park
11. Cazorla Nature Park
12. Doñana National Park and Buffer zone
13. Beas Reservoir (River Castaño)
14. Guadalhorce- Guadalteba Reservoir (Rivers Guadalhorce/ Gaudalteba)
15. "Marismas del Odiel" (Odiel marshes)
16. Bay of Cadiz Natural Park
17. Coastal lagoons of the rivers Aguas and Antas (Almería)
18. Los Hurones Reservoir (River Majaceite).
19. El Gergal Reservoir (River Huelva)

ANDALUCÍA

MAP B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES.

Black

1. Almonte - Marismas aquifer and Guadalquivir marshes
2. Campo de Níjar
3. Corbones River
4. Salado de Morón River
5. Guadajoz River
6. Guadalete River
7. Bay of Algeciras
8. Rambla de Mojácar

Grey

9. Ayamonte- Huelva and Mouth of the Piedras River
10. Almanzora River and associated aquifer
11. Guadalmena Reservoir (Guadalmena River)
12. Estuary of Huelva La Lentejuela Lagoon Complex
13. Laguna Gosque (not shown)
14. Laguna Amarga (not shown)
15. Laguna del Rincón (not shown)
16. Laguna de Tiscar (not shown)
17. Laguna Honda (not shown)
18. La Lentejuela Lagoon Complex (not shown)

SENSITIVE AREAS.

Black

19. Bay of Algeciras

Grey

20. Mouth of the Piedras River
21. Mouth of the Tinto River
22. Rambla de Mojácar

VULNERABLE ZONES

Legislation:

Decree 261/98 of 15 December, designating those zones which are vulnerable to pollution from nitrates from agricultural sources within Andalucía (Official Journal: Boletín Oficial de la Junta de Andalucía number 5, dated 12 January 1999)

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
<i>Guadalquivir Valley</i>	(Seville) (some 25 municipalities)	GQ	Decree 261/1998 of 15 December	
<i>Guadalquivir Valley</i>	(Cordoba y Jaen) (8 municipalities of Cordoba, 3 municipalities of Jaén)	GQ	Decree 261/1998 of 15 December	
<i>Antequera aquifer</i>	(5 municipalities of Malaga, 1 municipality of Seville)	GQ	Decree 261/1998 of 15 December	
"Vega de Granada" farmland plain	(22 municipalities in Granada)	GQ	Decree 261/1998 of 15 December	This area includes the Iznajar, Malpasillo and Cordobilla reservoirs, identified by report (8) as having at least 20-30% of the total nitrogen load coming from an agricultural source. Unspecified by (8) whether the reservoirs are eutrophic. If so, should also be regarded as a Sensitive Area.
Atlantic Coast	(6 municipalities in Cadiz)	S	Decree 261/1998 of 15 December	
Mediterranean Coast	(12 municipalities in Almeria, 6 municipalities in Granada, 4 municipalities in Malaga)	S	Decree 261/1998 of 15 December	In Dalías farming region ("Campo de Dalías", Almeria): <ul style="list-style-type: none"> • Eutrophic coastal lagoon (López y Tomàs) • Nitrate concentration above average at coastal stations (RCCAL) • Main effects on the "Albufera Honda"

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring "Sensitive" areas in inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998).

Autonomous Community: Decree 54/1999 of 2 March, declaring the sensitive areas, normal areas, and less sensitive areas of the coastal waters and intra-community water basins of the Autonomous Community of Andalucía (Official Journal: Boletín Oficial de la Junta de Andalucía nº 35, 23 March 1999).

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Sierra Boyera reservoir (on the Guadiato River)	Córdoba (Belmez)	GQ	Resolution of 25 May 1998	Purpose/use: Water supplies
Puente Nuevo reservoir (on the Guadiato River)	Córdoba (Villaviciosa)	GQ	Resolution of 25 May 1998	Purpose/use: irrigation, water supplies, and energy
Canales reservoir (on the Genil River)	Granada (Guejar-Sierra)	GQ	Resolution of 25 May 1998	Purpose/use: Water supply, irrigation and energy
Cubillas reservoir (Cubillas River)	Granada (Albolote and Chaparral)	GQ	Resolution of 25 May 1998	Purpose/use: irrigation
El Gergal reservoir (on the Huelva River)	Sevilla (Guillena)	GQ	Resolution of 25 May 1998	Purpose/use: Water supplies
Grazalema Nature Park	Cádiz (Grazalema)	GQ	Resolution of 25 May 1998	

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Cazorla Nature Park	Jaen	GQ	Resolution of 25 May 1998	
Doñana National Park and surrounding area	Seville - Huelva	GQ	Resolution of 25 May 1998	
Beas reservoir (Castaño River)	Huelva (Beas)	GN	Resolution of 25 May 1998 Decree 54/1999 of 2 March	Purpose/use: Water supplies
Guadalhorce-Guadalteba reservoir (Guadalhorce and Guadalteba Rivers)	Malaga (Malaga)	S	Resolution of 25 May 1998 Decree 54/1999 of 2 March	Purpose/use: Guadalhorce: Irrigation and water supplies; Guadalteba: Irrigation and energy
"Marismas de Odiel" Natural Site	Huelva	GN	Decree 54/1999 of 2 March	
Bay of Cadiz Nature Park	Cadiz	S	Decree 54/1999 of 2 March	
Coastal lagoons of the Aguas and Antas rivers	Almeria	S	Decree 54/1999 of 2 March	
Los Hurones reservoir (Majaceite River)	Cadiz (Algar)	GQ	Decree 54/1999 of 2 March	Purpose/use: Irrigation and water supplies

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to be designated</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 04.12 Ayamonte-Huelva And Mouth of the Piedras River	Farming area	GN	<ul style="list-style-type: none"> According to ref. (1), (4) and (7), polluted by nitrates from agricultural sources. The aquifer zone coincides with irrigated cropland area. Nitrate concentrations over 50 mg/l have been recorded. 	<ul style="list-style-type: none"> Despite evidence of pollution, it was not designated because, according to (7), nitrate level tended to decrease. It is regarded as an “area to be watched” by the Autonomous Community
Grey (91/271/EEC) - monitoring/ investigations suggested	Mouth of the Piedras River	The mouth of the river		<ul style="list-style-type: none"> Somewhat closed estuary with a large population in the water basin Nutrient values slightly above average (RCCAL) 	<ul style="list-style-type: none"> A study should be made of whether human activity modifies the environment
Vulnerable Zone	HU 05.51 Almonte - Marismas And Zone of the “Marismas del Guadalquivir”	Intensive agricultural area	GQ	<ul style="list-style-type: none"> According to ref.(1), (8) , (9) and (10) , polluted by nitrates from agricultural sources. Estuary with predominantly continental inflow and scant water renovation. Very high nitrate concentration (RCCAL). The Government of Andalucía has recognised intense use of agricultural fertilisers in the water basin (Junta de Andalucía, 1997) Includes eutrophic water courses (15). 	<ul style="list-style-type: none"> Sensitive Zone labelled “Doñana and environment” Nitrate concentrations >50 mg/l have been recorded. The zone coincides with a large irrigated area (14).
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 06.03 and 06.06 Floodplain and detritus of the Alanzora and Alanzora river	Middle and lower sections of the Alanzora River and floodplain	S	<ul style="list-style-type: none"> According to ref. (5), (7) and (9), polluted by nitrates from agricultural sources. 	<ul style="list-style-type: none"> Nitrate concentrations >50 mg/l have been recorded. There is an irrigated area around the Alanzora River (14).

Vulnerable Zone	HU 6.11 Campo de Níjar (Almería)	Intensive agricultural activity perimeter	S	<ul style="list-style-type: none"> According to ref. (5) and (7), polluted by nitrates from agricultural sources. 	<ul style="list-style-type: none"> Nitrate concentrations >50 mg/l have been recorded. Coincides with a fast expanding area of intense farming under plastic.
Vulnerable Zone	Corbones River (Sevilla)	Corbones River basin	GQ	Identified by (8)	
Vulnerable Zone	Salado de Moron River	Section from the Torre del Aguila reservoir (included) up to confluence of the Guadalquivir River and slope basin	GQ	Identified by (8)	<ul style="list-style-type: none"> The reservoir is identified by report (8) as having at least a 20-30% of the total nitrogen load coming from agricultural sources. (8) Does not specify whether the reservoir is eutrophic, but it is given such category by (15). If confirmed, it should also be regarded as a Sensitive Area. <p>Purpose/use: Irrigation (2).</p>
Vulnerable Zone	Guadajoz River	From Castro del Rio and slope basin	GQ	Identified by (8)	
Vulnerable Zone	Guadalete river floodplain and Guadalete river, including Bornos reservoir.	Guadalete River basin	GQ	Identified by (8) and (9). Upper and mid-sections, including reservoirs, identified as Hipereutrophic, (15).	<ul style="list-style-type: none"> Report (8) highlights recording of 45 mg/l nitrate concentrations, with a clear increasing trend, in the river. Ref. (8) reports that at least 20-30% of the total nitrogen load was regarded as coming from agricultural sources.
Grey (91/676/EEC) - monitoring/ investigations suggested	Guadalmena reservoir (Guadalmena River, Jaen. Chiclana de S. and S. De la Sierra)	Reservoir and slope water basin	GQ	Identified at (8) Mesoeutrophic according to (15)	<ul style="list-style-type: none"> Purpose/use: Irrigation and energy Reservoir identified by report (8) as having at least 20-30% of the total nitrogen load coming from agricultural sources. Unspecified by (8) as a eutrophic reservoir. If so, it should also be regarded as a Sensitive Area.

Grey (91/676/EEC) - monitoring/ investigations suggested	La Lentejuela lagoon complex		GQ	Identified by (8) as affected by agricultural activity	No nitrate values reported in (8).
Grey (91/676/EEC) - monitoring/ investigations suggested	Laguna Gosque		GQ	Identified by (8) as affected by agricultural activity	No nitrate values reported in (8).
Grey (91/676/EEC) - monitoring/ investigations suggested	Laguna Amarga		GQ	Identified by (8) as affected by agricultural activity	No nitrate values reported in (8).
Grey (91/676/EEC) - monitoring/ investigations suggested	Laguna del Rincón		GQ	Identified by (8) as affected by agricultural activity	No nitrate values reported in (8).
Grey (91/676/EEC) - monitoring/ investigations suggested	Laguna de Tiscar		GQ	Identified by (8) as affected by agricultural activity	No nitrate values reported in (8).
Grey (91/676/EEC) - monitoring/ investigations suggested	Laguna Honda		GQ	Identified by (8) as affected by agricultural activity	No nitrate values reported in (8).
Sensitive Area	Bay of Algeciras	The Bay itself		<ul style="list-style-type: none"> • A closed bay with scant water renovation, surrounded by large population centres. • Very high nitrate and phosphate values (RCCAL) • Local studies have characterised it as eutrophic (Hernández et al., 1997) • The Government of Andalucía indicates that the values of the parameters measured are high (Junta de Andalucía, 1997) 	<ul style="list-style-type: none"> • Clearly eutrophic
Vulnerable Zone	Bay of Algeciras	Campo de Gibraltar		<ul style="list-style-type: none"> • Bay with predominantly continental inflow and scant water renovation • Very high nitrate concentration (RCCAL) • The Government of Andalucía has recognized intense use of agricultural fertilizers in the community (Junta de Andalucía, 1997) • Eutrophication at the mouth of the Palmes River (Hernández et al., 1997) 	<ul style="list-style-type: none"> • The “Campo de Gibraltar” area flows directly into the Bay of Algeciras

Grey (91/271/EEC) - monitoring/ investigations suggested	Mouth of the Tinto River and estuary of Huelva	Mouth of the Tinto River and estuary of Huelva itself.		<ul style="list-style-type: none"> • Somewhat closed estuary with a large population in the water basin • Nutrient values slightly above average (RCCAL) • Zone adjacent to the Odiel marshes, which have been declared a sensitive area. 	<ul style="list-style-type: none"> • A study should be made of whether human activity modifies the environment
Grey (91/676/EEC) - monitoring/ investigations suggested	Estuary of Huelva	Farmland around Huelva city		<ul style="list-style-type: none"> • Somewhat closed estuary with a large population in the water basin • Nutrient values slightly above average (RCCAL) • Nitrate pollution of coastal aquifers of the hydrogeological unit (MOPT, 1996). 	
Vulnerable Zone	Rambla de Mojacar	“Campo de Mojacar” area		<ul style="list-style-type: none"> • The mouth of the streambed is eutrophic (López y Tomàs) • Nitrate concentration above average in coastal stations (RCCAL) 	Associated to Sensitive area: “Coastal lagoons of the Rivers Aguas and Antas”.
Grey (91/271/EEC) - monitoring/ investigations suggested	Rambla de Mojacar	The Rambla itself		<ul style="list-style-type: none"> • The mouth of the streambed is eutrophic (López y Tomàs) • Nitrate concentration above average in coastal stations (RCCAL) • Seasonal tourism agglomerations 	Associated to Sensitive area: “Coastal lagoons of the Rivers Aguas and Antas”.

Note: In order to determine the grey and black coastal areas, we took into consideration coastal morphology, regional hydrography, the population density near the coast, population centres of more than 10,000 inhabitants, agricultural development of the autonomous community, particularly irrigation, the presence of coastal aquifers with a high degree of nitrate pollution (MOPT, 1996), the Report on Environment Status issued by the Andalusian Board (Andalusian Board, 1997), technical information (Establier et al., 1987; López and Tomàs, 1989; Gómez-Parra and Forja, 1992; Hernández et al., 1997) and data from the Monitoring Network for Quality of Coastal Waters (RCCAL).

Some of the reservoirs that have an irregular degree of eutrophication, according to (4), (5) and (15), are presented below. The reference documents (4) and (5) underline that the data used are obsolete and a new monitoring campaign will be needed to verify them. Besides, document (15), despite being the most comprehensive study on eutrophication of continental waters in Spain, has limited value, since it uses mainly single campaign data from the 1980s. Therefore, in this report no conclusion has been reached about the appropriateness of their designation and they are included only as information.

<i>Reservoir</i>	<i>Water basin code</i>	<i>Eutrophication status</i>	<i>Observations</i>
Los Silillos reservoir (Butrón River, Huelva: Valverde del Camino)	GN	Eutrophic (4).	Purpose/use: Water supplies (2).
Riscoso reservoir (Riscoso River, Huelva: Calañas)	GN	Eutrophic (4).	Purpose/use: Industrial water supplies (2).
Campofrío II reservoir (Campofrío River, Huelva: Campofrío)	GN	Mesoeutrophic (4).	Purpose/use: Human water supplies (2).
Calabazal II reservoir (Calabazal River, Huelva: Calavias)	GN	Mesoeutrophic (4).	Purpose/use: Industrial water supplies (2).
Odiel-II reservoir (Odiel River, Huelva: Aracena)	GN	Mesoeutrophic (4).	Purpose/use: Industrial water supplies (2).
Cuevas de Almanzora reservoir (Almanzora River, Almeria: Cuevas de Almanzora)	S	Eutrophic (5).	Purpose/use: Irrigation and water supplies (2)
Guadarranque reservoir (Guadarranque River, Cadiz: Castellar de la Frontera)	S	Mesoeutrophic (5). Ref. (15) determines eutrophic status.	Purpose/use: Irrigation and water supplies (2)
Conde de Guadalhorce reservoir (Turón River, Malaga: Ardales)	S	Mesoeutrophic (5), but (15) states that it is eutrophic.	Purpose/use: Irrigation and energy (2)
Gaitanejo reservoir (Guadalhorce River, Malaga: Ardales)	S	Mesoeutrophic (5).	Purpose/use: Energy (2)
La Concepción reservoir (Verde River, Malaga: Marbella)	S	Oligo-mesoeutrophic, with a clear increasing trend (5). In turn, (15) identifies Hipereutrophic status.	Purpose/use: Irrigation and water supplies (2)

The Autonomous Community of Andalucía has covered the majority of land affected by nitrates from agricultural sources with Vulnerable Zone designation. However, outstanding areas with clear pollution have been left aside, such as the Almonte – Marismas and Campo de Níjar zones, and some Guadalquivir River tributaries. Socio-economic pressures might be behind the non-designation of the former two areas. Almonte - Marismas is a somehow deprived intensively irrigated area close to Doñana National Park, where conservation needs pose considerable pressure upon current agricultural practice. Campo de Níjar plastic crops, in turn, are becoming a major source of income at provincial (Almería) and even regional level.

In addition, investigations should be undertaken in Ayamonte – Huelva, Almanzora and Mojacar to determine the trends in nitrate pollution from agricultural sources.

Regarding the classification of Sensitive Areas, the region has largely covered the need for designation, with only one area being identified as requiring designation (Bay of Algeciras) and two others pending confirmation after specific monitoring (Mouth of the Piedras and the Tinto Rivers).

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8. Confederación Hidrográfica del Guadalquivir. 1997. *Informe de aplicación del Real Decreto 261/96 al ámbito de gestión de la Cuenca del Guadalquivir*. Confederación Hidrográfica del Guadalquivir, Comisaría de Aguas. Abril, 1997. Informe inédito.
9. Consejería de Medio Ambiente de la Junta de Andalucía. 1988 *"Informe de Medio Ambiente, 1988"*.
10. Consejería de Medio Ambiente de la Junta de Andalucía. 1994 *"Informe de Medio Ambiente, 1994"*
11. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de

cuenca del Guadalquivir, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).

12. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Segura, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
13. Orden de 6 de septiembre de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Sur, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 223, de 17 de septiembre 1999).
14. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis*. Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.
15. Álvarez Cobelas, M.; P. Muñoz Ruíz and A. Rubio Olmo 1991. *La Eutrofización de las Aguas Continentales Españolas*. Centro de Investigaciones del Agua, Consejo Superior de Investigaciones Científicas. Febrero, 1991.

3.1 GENERAL DESCRIPTION

Water basins: Ebro River: (49.28% of the water basin area, all of Zaragoza and Huesca and much of Teruel).
 Júcar River: (13.15% of the area of the water basin, in the province of Teruel)

Economic activities: In mountainous areas, subsistence farming. Throughout the Ebro River valley, in extensive irrigated areas, intensive agriculture and livestock raising. Large areas of irrigated farmland in Huesca and Zaragoza. Abundant livestock. Large industrial estates in Zaragoza.

Observations: The Ebro River basin has problems of natural salinity.

3.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

3.2.1 Vulnerable zones

The bodies of water affected by nitrate pollution were identified by the State because the Autonomous Community of Aragon only has intercommunity water basins (Ebro and Júcar) (5). In practice, affected groundwater was determined only in the Ebro water basin (report by the Ebro Basin Authority; ITGME did not prepare a report for Aragon, even though it should have for part of its territory is included in the Júcar water basin). In the Ebro, 10 hydrogeology units (HU) with nitrate pollution were identified within this autonomous community.

As for surface waters, the Ebro Basin Authority identified one river (Arba). For their part, the Júcar Basin Authority stated that in no case had the limit of 50 mg/l been exceeded in surface waters and reservoirs. As for reservoir eutrophication, both confederations attribute it expressly to phosphates, although the Ebro Report mentions a major contribution of agricultural input.

The autonomous community did not prepare any report to determine what Vulnerable Zones should be designated. According to a telephone conversation held with a technical official of the autonomous community, the Identification of affected water bodies made by the Ministry was considered inadequate. The following criteria were followed for designation:

1. Temporal evolution of nitrate pollution;
2. Current water uses, with special attention of water-supply points destined for the production of drinking water (information obtained from the General Directorate of Public Health of the Aragon government) and;
3. Land uses and agricultural and livestock origin of nitrates.

Therefore, the two zones that have been designated do not have reports justifying the designation.

3.2.2

Sensitive Areas

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. Later, the state Resolution of 25 May 1998 publicly acknowledged the sensitive areas.

ARAGON

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL VULNERABLE ZONES.

1. Jalón de Huerva aquifer
2. Gallocanta basin

OFFICIAL SENSITIVE AREAS.

3. Sotonera Reservoir (Rivers Astón and Sotón)
4. Yesa Reservoir (River Aragón)
5. Barasona Reservoir (River Esera) and Santa Ana Reservoir (River Noguera Ribargozana)
6. Monte Arago and Vadiello Reservoir (River Guatizalamea)
7. Tranquera Reservoir (River Piedra)
8. Cueva Foradada Reservoir (River Martín)
9. Guadalope River basin
10. Gallego River basin up to Ardisa Reservoir
11. Arquillo de San Blas Reservoir (river Guadalaviar)

ARAGON

MAP B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES.

Black

1. Ebro III, Arba River and Gallego floodplain aquifers
2. Cinca floodplain aquifer
3. Alto Jiloca floodplain aquifer
4. Apies and Hoya de Huesca aquifer

Grey

5. Muel Belchite Aquifer
6. Beceite Passes Aquifer
7. Mequinenza Reservoir

SENSITIVE AREAS.

Black

8. Mequinenza Reservoir

Grey

9. Mediano Reservoir (River Cinca)
10. Escales Reservoir (River Noguera Ribagorzana)
11. Canalles (River Noguera Ribagorzana)

VULNERABLE ZONES

Legislation:

Autonomous Community: Decree 77/1997, 27 May, of the Government of Aragon which approves the agricultural Code of Good Practice of the Autonomous Community of Aragon and designates certain sites as Vulnerable Zones to water pollution by nitrates of agricultural origin (Official Journal: Boletín Oficial de Aragón nº 66, 11 June 1997).

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
<i>HU no. 09.37 "Jalón de Huerva",</i>	<i>Zaragoza (Calatorao, La Almunia de Doña Godina and Longares)</i>	<i>E</i>	<i>Decree 77/1997 of 27 May</i>	<ul style="list-style-type: none"> • The vulnerable zone does not cover the entire HU. Its extension was delimited with the help of a university doctor who wrote a doctoral dissertation on this aquifer. Only the most vulnerable parts of the aquifer were declared vulnerable. • According to ref. (3), cases of more than 100 mg/l NO³ are recorded. • This is the only aquifer where priority action is recommended in the Report of the Ebro Basin Authority (5), due to its importance as a source of urban water supplies.
<i>HU no. 09.44 "Gallocanta",</i>	<i>Teruel and Zaragoza (Las Cuerlas, Tornos, Torralba de los Sisonos and Bello)</i>	<i>E</i>	<i>Decree 77/1997 of 27 May</i>	<ul style="list-style-type: none"> • In this case, the entire HU has been declared a Vulnerable Zone. Its natural importance has weighed heavily (it feeds the Gallocanta pond, one of the most important wetlands in Spain). • Agri-environment Schemes (EEC Regulation 2078/92) are implemented in this area to provide subsidies to farmers following environmentally sensitive practice.

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring "Sensitive" areas in the intercommunity hydrographic water basins (BOE nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998).

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Sotonera reservoir (on the Astón and Sotón Rivers)	Huesca (Alcalá de Gurrea)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: irrigation and water supplies (2). • No population centres under obligation by the Directive. • Eutrophic reservoir according to (10).
Yesa reservoir (on the Aragón River)	Huesca (Yesa)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: irrigation, water supplies, and energy (2). • Population centres under obligation by the Directive: Jaca
Joaquín Costa or Barasona reservoir (on the Esera River) and Santa Ana reservoir (on the Noguera Ribagorzana River)	Huesca (Graus and Puebla de Castro; Castillonroy)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of Joaquín Costa reservoir water: irrigation, water supplies, and energy; purpose/use of Santa Ana reservoir water: energy (2). • No population centres under obligation by the Directive.
Monte Aragón and Vadiello reservoirs (on the Guatzalamea River)	Huesca (Santa Eulalia)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use: irrigation and energy (2) • No population centres under obligation by the Directive.
Tranquera reservoir (on the Piedra River)	Zaragoza (Carenas)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use: irrigation, water supplies, and energy (2) • No population centres under obligation by the Directive.
Cueva Foradada reservoir (on the Martín River)	Teruel (Oliete and Alcañiz)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use: irrigation (2) • No population centres under obligation by the Directive.
Guadalupe River basin	Teruel (mainly) and Zaragoza	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Alcañiz • The river includes the Santolea reservoir, considered oligomesotrophic by ref. (3). Purpose/use: irrigation

Gállego River basin to the Ardisa reservoir	Huesca and Zaragoza	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> Population centres under obligation by the Directive: Sabiñánigo Reservoir purpose/use: irrigation and derivation (2).
Arquillo de San Blas reservoir (on the Guadalaviar River)	Teruel (Teruel)	J	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: irrigation, water supplies, and energy (2). No population centres under obligation by the Directive.

3.3

SUGGESTED DESIGNATION

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	HU 09.27 Ebro III And Arba River floodplain aquifer; And HU 09.28 Gállego floodplain aquifer	Agricultural irrigated areas	E	<ul style="list-style-type: none"> Identified as affected water bodies in the Ebro Authority Report (5), UH 09.27 (5) is identified by the report of the Ebro Authority (5) as one of the most intensely and generally affected aquifers of the Ebro River basin. Includes a large irrigated farmland area (10). 	<ul style="list-style-type: none"> HU 09.27 is shared with Navarra. With respect to HU 09.27, ref. (5) indicates that it is one of the most affected zones around Zaragoza and among the watercourses until Fuentes de Ebro. With regard to HU 09.28, ref. (5) indicates that many sampling points regularly exceed 50 mg/l, particularly at the mouth. According to the Hydrological Plan (3), the connection with watercourses makes these floodplain aquifers vulnerable to pollution.
Vulnerable Zone	HU 09.29 Cinca floodplain aquifer	Agricultural irrigated areas	E	<ul style="list-style-type: none"> Identified as an affected water body in the Ebro Authority Report (5). The Cinca Valley is a large irrigated area (10). 	<ul style="list-style-type: none"> According to the Hydrological Plan (3), the connection with watercourses makes the floodplain aquifer vulnerable to pollution. Ref. (5) mentions that pollution is mild, presumably greater between Monzón and the mouth of the Cinca, and increases downstream

Vulnerable Zone	HU 09.46 Alto Jiloca floodplain	Agricultural areas	E	<ul style="list-style-type: none"> Identified as an affected water body in the Ebro Authority Report. According to ref. (3), more than 50mg/l. Includes a strip of irrigated cropland (10). 	<ul style="list-style-type: none"> Ref. (5) mentions that the most polluted areas are at the head and the section downstream from Monreal del Campo.
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 09.38 Muel-Belchite	Agricultural areas	E	<ul style="list-style-type: none"> Identified as an affected water body in the Ebro Confederation Report (5). 	<ul style="list-style-type: none"> Ref. (5) considers the floodplain aquifer of the Huerva polluted in its lower section. Part of the adjacent HU (09.37) has been officially classified as Vulnerable Zone.
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 09.42 Beceite passes	Agricultural areas	E	<ul style="list-style-type: none"> Identified as an affected water body in the Ebro Confederation Report (5). 	<ul style="list-style-type: none"> Ref. (5) estimates that the tertiary dendritic aquifer and river floodplains of this unit are mildly polluted.
Vulnerable Zone	Apiés and Hoya de Huesca aquifer.	Agricultural areas	E	<ul style="list-style-type: none"> According to ref. (8) and (9), polluted by nitrates from agricultural sources. Dry croplands dominate. 	<ul style="list-style-type: none"> This aquifer has not been officially mapped. Uses include population supplies.
Sensitive Area	Mequinena reservoir (on the Ebro River in Zaragoza)	The reservoir itself	E	<ul style="list-style-type: none"> Extremely eutrophic according to ref. (3), (5) and (11). 	<ul style="list-style-type: none"> Purpose/use: energy (2) Ref. (5) did not determine it as an affected water body, by attributing the cause of eutrophication to phosphates, but generally recognised that there were inputs of agricultural origin.
Grey (91/676/EEC) - monitoring/ investigations suggested	Mequinena reservoir (on the Ebro River in Zaragoza)	Agricultural areas around the reservoir	E	<ul style="list-style-type: none"> It is surrounded by irrigated and dry croplands (10). 	<ul style="list-style-type: none"> Ref. (5) did not determine it as an affected water body, by attributing the cause of eutrophication to phosphates, but generally recognised that there were inputs of agricultural origin.
Grey (91/271/EEC) - monitoring/ investigations suggested	Mediano reservoir (on the Cinca River in Huesca)	The reservoir itself	E	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (3). 	<ul style="list-style-type: none"> Purpose/use: irrigation and energy (2)

Grey (91/271/EEC) - monitoring/ investigations suggested	Escales reservoir (on the Noguera Ribagorzana River in Huesca)	The reservoir itself	E	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (3). 	<ul style="list-style-type: none"> Purpose/use: energy (2) The Noguera Ribagorzana River is a tributary of the Segre. The Segre and its tributaries have been identified in Cataluña as a Sensitive Area. Therefore, there is a lack of coordination between autonomous communities.
Grey (91/271/EEC) - monitoring/ investigations suggested	Canelles reservoir (on the Noguera Ribagorzana River in Huesca, Estopiñán)	The reservoir itself	E	<ul style="list-style-type: none"> Oligomesoeutrophic according to ref. (3). 	<ul style="list-style-type: none"> Purpose/use: energy (2). The Noguera Ribagorzana River is a tributary of the Segre. The Segre and its tributaries have been identified in Cataluña as a Sensitive Area. Therefore, there is a lack of coordination between autonomous communities.

Note: The Hydrological Plan of the Ebro water basin establishes establishes the following eutrophication categories in reservoirs: Hypereutrophic, Eutrophic, Mesoeutrophic, Oligomesoeutrophic and Oligoeutrophic. Given the impossibility of comparing these categories with OECD categories, we chose to include all categories related with the plan as Grey or black zones, with the sole exception of those included in the Oligoeutrophic category.

According to the information analysed, the Autonomous Community of Aragón has carried out a rather comprehensive designation of Sensitive Areas under Directive 91/271/EEC, with only one clear gap (Mequinenza Reservoir) and a few other water bodies for which further information is needed. These are the Mediano, the Escales and the Canelles Reservoirs. The latter two reservoirs are located in the boundary with Catalonia, within the Segre and tributaries sub-basin. It should be noted that, unlike Aragon, Catalonia has classified the Segre system as a Sensitive Area. This is an indication of the likely lack of co-ordination between the two autonomous communities during the designation process.

Gaps have been mainly identified for the designation of Vulnerable Zones under Directive 91/676/EEC. The regional government has classified only two areas, which do not show, according to the information available, the most alarming situations regarding nitrate pollution from agricultural sources. These significant omissions include the intensive farming areas within the Ebro valley (Ebro and main tributary floodplains) and the Jiloca plains. In addition, further investigation is recommended in two more areas.

1. Varela Sánchez, 1991. *"Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear"*. Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. *"Inventario de presas españolas"*. Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT (1992) *Confederación Hidrográfica del Ebro. Plan Hidrológico. Propuesta de Proyecto de Directrices. Tomo IV: Resumen.* Ministerio de Obras Publicas Y Transportes. Secretaría de Estado para las Políticas del Agua y Medio Ambiente. Dirección General Hidráulica.
4. MOPT (1992). *Confederación Hidrográfica del Júcar. Plan Hidrológico. Proyecto de Directrices.* Ministerio de Obras Publicas Y Transportes. Secretaría de Estado para las Políticas del Agua y Medio Ambiente. Dirección General Hidráulica.
5. *Determinación de masas de aguas afectadas por nitratos de origen agrario para la Comunidad Autónoma de Aragón (Informe CH Ebro e Informe CH Júcar).*
6. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Júcar, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
7. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Ebro, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 222, de 16 de septiembre 1999).
8. Cuchí Oterino et al 1994.. *"Contaminación por nitratos en el Acuífero de Apiés (Huesca)"*. Revista Agua y Medio Ambiente.Zaragoza
9. Cuchí Oterino et al. 1997. *"Niveles de ión nitrato en aguas subterráneas de la Hoya de Huesca"*. Revista Kalium nº 4, 1997. Huesca.
10. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis.* Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Miniterio de Agricultura, Pesca y Alimentación.
11. Álvarez Cobelas, M.; P. Muñoz Ruíz and A. Rubio Olmo 1991. *La Eutrofización de las Aguas Continentales Españolas.* Centro de Investigaciones del Agua, Consejo Superior de Investigaciones Científicas. Febrero, 1991.

4.1 GENERAL DESCRIPTION

Water basins: Norte (Norte I: 18 Km²; Norte II: 61% of the Cuenca River basin)

Economic activities: Coal mines (inland) and steel furnaces (central coastal area). To a lesser degree, agriculture, livestock (east and west); and tourism (inland and coastal).

4.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

4.2.1 Vulnerable zones

The Identification of surface and ground bodies of water affected by nitrates is the responsibility of the State (Norte I and II inter-community water basin). The Identification of coastal waters affected by nitrates is the responsibility of the autonomous community.

In the Norte water basin, no underground water body was identified as affected. ITGME has had a monitoring network since 1978, which was optimised in 1990 and consists of 68 monitoring points distributed throughout 8 hydro-geology units (HU). According to data obtained by this network and in the April 1996 campaign, the situation of groundwater in Asturias with respect to nitrates is fully satisfactory (no sample exceeded 50 mg/l) because of high rainfall and the large amount of unfarmed land (70% of the total).

With regard to the surface waters of the Norte River basin, the Norte Basin Authority declared that points with more than 50 mg/l were non-existent in Asturias. At 8 sampling stations, values over 25 mg/l were recorded, all due to direct effluents. Finally, with respect to reservoir eutrophication, the limiting factor was phosphates and none of the cases of involvement were attributed to agricultural pollution.

This autonomous community has not made any report on nitrate pollution in the community.

4.2.2 Sensitive Areas

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. Later, the state Resolution of 25 May publicly acknowledged the only two sensitive areas that have been declared.

4.2.3

Coastal Sensitive Areas and Vulnerable Zones

The information used by national authorities is unknown, if indeed they used any information sources. At regional level, the Water Quality Service within the regional Ministry for the Environment used a report on coastal eutrophication caused by agricultural nitrates to justify the non-designation of any coastal vulnerable zone (8). In addition, information on the quality of bathing water has also been processed in the present report.

ASTURIAS

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL SENSITIVE AREAS.

1. Tanes and Rioseco Reservoir (River Nalón)
2. Alfilorios Reservoir (River Barrea)

ASTURIAS

MAP B: SUGGESTED DESIGNATIONS

SENSITIVE AREAS

Black

1. Bay of Avilés

Grey

2. Port of Musel
3. Prianes Reservoir (River Nora)
4. La Granda Reservoir (River La Granda)
5. Trasona Reservoir (River Corbera)

VULNERABLE ZONES

The Autonomous Community of Asturias has declared that no vulnerable zones exist, although this declaration has not been officially acknowledged.

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring "Sensitive" areas in the intercommunity hydrographic water basins (Official Journal: Boletín Oficial del Estado n° 155, 30 June 1998, correction of errata: BOE n° 189, 8 August 1998).

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Tanes and Rioseco reservoir (Nalón River)	Oviedo (Caso and Sobrescobio)	N-II	Resolution of 25 May 1998	<ul style="list-style-type: none">• Purpose/use: irrigation and water supplies (2).• No population centres under obligation by the Directive.
Alfilorios reservoir (on the Barrea River)	Oviedo (Ribera)	N-II	Resolution of 25 May 1998	<ul style="list-style-type: none">• Purpose/use: Water supplies (2).• No population centres under obligation by the Directive.

(*) Although it is estimated that the Spanish authorities have not formally designated Less Sensitive Areas, according to semi-official information (Medio Ambiente en España 1997, MMA) it has been determined that the entire coast of Asturias is a less sensitive area.

4.3

SUGGESTED DESIGNATIONS

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Grey (91/271/EEC) - monitoring/ investigations suggested	"Prianes" reservoir (on the Nora River in Oviedo)	The reservoir itself	N-II	<ul style="list-style-type: none"> The reservoir is eutrophic (4) Phosphorus is the limiting factor (6) 	<ul style="list-style-type: none"> Purpose/use: energy (2)
Grey (91/271/EEC) - monitoring/ investigations suggested	"La Granda" reservoir (on the La Granda River in Oviedo)	The reservoir itself	N-II	<ul style="list-style-type: none"> The reservoir is moderately eutrophic (4) Phosphorus is the limiting factor (6) 	<ul style="list-style-type: none"> Purpose/use: Industrial uses (2)
Grey (91/271/EEC) - monitoring/ investigations suggested	"Trasona" reservoir (on the Corbera River, Oviedo)	The reservoir itself	N-II	<ul style="list-style-type: none"> The reservoir is moderately eutrophic (4) Phosphorus is the limiting factor (6) 	<ul style="list-style-type: none"> Purpose/use: Industrial uses (2)
Sensitive Area	Bay of Avilés	The Bay		<ul style="list-style-type: none"> A closed bay with scant water renovation, surrounded by large population centres. The hydrological plan of the water basin has declared it eutrophic (4). The regional Water Quality Services have identified high volume of virtually untreated urban and industrial waste effluent (8) 	
Grey (91/271/EEC) - monitoring/ investigations suggested	Port of Musel	The Bay		<ul style="list-style-type: none"> A closed bay with scant water renovation, surrounded by large population centres. The regional Water Quality Services have identified high volume of waste effluent and deficient treatment (8) 	<ul style="list-style-type: none"> Additional local information is required.

Note 1: According to data from the Norte Hydrographic Confederation (6), there are 8 surface water sampling points in which the nitrogen concentration is over 25 mg/l, but they were located in areas of effluents and were limited. These points could not be identified.

Note 2: Several issues were considered in order to determine the grey and black coastal areas. These include: coastal morphology, regional hydro-geology, the population density near the coast, population centres of more than 10,000 inhabitants, agricultural development of the autonomous community, and miscellaneous technical information (Bode, 1990; Bode and Fernández, 1992; Bode et al., 1996). In addition, information from the relevant hydrological plan, the coastal eutrophication report (8) and the quality of bathing water was also processed.

Water quality problems relevant to the designation of Sensitive Areas and Vulnerable Zones are not extreme in Asturias region, according to the information processed in this report. This status results from a variety of factors such as local climate conditions, lack of groundwater bodies and land use patterns. However, several gaps have been identified regarding the designation of Sensitive areas; investigations are suggested for three reservoirs and one coastal area (Musel) to ensure compliance with the requirements of Directive 91/271/EEC, and evidence has been found towards the firm designation of another coastal area (Bay of Avilés). Monitoring and investigations are particularly recommended for the coastal fringe.

1. Varela Sánchez, M. 1991. Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y balear. Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. "Inventario de presas españolas" Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT (1992). Confederación Hidrográfica del Norte. *Plan Hidrológico Norte I*. Proyecto de Directrices. Tomo I: Memoria y Tomo II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
4. MOPT (1992). Confederación Hidrográfica del Norte. *Plan Hidrológico Norte II*. Proyecto de Directrices. Tomo I: Memoria y Tomo II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
5. MOPT (1992). Confederación Hidrográfica del Norte. *Plan Hidrológico Norte III*. Proyecto de Directrices. Tomo I: Memoria y Tomo II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
6. Determinación de masas de agua afectadas realizada por el MMA para Asturias (Special ITGME Report for Galicia, Declaration of the Norte Hydrographic Confederation)
7. Order of 13 August 1999 regarding the publication of the Identification of legal content of the hydrological plans of the Norte I, Norte II and Norte III water basin, approved by Royal Decree 1664/1998 of 24 July (BOE nº 205, 27 August 1999).
8. CMAPA (1999). Aplicación del procedimiento común para identificar el estado de eutrofización del área marítima de Asturias. Consejería de Medio Ambiente, Principado de Asturias.

5.1 *GENERAL DESCRIPTION*

- Water Basin: Intra-community basin for the whole Balearic Archipelago, with the single authority being the Water Board of the Balearic Islands (Junta d’ Aigües de Balears).
- Economic Activity: Tourism, and the service sector in general, is the major source of income in these islands, where farming and shoe manufacturing are also significant, mainly in Mallorca and Menorca.
- Observations: Surface waters are mainly restricted to “Torreteras”, that hold the runoff volumes after rainfall episodes. Groundwater units have been identified only in Mallorca and Menorca.

5.2 *DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS*

5.2.1 *Vulnerable zones*

The Identification of surface and groundwater affected and the proposal of vulnerable zones were carried out by the Water Board of Balears and the ITGME (3), through an agreement established especially for this purpose between the two institutions.

Affected water bodies were identified using historical data of the monitoring network of the Water Board and ITGME Network, data supplied by the Balearic Ministry for Health, and information on farming and stabled livestock provided by the regional Agriculture Ministry and the Water Board.

The methodology followed in (3) was:

- **PHASE I: Identification of water bodies affected by nitrates of agricultural origin.**
 1. Identification of trends in the quality of groundwater (all historical information available from quality monitoring networks up to 1996 was used).
 2. Evaluation of the reliability and representative coverage of the available sampling network.
 3. Determination of the role of agriculture as the main cause of nitrate pollution.

- **PHASE II: Designation of zones vulnerable to nitrate pollution of agricultural origin.**

1. Characterisation of the geology and hydro-geology of the potential vulnerable zone.
2. Evaluation of the hydro-chemistry within the potential vulnerable zone.
3. Identification of the current and potential use of water from each aquifer for human water supplies.
4. Characterisation of farming systems and agricultural uses in the area defined.
5. Definition of boundaries for the vulnerable zones.

In Phase I, 4 HU were determined on Mallorca and 1 HU on Menorca. In each HU were studied a) farming and livestock activities, b) water uses; c) NO³ content and affectation of water wells; d) evaluation of NO³. Using these data a conclusion was reached in which it was determined whether the HU should be treated as a possible vulnerable zone. As a result of Phase I, only one HU was classified as a potentially vulnerable zone and finally declared as such (HU 18.11. Llano de Inca-Sa Pobla, in Mallorca).

5.2.2

Sensitive Areas

The State determined the sensitive and less sensitive areas in the Autonomous Community of the Balearic Islands ¹ following a proposal of the Balearic Ministry for Public Works and Land Use Planning, because the responsibility for water matters had not yet been transferred. The transfer of authority was carried out in 1995, so the State Resolution of 25 May 1998 did not officially acknowledge the declaration of these zones. The autonomous communities have not officially acknowledged them yet.

Only coastal areas have been designated. The information used by the environmental authorities towards the designations is not known. Nevertheless, the coastal morphology indicates that the classification has followed preventive principles for most of the zones, since, except for the Bay of Palma, there is hardly any eutrophication along the coastal fringe.

¹ General Directorate of Water Quality of the then Ministry of Public Works, Transportation and the Environment.

BALEARIC ISLANDS

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

UNOFFICIAL VULNERABLE ZONES.

1. Llano de Inca - Sa Pobla (Mallorca)

UNOFFICIAL SENSITIVE AREAS.

2. Mallorca Island (Bay of Palma, Bay of Alcudia, Bay of Pollensa, Port d'Andratx, Bay of San Telmo, other Turist Areas)
3. Menorca Island (Port of Mahon, Port of Fornells, Port of Ciudadela, Albufera d'Es Grau, Torrente Cala Galdana, other turist areas).
4. Ibiza Island (Bay of Ibiza, Bay of Portmany, Beach d'En Bossa, Salt Pans (San José), other turist areas).

BALEARIC ISLANDS

MAP B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Black

1. Llano de PaLma (Mallorca)
2. Llucmajor - Campos (Mallorca)
3. Es Migjorn (Menorca)

Grey

4. Manacor (Mallorca)
5. Soller area (Mallorca).

SENSITIVE AREAS

Black

6. Port of Soller (Mallorca).

VULNERABLE ZONES

Not officially acknowledged (no official publication), therefore considered unofficial.

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Observations</i>
Northern half of the HU 18.11 Llano de Inca-Sa Pobla	Mallorca Island (AlcudiaCampanet, Inca, Llubi, Mura, Sa Pobla,)	CIB	Reasons for designation: <ul style="list-style-type: none"> • The zone of most intense agricultural activity of Mallorca Island (more than 20,000 ha under cultivation, 25% of which corresponds to irrigated land located in the northern half of the unit) • The common practice of using nitrogen fertilizers on irrigated land (the annual nitrogen load is more than 2300 t/year). • High nitrate concentration in the northern half of the HU • The existence of numerous water wells with a nitrate content of more than 50 mg/l • Nitrate trend: decreasing in the area of Muro, increasing in the area of Sa Pobla-Alcudia.

SENSITIVE AREAS

Not officially acknowledged (no official publication), therefore considered unofficial.

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Observations</i>
<i>Mallorca Island</i> (Bay of Palma, Bay of Alcudia, Bay of Pollensa, Port of Andraxt, Bay of San Telmo and Closed coves with tourist areas)	Mallorca Island	CIB	Population centres under obligation by the Directive: Alcudia; Sa Pobla; Calvià; Bendinat-Sta. Ponça-Peguera; Cala Ferrera; Zona costera de Lluçmajor; Calas de Manacor; Calas de Mallorca; Palma; Porto Colom; Cala d'Or; Cala Millor; Cala Ratjada; Pollensa- Pto. Pollensa.
<i>Menorca Island</i> (Port of Mahón, Port of Fornells, Port of Ciudadela, Albufera d'Es Grau, Torrente de Cala Galdana and Closed coves with tourist areas)	Menorca Island	CIB	Population centres under obligation by the Directive: Mahón- Es Castell; Cala Galdana; Son Boù; Arenal d'en Castell; Santo Tomás.
<i>Ibiza Island</i> (Bay of Ibiza, Bay of Portmany, Beach of d'En Brossa, San José Salt pans, and all closed coves with tourist areas)	Ibiza Island	CIB	Population centres under obligation by the Directive: Eivissa; D'en Bossa Beach

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	Agricultural zone of HU 18.14 Llano de Palma (in Mallorca)	Agricultural zones	CIB	<ul style="list-style-type: none"> • According to ref. (3). <ul style="list-style-type: none"> • Permeable aquifer, also noted in (1). • Intensive agricultural and livestock uses. • High grade NO₃ content. • Trend: increasing. 	
Vulnerable Zone	HU 18.21 Lluçmajor-Campos (in Mallorca)	Agricultural zones	CIB	<ul style="list-style-type: none"> • According to ref. (3). <ul style="list-style-type: none"> • Permeable aquifer. • Main agricultural and livestock area of the island (this is still so in spite of a decrease in recent years). • At points where NO₃ exceeds 50 mg/l, the trend is toward an increase. 	<ul style="list-style-type: none"> • The delimitation should include part of HU 18.22 and 18.23.
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 18.18 Manacor (in Mallorca)	Agricultural zones	CIB	<ul style="list-style-type: none"> • Ref. (3) rejects its characterization as a vulnerable zone because it attributes pollution to urban sources, since the permeable part of this aquifer is located under the urban center of Manacor. Nonetheless, the area affected by nitrates (50-100 mg/l) is much more extensive than the urban center and irrigated land exists throughout the area. A slow increase in greenhouses and stabled livestock (poultry and pigs) is noted. 	<ul style="list-style-type: none"> • A study should be made as to determine the respective origin (urban or farming) of nitrate pollution.

Vulnerable Zone	HU 19.01 Es Migjorn (in Menorca)	Agricultural zones	CIB	<ul style="list-style-type: none"> • The aquifer is 70% permeable. • The purpose/use of the water is divided equally between water supplies (including industrial uses) and agriculture (17 Hm³/year per unit). • Livestock (predominant) and farming uses (32,731 ha) are very important, the nitrogen input being estimated at 1060 t/year from agriculture and 720 t/year from livestock. • Water wells are affected, with levels above 25 and 50 mg/l. • Ref. (1) reports a growing trend toward nitrate pollution. 	<ul style="list-style-type: none"> • (*) Ha dedicated to livestock: • Ref. (3) rejects classification as a vulnerable zone because it attributes the predominance of pollution to urban sources.
Sensitive Area	Port of Sóller	The port itself		<ul style="list-style-type: none"> • A closed bay with scant water renovation • Population growth with a strong seasonal nature and peak presence in summer. • A criterion of caution is applied, implying a high level of sanitation to prevent the appearance of eutrophication problems. 	<ul style="list-style-type: none"> • Intensive farming has been pinpointed as responsible for this pollution. Nitrate origin should be investigated (see below).
Grey (91/676/EEC) - monitoring/ investigations suggested	Sóller area	Agricultural area around Sóller	CIB	<ul style="list-style-type: none"> • Report (1) shows a single sampling point showing pollution level for nitrate. 	<ul style="list-style-type: none"> • Intensive agriculture seems related to nitrate pollution of coastal waters in Sóller.

Note 1. The determination of grey and black coastal areas was based on various issues. These include coastal morphology, regional hydrology, the population density near the coast, population centres of more than 10,000 inhabitants, agricultural development of the autonomous community, particularly irrigation, the presence of coastal aquifers with a high degree of nitrate pollution (MOPT, 1996) and technical information (Fernández de Puelles and Jansa, 1992). The preventive criterion used by government has been followed.

Unlike other autonomous communities, thorough studies following sound methodology have been carried out in the Balearic Islands in the framework of implementation of Directive 91/676/EEC. The identification of groundwater affected by nitrate pollution revealed problems in several areas. However, the regional government only classified one Vulnerable Zone, and determined that agriculture was not the main source of nitrate pollution in the remaining affected waters. Nevertheless, the information from the Balearic Water Board shows that a clear relationship between farming practices and nitrate groundwater pollution can be established, and therefore further determination of Vulnerable Zones is recommended.

The situation regarding the designation of Sensitive Areas is rather different, since the regional government has followed a precautionary approach and has classified a large amount of coastal areas under this category which do not necessarily show extreme pollution or eutrophication scenarios. The importance of coastal tourism for the economy of the Archipelago, which therefore depends to some extent on the quality of coastal waters, might have been largely weighed in this decision.

1. Varela Sánchez, M. 1991. *Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y balear*. Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. *"Inventario de presas españolas"* Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes. Madrid.
3. ITGME and Balearic Water Board. 1997. *"Identificación de masas de agua afectadas por nitratos. Designación de Zonas Vulnerables a la contaminación por nitratos de origen agrario"*. Baleares. (April 1997)

6.1 GENERAL DESCRIPTION

Water basins:	The Canary Islands comprise a single intra-community basin.
Economic activities:	Tourism (nature and conventional), fishing and farming.
Coastal eutrophication:	Not determined.
Observations:	There is a Hydrological Plan for the Autonomous Community and individual Plans are being produced for each of the seven main Islands of the archipelago. This shows the further devolution of powers existing within this autonomous community.

6.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

6.2.1 Vulnerable zones

The Autonomous Community has full responsibilities for the identification of surface and ground bodies of water, as well as coastal waters, affected by nitrates. The designation of Vulnerable Zones is also the responsibility of the regional government.

The Water Services of the relevant Ministry within the Autonomous Community produced a report and a draft Decree proposal (5) where affected waters were identified and Vulnerable Zones were determined. However, there is no evidence that the content of the report has been accepted by the regional government, neither has the Decree been published or finalised. This may be due to the current process of decentralisation of powers on water management following the Regional Water Act (1). At present, individual hydrological plans for each of the seven main Islands are being produced, with only two of them being approved so far (2, 3 and 4).

In general, a clear division can be made between the five western Islands and the two eastern ones (Fuerteventura and Lanzarote), which show semi-desert like conditions and largely depend on desalination for water supplies. Natural water resources can be used in the remaining five islands. Groundwater is, besides desalinated water, the main source for water supply. Surface water is virtually restricted to the five western Islands, and consists mainly of the runoff volume after the usual short periods of rainfall, which occur mainly in the Islands' central mountain ranges. Therefore, water runs

from the mountains to the coasts, where infiltration to aquifers is usually larger.

Population is concentrated along the coasts, and agricultural activities are located likewise. This is clearly the case for intensive and irrigated croplands.

The surface water regime contributes to the lack of quality problems in this sector. However, problems have been identified for groundwater. These

The situation by Island, according to (5) can be summarised as follows:

- Lanzarote: Groundwater is restricted to superficial layers with high natural salinity that makes them hardly suitable for any use. In addition, there are no irrigated crops or intensive agriculture. Nitrate pollution is not relevant.
- Fuerteventura: Groundwater gets stored in certain areas after rainfall seasons in this Island. Extensive surveys (150 sampling points) have shown that nitrate content in these aquifers is below pollution values. Agricultural practice consists of small croplands sustained on these groundwater resources.
- Gran Canaria: Important and intensely used aquifers that, owing to the “mountain to coast” flow regime show pollution problems towards the coasts, where population is also concentrated. There is severe nitrate pollution in the north and western areas near the coast. Nitrate levels below 50 mg/l have been recorded in the Southeast of the Island.
- Tenerife: Important and intensely used aquifers that show high nitrate levels towards the coastal sections. Analyses on 2,300 water samples show that nitrate levels over 50 mg/l are only found in La Orotava Valley. This area has a population of some 100,000 people and deficient sanitation. Irrigated cropland also exists in this location, and nitrate pollution should thus be attributed to both urban and agricultural sources.
- La Gomera: Groundwater use occurs mainly in the valleys. These are usually rather narrow strips of land among mountains where both agricultural practice and population are concentrated. This brings about nitrate pollution scenarios.
- La Palma: This is the wettest Island within the Archipelago, and therefore the accumulation of nitrates in the coastal sections of the aquifers is buffered to some extent. Soil wash out also takes place, and high nitrate concentrations are recorded only at the end of the dry season, with levels becoming lower as the rainy season progresses. This largely contributes to the lack of general nitrate pollution in La Palma groundwater.
- El Hierro: Groundwater pollution by nitrates has been recorded occasionally only in a small area and high levels have not been found over time. Therefore groundwater nitrate pollution in El Hierro is punctual.

6.2.2

Sensitive Areas

No sensitive areas have been determined in the Canary Islands. The particular regime of surface waters and the fact that water is highly used and recycled in the Archipelago are consistent with this determination.

6.2.3

Coastal vulnerable zones and sensitive areas

As mentioned, nitrate pollution occurs in the aquifer sections close to the coasts, where population and some irrigation areas concentrate in some of the Islands. However, no coastal waters seem to be affected by nitrate pollution or are eutrophic.

CANARY ISLANDS

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

UNOFFICIAL VULNERABLE ZONES.

1. Guía, Galdar and Moya Coastal aquifers (Gran Canaria)
2. Telde coastal aquifer (Gran Canaria)
3. Valle de la Aldea coastal aquifer (Gran Canaria)
4. Valle de la Orotava coastal aquifer (Tenerife)
5. Valle Gran Rey and San Sebastian coastal aquifers (La Gomera)

VULNERABLE ZONES

The autonomous community of Canary Islands has designated vulnerable zones in three of the western Islands, namely Gran Canaria, Tenerife and La Gomera. However, this classification has not been officially acknowledged, and thus the zones must be considered as “unofficial” designations. The relevant technical officer within the regional government granted access to the report and draft designation Decree (5).

<i>Zone</i>	<i>Island (and municipalities)</i>	<i>Official publication</i>	<i>Observations</i>
Guía, Gáldar and Moya Coastal aquifers	Gran Canaria Island (Gáldar, Guía and Moya)	None	<ul style="list-style-type: none"> • Investigations within the Gran Canaria Hydrological Plan showed nitrate level over 300 mg/l in these areas, where the most intensive agricultural practice within the Island also takes place. • Designation includes the sections below 300 m.a.sl..
Telde coastal aquifer	Gran Canaria Island (Telde)	None	<ul style="list-style-type: none"> • Investigations within the Gran Canaria Hydrological Plan showed nitrate level over 300 mg/l in these areas, where the most intensive agricultural practice within the Island also takes place. • Designation includes the sections below 300 m.a.sl..
Valle de la Aldea aquifer	Gran Canaria Island (Barranco de La Aldea, S. Nicolás de Tolentino)	None	<ul style="list-style-type: none"> • Investigations within the Gran Canaria Hydrological Plan showed nitrate level over 300 mg/l in these areas, where the most intensive agricultural practice within the Island also takes place. • Designation includes the sections below 300 m.a.sl..
Valle de La Orotava Coastal aquifer	Tenerife Island (La Orotava, Puerto de la Cruz and Los Realejos)	None	<ul style="list-style-type: none"> • The Tenerife Hydrological Plan shows nitrate levels over 50 mg/l in La Orotava Valley. An important area of intensive agriculture extends above the coastal strip of the aquifer. However, agricultural activities are becoming marginal over time. • Designation includes the sections below 300 m.a.sl.. • This area also concentrates population centres tallying some 100,000 people which ha deficient sanitation. Therefore, part of the nitrate pollution recorded must be due to urban sources. A study is suggested so as to determine urban pollution.
Valle del Gran Rey and San Sebastián Coastal aquifers	La Gomera Island (San Sebastián de La Gomera and Valle del Gran Rey)	None	<ul style="list-style-type: none"> • Wells in the land stripes of the Gran Rey and San Sebastián Valleys show nitrate concentrations above 95 mg/l . Agricultural activities dominate in these areas, which show low population. • The scarcely populated villages within these areas have sanitation networks. Nitrate pollution is thus mainly due to agricultural sources. • Designation includes the sections below 200 m.a.sl..

SENSITIVE AREAS

The Autonomous Community has not designated any Sensitive Areas. Regarding Less Sensitive Areas, although it is estimated that the Spanish authorities have not formally designated these, the whole coast has been classified in this category according to pseudo-official information (Medio Ambiente en España 1997, MMA).

6.3 *SUGGESTED DESIGNATIONS*

No further designations are suggested, since it is considered that current designations in the Canary Islands are sufficient to comply with the provisions of Directives 91/271/EEC and 91/676/EEC regarding the classification of Sensitive Areas and Vulnerable Zones.

6.4 *REGIONAL CONCLUSION*

According to the available information, there are no water bodies that should have been designated Sensitive Areas under Directive 91/271/EEC in the Canary Islands. As for the designation of Vulnerable Zones under Directive 91/676/EEC, the regional government has classified all the areas identified as having nitrate pollution from agricultural sources. Nevertheless, the classification has not been made official at the date of finishing this report. To this respect, it should be noted that the provisions must be incorporated into the hydrological plan of the relevant Island. Indeed, the devolution of powers within the Canary Islands, where the individual water management authorities for each Island in charge of water management are still producing their respective planning documents may be behind the apparent delay of the official publication of the classified areas.

1. Ley 12/1990 (Canarias), de 26 de julio, sobre normas reguladoras de aguas (Boletín Oficial de Canarias núm. 94, de 27 de julio de 1990). [Ley Territorial de Aguas/Regional Water Act].
2. Decreto 319/1996, de 23 de diciembre, por el que se aprueba el Plan Hidrológico Insular de Tenerife. (Boletín Oficial de Canarias de 14 de febrero de 1997). [Tenerife Island Water Plan]
3. Decreto 81/1999 (Canarias), de 6 de mayo, por el que se aprueba el Plan Hidrológico Insular de Fuerteventura. (Boletín Oficial de Canarias núm. 105, de 6 de agosto de 1999). [Fuerteventura Island Water Plan].
4. Decreto 82/1999 (Canarias), de 6 de mayo, por el que se aprueba el Plan Hidrológico Insular de Gran Canaria. (Boletín Oficial de Canarias núm. 73, de 8 de junio de 1999). [Gran Canaria Island Water Plan].
5. Proposal for the publication of a Decree regarding affected waters and designation of Vulnerable Zones owing to nitrate pollution from agricultural sources. Report by the Regional (Canaries) Ministry for Public Works, Housing and Water, Hydraulic Services. [Cover letter dated may 1997]. Unpublished.

7.1 GENERAL DESCRIPTION

Water basins:	Norte (Norte II: 26% of the Cuenca River basin). Ebro River: (less than 1% of the water basin surface).
Economic activities:	Farming and livestock. Industry (chemical and metallurgy in Corrales de Buelna and Torrelavega) and tourism (mainly in Castro-Urdiales, Laredo and Santoña).
Coastal eutrophication:	The Bay of Santander (according to the Hydrological Plan for the Norte Basin).

7.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

7.2.1 Vulnerable zones

The Identification of surface and ground bodies of water affected by nitrates is the responsibility of the State (Norte II intercommunity water basin). The Identification of coastal waters affected by nitrates is the responsibility of the autonomous community.

In the Norte water basin, no groundwater body was identified as affected. ITGME has had a monitoring network since 1980, which was optimized in 1990, that controls the main aquifers of this autonomous community and consists of 69 monitoring points distributed throughout 7 hydrographic units (HU). According to data obtained from this network during the April-May 1996 campaign, the situation of groundwaters in Cantabria with respect to nitrates is good (no sample exceeded 50 mg/l and only one reached 26 mg/l) mainly as a result of the high rainfall.

With regard to the surface waters of the Norte River basin, the Norte Hydrographic Confederation declared that points with more than 50 mg/l were non-existent in Cantabria. At 8 sampling stations values over 25 mg/l were recorded, all due to direct effluents. Finally, with respect to reservoir eutrophication, the limiting factor was phosphates and none of the cases of involvement were attributed to agricultural pollution.

This autonomous community has not made any report on nitrate pollution in the community.

7.2.2 *Sensitive Areas*

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. In this autonomous community, three wetlands of major environmental value were classified.

7.2.3 *Coastal vulnerable zones and sensitive areas*

The information sources on which the government based the declaration are unknown. However, the Cantabrian Ministry of the Environment has several web pages (MAC, 1999a, b, and c) and the content of these suggests that technical information was used and reports were produced in the course of planning their water treatment and sanitation policy. At present, this autonomous community is working to apply the OSPAR Convention, but access to the information within this framework has not been granted.

CANTABRIA

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

UNOFFICIAL SENSITIVE AREAS.

1. Santoña Marshes, Victoria Marshes and Joyel Marshes.

CANTABRIA

MAP B: SUGGESTED DESIGNATIONS

SENSITIVE AREAS

Black

1. Bay of Santander

Grey

2. Estuary of San Vicente de la Barquera
3. Estuary os Miengo
4. Besaya River
5. Saja River

VULNERABLE ZONES

The autonomous community of Cantabria has stated that no vulnerable zones exist, mentioning their non-existence in the Resolution of the regional Ministry for Livestock, Agriculture and Fishing by which the code of good farming practices was approved (Official Journal: Boletín Oficial de Cantabria nº 66, 2 April 1997).

SENSITIVE AREAS

The Sensitive Areas classified have not been officially acknowledged, and are therefore considered as “unofficial” designations.

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Santoña marshes	Santander (Santoña area)	N-II	None	<ul style="list-style-type: none"> Population centres affected by the Directive: Santoña-Noja and Laredo-Ampuero-Colindres. Santoña, Victoria and Joyel marshes are all part of the same system within the Estuary of the Asón River.
Victoria marshes	Santander (Santoña area)	N-II	None	<ul style="list-style-type: none"> No population centres under obligation by the Directive. Santoña, Victoria and Joyel marshes are all part of the same system within the Estuary of the Asón River.
Joyel marshes	Santander (Santoña area)	N-II	None	<ul style="list-style-type: none"> No population centres under obligation by the Directive. Santoña, Victoria and Joyel marshes are all part of the same system within the Estuary of the Asón River.

(*) It is estimated that the Spanish authorities have not formally designated Less Sensitive Areas. However, according to pseudo-official information (Medio Ambiente en España 1997, MMA) it has been determined that the entire coast is a less sensitive area, with the exception of the sensitive areas mentioned and the Bay of Santander, which is considered a Normal Zone.

7.3

SUGGESTED DESIGNATIONS

Suggested Designation	Affected water body	Area to designate	Water basin code	Justification	Observations
Sensitive Area	Bay of Santander	Bay		<ul style="list-style-type: none"> • A closed bay with scant water renovation, surrounded by large population centres. • According to public information of the MAC (1999a), the bay receives an enormous amount of effluents that reduce dissolved O₂ and there is bioaccumulation of contaminants in living organisms. • The hydrological plan of the water basin has declared it eutrophic. 	<ul style="list-style-type: none"> • A comprehensive WasteWater Management Plan is being implemented. Nevertheless, the lack of designation for this area is not justified.
Grey (91/271/EEC) - monitoring/ investigations suggested	Estuary of San Vicente de la Barquera	Estuary		<ul style="list-style-type: none"> • A closed bay with scant water renovation, but the water basin is sparsely populated. • The Department of the Environment of Cantabria has detected pollution problems and indicates that these could become worse if measures are not taken. 	<ul style="list-style-type: none"> • A study should be made to determine if the planned population increase will produce eutrophication.
Grey (91/271/EEC) - monitoring/ investigations suggested	Estuary of Miengo (mouth of the Besaya River)	Estuary		<ul style="list-style-type: none"> • A closed bay with scant water renovation, but the water basin is sparsely populated. • The Department of the Environment of Cantabria has detected pollution problems and indicates that these could become worse if measures are not taken. 	<ul style="list-style-type: none"> • A study should be made to determine if the planned population increase would produce eutrophication.
Grey (91/271/EEC) - monitoring/ investigations suggested	Besaya River	The River itself	N-II	<ul style="list-style-type: none"> • Report (9) provides evidence of hipereutrophic and eutrophic status along the whole river course, with the highest phosphorus values in Torrelavega and Corrales de Buelna, where industry is also located. 	<ul style="list-style-type: none"> • Data of report (9) are from the late 1980s and treatment may have improved present water quality.
Grey (91/271/EEC) - monitoring/ investigations suggested	Saja River	The River itself	N-II	<ul style="list-style-type: none"> • Report (9) shows phosphorus values within the mesotrophic category, except for hipereutrophic levels at Torrelavega. 	<ul style="list-style-type: none"> • Data of report (9) are from the late 1980s and treatment may have improved present water quality.

Note 1: According to data from the Norte Hydrographic Confederation (6), there are 8 surface water sampling points in which nitrogen concentration is over 25 mg/l, but they were located in areas of effluents and were limited. These points could not be identified.

Note 2: Several issues were considered in order to determine the grey and black coastal areas. These issues include: coastal morphology, regional hydrography, the population density near the coast, population centres of more than 10,000 inhabitants, agricultural development of the autonomous community, miscellaneous technical information (Bode, 1990; Bode and Fernández, 1992; Bode et al., 1996). The hydrological plan of the water basin and information published on the Internet by the Department of the Environment of the Government of Cantabria were also processed.

Water quality problems relevant to the designation of Vulnerable Zones are not extreme in the region of Cantabria, according to the information processed in this report. This status results from a variety of factors such as local climate conditions, lack of significant groundwater bodies and land use patterns. However, several gaps have been identified regarding the designation of Sensitive areas, and investigations are suggested for the coastal fringe and for two river courses (Besaya and Saja) to ensure compliance with the requirements of Directive 91/271/EEC. Monitoring and investigations are particularly recommended for these areas.

Moreover, evidence is clear that the Bay of Santander should have been classified as Sensitive Area. This lack of designation might be related to the fact that comprehensive sanitation strategies are currently being implemented in the Bay. Finally, the implementation of a judgement by the European Court of Justice, regarding the application of Directive 79/409/EEC (the Santoña case) might be linked to the designation of the Santoña, Victoria and Joyel marshes.

1. Varela Sánchez, 1991. "Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear" Ed. Ministerio de Obras Públicas y Transportes, Madrid.
2. MOPT, 1991. "Inventario de presas españolas" Ed. Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes, Madrid.
3. MOPT (1992). Confederación Hidrográfica del Norte. *Plan Hidrológico Norte I*. Proyecto de Directrices. Vol. I: Memoria and Vol. II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
4. MOPT (1992). Confederación Hidrográfica del Norte. *Plan Hidrológico Norte II*. Propuesta de Directrices. Vol. I: Memoria and Vol. II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
5. MOPT (1992). Confederación Hidrográfica del Norte. *Plan Hidrológico Norte III*. Propuesta de Directrices. Vol. I: Memoria and Vol. II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
6. Determinación de masas de agua afectadas realizada por el MMA para Cantabria (Informe especial ITGME para Cantabria, Declaración de la CH del Norte)
7. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo de los Planes Hidrológicos de cuenca Norte I, Norte II y Norte III, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
8. Álvarez Cobelas, M.; P. Muñoz Ruíz and A. Rubio Olmo 1991. *La Eutrofización de las Aguas Continentales Españolas*. Centro de Investigaciones del Agua, Consejo Superior de Investigaciones Científicas. Febrero, 1991.

8.1 GENERAL DESCRIPTION

Total area:	79,226 Km ²
Water basins:	Tajo, Guadiana, Júcar, Segura, Ebro and Guadalquivir
Economic activities:	Mainly agriculture. Industry concentrated in areas such as Puertollano and the Henares corridor in Guadalajara. Mining is also important.

8.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

Vulnerable zones

The bodies of water affected by nitrate pollution were identified by the State because the Autonomous Community of Castilla-La Mancha only has inter-community water basins (8). This region requested from the ITGME, within the context of their co-operative agreement, the preparation of a specific report on the problems of pollution of agricultural origin in this autonomous community (14). This report was the basis for designating Vulnerable Zones. Therefore, ITGME prepared two reports, one for the Ministry of the Environment in which groundwater bodies affected by nitrates were identified (8) and the other for Castilla-La Mancha in which the vulnerable zones to be designated were delimited (13). There are discrepancies between these reports, in spite of their being prepared by the same organisation.

The method used to prepare the report (14) was evaluation and analysis of four layers of information:

- 1) Nitrogen load incorporated into the soil by farming activities
- 2) Aquifer vulnerability to pollution
- 3) Use of groundwater for human water supplies
- 4) Nitrate content of groundwater

Finally, based on a combined analysis of these criteria, the authors of the report proposed two types of zones:

- **Zones to be declared** vulnerable (which was done)
- **Zones to be kept under surveillance**

Access to the list of zones to be kept under surveillance was not provided, and the annexes to the report were not made available either. These contained detailed descriptions of the following items of information, among others: a) surface areas farmed and the nitrogen load applied to the soil, by municipality, and b) the map of groundwater vulnerability. This information

is still lacking, and would have been extremely valuable to complement the proposal of suggested Vulnerable Zones. Access to the full report is strongly recommended.

Sensitive areas

The Identification of sensitive areas was included in the National Plan for Wastewater Treatment, but it was not officially made public until May 1998 (State Resolution of 25 May 1998).

CASTILLA - LA MANCHA

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL VULNERABLE ZONES

1. Western La Mancha
2. Campo de Montiel

OFFICIAL SENSITIVE AREAS.

3. Vicario Reservoir (River Guadiana) (not shown)
4. Cíjara Reservoir (River Guadiana)
5. Las Tablas de Daimiel National Park
6. Las Lagunas de Ruidera Nature Park
7. Guajaraz Reservoir (River Guajaraz)
8. El Torcón Reservoir (River Torcón)
9. El Vado Reservoir (River Jarama)
10. La Portiña Reservoir (River Portila)
11. Navalcán Reservoir (River Guadyerbas)

CASTILLA - LA MANCHA

MAP B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Black

1. Mancha Oriental (Eastern Mancha)
2. Consuegra - Villacañas aquifer
3. Lillo - Quintanar + Ocaña aquifers

Grey

4. Madrid - Talavera aquifer
5. La Alcarria - Guadalajara aquifer
6. Tiétar aquifer
7. Talave Reservoir (River Mundo)
8. Camarillas Reservoir (River Mundo)
9. Taibilla Reservoir (River Taibilla)

SENSITIVE AREAS

Black

10. Finisterre Reservoir
11. Rosarito Reservoir
12. Azután Reservoir
13. Bolarque Reservoir
14. Palmaces Reservoir
15. Alcorlo Reservoir
16. Castrejón Reservoir
17. Cazalegas Reservoir

VULNERABLE ZONES

Legislation:

Autonomous Community: Resolution of 7 July 1998 designating, within the boundaries of the Autonomous Community of Castilla-La Mancha, certain areas as Vulnerable Zones (Official Journal: Diario Oficial de Castilla-La Mancha nº 38, 21 August 1998).

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Western La Mancha	<p>Albacete (Villarobledo) Ciudad Real (Alcázar de San Juan, Arenas de San Juan, Argamasilla de Alba, Bolaños de Calatrava, Campo de Criptana, Daimiel, Herencia, Las Labores, Manzanares, Membrilla, Pedro Muñoz, Puerto Lápice, Socuéllamos, Tomelloso, Torralba de Calatrava, Valdepeñas, Villarubia de los Ojos and Villarta de San Juan) Cuenca (La Alberca del Záncara, Casas de Fernando Alonso, Casas de los Pinos, Casas de Haro, Las Mesas, Mota del cuervo, El Pedernoso, Las Pedroñeras, Pozoamargo, El Provencio, San Clemente, Santa María del Campo Rus and Santa María de Llanos)</p>	GN	Resolution of 7 July 1998	<p>Aimed at protecting groundwater. Specifically: HU 04.04 Western La Mancha. Reasons:</p> <ul style="list-style-type: none"> • Large nitrogen load applied to soil (19,500 T/year of nitrogen) • High aquifer vulnerability exists in most of the area and intermediate vulnerability in the rest. • Important source of human water supplies. • High nitrate content (42% of the points had over 50 mg/l N and 85% over 25 mg/l) • A program of income compensation exists in the region to provide subsidies to farmers who use farming practices compatible with the environment. (EEC Regulation 2078/92).
Campo de Montiel	<p>Albacete: Alcaraz, El Balletero, El Bonillo, Munera, Ossa de Montiel, Povedilla and Viveros. Ciudad Real: Albaladejo, Alhambra, Carrizosa, Fuenllana, Montiel, Ruidera, Santa Cruz de los Cáñamos, Terrinches, Villahermosa and Villanueva de la Fuente.</p>	GN	Resolution of 7 July 1998	<p>Aimed at protecting groundwater. Specifically: HU 04.65 and 05.65 Campo de Montiel. Reasons:</p> <ul style="list-style-type: none"> • Large nitrogen load applied to soil (5,300 T/year of nitrogen) • High aquifer vulnerability exists throughout almost the entire extension. • Important source of human water supplies. • High nitrate content (68% of the points over 50 mg/l N and 95% over 25 mg/l) • A program of income compensation exists in the region to provide subsidies to farmers who use farming practices compatible with the environment. (EEC Reg. 2078/92).

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring “Sensitive” areas in the inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998).

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Vicario reservoir (on the Guadiana River)	<i>Ciudad Real</i>	<i>GN</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Purpose/use: Urban and industrial water supplies (2). • Mesoeutrophic (4) • No population centres under obligation by the Directive.
Cjara reservoir (on the Guadiana River)	<i>Ciudad Real</i>	<i>GN</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Purpose/use: irrigation and energy (2) • Neither eutrophic nor mesoeutrophic (4) • No population centres under obligation by the Directive.
Las Tablas de Daimiel National Park	<i>Ciudad Real</i>	<i>GN</i>	<i>Resolution of 25 May 1998</i>	
Las Lagunas de Ruidera Nature Park	<i>Ciudad Real</i>	<i>GN</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive.
Guajaraz reservoir (on the Guajaraz River)	<i>Toledo (Arges, Lagos and Casasbuenas)</i>	<i>T</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Purpose/use: Urban water supplies (2). • No population centres under obligation by the Directive.
El Torcón reservoir (on the Torcón River)	<i>Toledo (Navahermosa and Menasalbas)</i>	<i>T</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Purpose/use: Urban water supplies (2). • Eutrophic water body according to (15). • No population centres under obligation by the Directive.
El Vado reservoir (on the Jarama River)	<i>Guadalajara (Valdesotos)</i>	<i>T</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Purpose/use: Urban water supplies (2). • No population centres under obligation by the Directive.
La Portiña reservoir (Portila River)	<i>Toledo (Talavera)</i>	<i>T</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Purpose/use: Urban water supplies (2). • No population centres under obligation by the Directive.
Navalcán reservoir (Guadyerbas River)	<i>Toledo (Oropesa)</i>	<i>T</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Purpose/use: Irrigation and urban water supplies (2). • No population centres under obligation by the Directive.

The selection of these zones was based mainly on the report (13), although it was completed with the references cited in the bibliography section. Only part of report (13) was accessible, so suggestions for designation were developed without information on surface areas farmed and the nitrogen load applied to the soil, by municipality, and ground water vulnerability data.

In this autonomous community, rivers with bad quality levels for water supply and a high phosphate content have been identified. For these rivers, firm conclusions cannot be reached because an exhaustive investigation beyond the scope of this report would be required. Nonetheless, they are listed below for information purposes.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	HU 08.29 Mancha Oriental (Albacete)	Areas of irrigation and extensive livestock raising in Llanos de Albacete	J	<ul style="list-style-type: none"> Identified as a HU with problems by ref. (1) and (7). Identified as an affected body of water (8). Only 15% of the monitoring points had more than 50 mg/l, but the area is third-ranked by extension among the nitrate polluted areas (1100 ha HU) (13). The density of the monitoring network is high (10 ha/monitoring point). This is the first-ranked UH in importance for water supplies (13). 	Irrigation and intensive livestock raising are expanding and the use of ground water resources is intense, which may lead to deterioration throughout the entire HU.
Vulnerable Zone	HU 04.03 Consuegra- Villacañas (Ciudad Real, Cuenca and Toledo)	Farming area around the aquifer and associated wetlands	GN	<ul style="list-style-type: none"> Identified as a HU with problems by ref. (4). This is the fourth-ranked UH in extension with nitrate pollution (1080 ha HU) (13). 78% of the monitoring points had over 50 mg/l (13). The density of the monitoring network is similar to that of zones designated vulnerable (46 ha/monitoring point). 	Not identified as an affected body of water in ref. (8). Probably because it is not a HU important for human water supplies (not listed in ref. 13 as such). Nonetheless, the analytical series cited in ref. (8) mention the purpose/uses: Agriculture and water supplies.

					The zone includes dispersed irrigated fields in a wetland area that is easily saturated and saline, which makes it highly vulnerable to pollution.
Vulnerable Zone	HU 04.02 Lillo-Quintanar, area of Corral de Almaguer and Horcajo de Santiago	Region of irrigation and wetland complexes	GN	<ul style="list-style-type: none"> • Identified as an affected body of water in ref. (8). • 73% of the monitoring points had over 50 mg/l (13). • The density of the monitoring network is 35 ha/monitoring point. • This is the seventh-ranked UH in extension with nitrate pollution (770 ha HU) (13). 	It ranks 27 th in importance for water supplies (13). The zone includes dispersed irrigated plots (16) in a wetland area that is easily saturated and saline, which makes it highly vulnerable to pollution.
	HU 03.08 Ocaña (Adjacent to 04.02)	Region of irrigation and farmland	T	<ul style="list-style-type: none"> • 68% of the monitoring points had over 50 mg/l (13). • The density of the monitoring network is similar to that of zones designated vulnerable (44 ha/monitoring point). • This is the sixth-ranked UH in extension with nitrate pollution (1020 ha HU) (13). • Ref. (5) reports a high nitrate concentration. 	Ref. (8) mentions this HU as a point of pollution but does not identify it. It ranks 15 th in importance for human water supplies (13). Includes an area of irrigation around the Tajo River (16).
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 03.05 Madrid Talavera, in the La Sagra Torrijos sector (Toledo)	Irrigated area	T	<ul style="list-style-type: none"> • Identified as an affected body of water in ref. (8). • 25% of the monitoring points had over 50 mg/l. • This is the fifth-ranked UH in extension with nitrate pollution (1020 ha HU) (13). • The density of the monitoring network is high (10 ha/monitoring point). • This is the third-ranked UH in importance for water supplies (13). 	This is an area in which irrigation is in expansion (16). Analyses on likely evolution of groundwater pollution according to these land use trends are strongly recommended.

Grey (91/676/EEC) - monitoring/ investigations suggested	HU 03.06 and 03.04 La Alcarria and Guadalajara	Farmland	T	<ul style="list-style-type: none"> Refs. (1) and (5) mention these zones as having incipient nitrate and nitrite pollution. 23% of the monitoring points had over 50 mg/l. The density of the monitoring network is very high (5 ha/monitoring point). The area includes the Henares irrigated croplands (16). 	<ul style="list-style-type: none"> Not listed in ref. (13) as a HU important for water supplies. In the analytical series of ref. (8), the purpose/uses are: Industry, agriculture, water supplies for urban and non-urban areas, and unknown. Crops are mostly dry-farmed; ref. (1) notes the importance of nitrate input for this type of crop in the Tajo River basin. Industrial and urban centres are also located in this area. <p>Studies to determine nitrate pollution from agricultural sources are recommended.</p>
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 03.09 Tiétar	Irrigated area of the Tiétar River	T	<ul style="list-style-type: none"> Ref. (5) reports a high nitrate concentration. Includes irrigated areas (16). 	
Grey (91/676/EEC) - monitoring/ investigations suggested	Talave reservoir (on the Mundo River, Albacete, Lietor)	Reservoir and sloped water basin	SG	<ul style="list-style-type: none"> Oligomesoeutrophic according to ref. (6). Ref. (6) also mentions expressly that the eutrophication of the reservoirs in this basin is of agricultural origin. 	Purpose/use of reservoir water: irrigation and energy
Grey (91/676/EEC) - monitoring/ investigations suggested	Camarillas reservoir (on the Mundo River, Albacete, Hellín)	Reservoir and sloped water basin	SG	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (6). Ref. (6) also mentions expressly that the eutrophication of the reservoirs in this basin is of agricultural origin. 	Purpose/use of reservoir water: energy (2)
Grey (91/676/EEC) - monitoring/ investigations suggested	Taibilla reservoir (on the Taibilla River, Nerpio, Albacete)	Reservoir and sloped water basin	SG	<ul style="list-style-type: none"> Oligomesoeutrophic according to ref. (4). Ref. (4) also mentions expressly that the eutrophication of the reservoirs in this basin is of agricultural origin. 	Purpose/use of reservoir water: Water supplies
Sensitive Area	Finisterre reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Eutrophic according to ref. (5). 	Purpose/use: Water supplies
Sensitive Area	Rosarito reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Eutrophic according to ref. (5 and 15). 	Purpose/use: Irrigation and energy

Sensitive Area	Azután reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Eutrophic according to ref. (5), hipereutrophic according to (15). 	Purpose/use: Irrigation and energy
Sensitive Area	Bolarque reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (5). 	Purpose/use: Irrigation and energy
Sensitive Area	Pálmaces reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (5). 	Purpose/use: Irrigation
Sensitive Area	Alcorlo reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (5). 	Purpose/use: Water supplies
Sensitive Area	Castrejón reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (5), hipereutrophic according to (15). 	Purpose/use: Irrigation and energy
Sensitive Area	Cazalegas reservoir	The reservoir itself	T	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (5), hipereutrophic according to (15).. 	Purpose/use: Irrigation

(*) Unlike data from other basin authorities, the data on reservoir eutrophication within the Tagus Basin seem reliable since they correspond to two recent (1990s) sampling campaigns carried out by different bodies and showing similar results.

Following is a list of the rivers of the Community of Castilla-La Mancha in which quality problems or the presence of phosphates and nitrates has been identified.

<i>Affected water body</i>	<i>Area to investigate</i>	<i>Water basin code</i>	<i>Observations</i>
River Tagus from Castrejón reservoir to the boundaries of the autonomous community	The river section and Castrejón, Aguilar and Valdecañas reservoirs	T	<ul style="list-style-type: none"> Does not meet conditions for water supply in this section and has problems of effluents upstream to water supply intake points (5). Possible candidate for classification of Vulnerable Zone because it flows through the irrigated areas of Canales de Castrejón (4700 ha) and receives water from other irrigated areas of Castilla La Mancha (Canal del Alberche and Azután, 10150 ha) and from the Community of Madrid (Henares and Jarama) (5). Dry-farmed areas also add a pollution load in this case (1).
Valdemembra River and Arroyo Ledaña (Cuenca and Albacete)	River, arroyo and sloped water basins	J	<ul style="list-style-type: none"> Ref. (7) reports intense urban and agricultural pollution with significant nitrate concentrations. For designation by the wastewater Directive, the purpose/use should be confirmed.
Jabalón River	Jabalón water basin	GN	<ul style="list-style-type: none"> Ref. (4) reports urban phosphate problems throughout the water basin. For designation by the WasteWater Directive, the purpose/use should be confirmed.
Guadiana River between Vicario reservoir and Valdeazogues River	River section and sloped water basin	GN	<ul style="list-style-type: none"> Ref. (4) reports urban phosphate problems throughout the river section. For designation by the WasteWater Directive, the purpose/use should be confirmed.

The analysis of the available information relevant to the classification of special areas under Directives 91/271/EEC and 91/676/EEC shows that designation has been insufficient in the autonomous community of Castilla-La Mancha. Regarding the Vulnerable Zones, the regional government has undertaken investigations in sufficient detail and with the right methodological approach, although not all the areas matching the criteria for designation have been classified. The only two official Vulnerable Zones are those where compensation schemes under EEC Regulation 2078/92 are currently implemented.

As for the Sensitive Areas, although a variety of water bodies have been classified as such, a few others (mainly reservoirs) have been identified that should have been designated under this category.

1. Varela Sánchez, M. 1991. "Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear". Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991 *Inventario de presas españolas*. Dirección General de Obras Hidráulicas. Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT 1992. *Plan Hidrológico del Guadalquivir*. Confederación Hidrográfica del Guadalquivir. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas. Madrid.
4. MOPT 1992. *Plan Hidrológico Guadiana I y Plan Hidrológico Guadiana II*. Confederación Hidrográfica del Guadiana. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas. Madrid.
5. MMA 1996?. *Plan Hidrológico de la Cuenca del Tajo*. Confederación Hidrográfica del Tajo. Ministerio de Medio Ambiente. Secretaría de Estado de Aguas y Costas. Dirección General de Obras Hidráulicas y Calidad de Aguas. Madrid.
6. MMA 1997. *Confederación Hidrográfica del Segura. Plan Hidrológico de la Cuenca del Segura. Memoria (Tomos I y II)*. Secretaría de Estado de Aguas y Costas. Dirección General de Obras Hidráulicas y Calidad de Aguas. Ministerio de Medio Ambiente, Madrid.
7. MOPT 1992. *Confederación Hidrográfica del Júcar. Plan Hidrológico. Proyecto de Directrices*. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
8. Determinación de masas de agua afectadas realizada por el MMA para Castilla-La Mancha (Informe especial ITGME sobre Castilla - La Mancha para Nitratos; Informes de las Confederaciones Hidrográficas).
9. Determinación de masas de agua afectadas realizada por el MMA para Andalucía (Informe especial CH Guadalquivir para Nitratos)
10. MOPT 1992. *Plan Hidrológico de la Cuenca del Ebro*. Confederación Hidrográfica del Ebro. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
11. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de

- cuenca del Guadalquivir, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
12. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Segura, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
 13. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Jucar, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
 14. Resumen del estudio sobre problemas de contaminación de origen agrario que afectan a las aguas subterráneas en Castilla - La Mancha, realizado por el ITGME en diciembre de 1997, en el ámbito del Convenio suscrito con la Consejería de Agricultura y Medio Ambiente para apoyo en temas de agua y medio ambiente.
 15. Álvarez Cobelas, M.; P. Muñoz Ruíz and A. Rubio Olmo 1991. *La Eutrofización de las Aguas Continentales Españolas*. Centro de Investigaciones del Agua, Consejo Superior de Investigaciones Científicas. Febrero, 1991.
 16. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis*. Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.

9.1 *GENERAL DESCRIPTION*

Water basins:	<p>Duero River (98.32% of the water basin, 80% of the autonomous community)</p> <p>Norte River I</p> <p>Norte River II</p> <p>Ebro River (10% of the Castilla y León territory)</p> <p>TagusRiver</p>
Economic activities:	<p>Agricultural sector, fundamentally irrigated land in the Duero water basin. In the Norte basin, mining and irrigation predominate. In the Ebro basin, industry is significant. In the Tajo basin, subsistence agriculture and irrigation are found.</p>

9.2 *DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS*

9.2.1 *Vulnerable zones*

The identification of affected water bodies is the responsibility of the Ministry of the Environment (8). Water bodies were identified only in the Ebro and Duero water basins.

9.2.2 *Sensitive areas*

The Identification of sensitive areas was included in the National Plan for Wastewater Treatment, but it was not officially made public until May 1998 (State Resolution of 25 May 1998).

CASTILLA Y LEON

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL VULNERABLE ZONES

1. Segovia (5 sub - zones: UH 02.18)

OFFICIAL SENSITIVE AREAS.

2. Upper Luna River
3. Upper Porma River
4. Upper Esla River
5. Upper Carrión River
6. Upper Pisuerga River
7. Upper Arlanzón River
8. Upper Duero River
9. Upper Duratón River
10. Upper Eresma River
11. Upper Moros River
12. Upper Voltoya River
13. Upper Tormes River
14. Upper Agueda River
15. Upper Almar River
16. Upper Alberche River
17. Upper Cuerpo de Hombre River
18. Upper Cadagua River

CASTILLA Y LEON

MAP B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Black

1. Oroncillo River
2. Esla - Valderaduey
3. Los Arenales

Grey

4. Páramo de Torozos
5. Páramo de Cuellar
6. Almazán Basin and Siuthern of Almazán

SENSITIVE AREAS

Black

7. La Aceña Reservoir (River Aceña)
8. Sobrón Reservoir (River Ebro)

Grey

9. Almendra Reservoir (River Tormes)
10. Aldeávila Reservoir (River Duero)
11. Saucelle Reservoir (River Saucelle)
12. San Román Reservoir (River Duero), Villalcampo Reservoir (River Duero), and Castro Reservoir (River Duero)
13. Cernadilla Reservoir (River Tera)
14. Los Rábanos Reservoir (River Duero)
15. Linares del Arroyo Reservoir (River Riaza)
16. Rio Frío Reservoir (River Frío) (not shown).
17. Villameca Reservoir (River Tuerto)
18. Casares Reservoir (River Casares)
19. Las Vencias Reservoir (River Duratón)
20. Oroncillo River
21. Torrelara Reservoir (River Magdalena) (not shown)

VULNERABLE ZONES

Decree 109/1998 of 11 June, by which zones vulnerable to water pollution by nitrates of agricultural and livestock origin are designated and the Code of Good Farming Practices is approved (Official Journal: Boletín Oficial de Castilla y León nº 112, 16 June 1998; correction of errata: BOCyL nº 119, 25 June 1998).

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
<i>Zone 1</i>	Segovia (Navas de Oro)	<i>D</i>	<i>Decree 109/1998 of 11 June</i>	<ul style="list-style-type: none"> • Coincides with part of HU 01.18, containing intensive livestock raising, and particularly pork (10).
<i>Zone 2</i>	Segovia (Zarzuela del Pinar, Fuentepelayo, Navalmanzano)	<i>D</i>	<i>Decree 109/1998 of 11 June</i>	<ul style="list-style-type: none"> • Coincides with part of HU 02.18, containing intensive livestock raising, and particularly pork (10).
<i>Zone 3</i>	Segovia (Escarabajosa de Cabezas, Cantimpalos, Encinillas)	<i>D</i>	<i>Decree 109/1998 of 11 June</i>	<ul style="list-style-type: none"> • Coincides with part of HU 02.18, containing intensive livestock raising, and particularly pork (10).
<i>Zone 4</i>	Segovia (Cantalejo, Cabezuela, Beganzones, Turégano)	<i>D</i>	<i>Decree 109/1998 of 11 June</i>	<ul style="list-style-type: none"> • Coincides with part of HU 02.18, containing intensive livestock raising, and particularly pork (10).
<i>Zone 5</i>	Segovia (Chañe, minor entity of Chatún)	<i>D</i>	<i>Decree 109/1998 of 11 June</i>	<ul style="list-style-type: none"> • Coincides with part of HU 02.18, containing intensive livestock raising, and particularly pork (10).

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring "Sensitive" areas in the inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, de 8 de agosto de 1998).

Note: No population centres under obligation by Directive

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Luna River (upper section to Barrios de Luna reservoir, inclusive)	Reservoir in León (Barrios de Luna)	D	<i>Resolution of 25 May 1998</i>	• Purpose/use of reservoir water: irrigation, water supplies, and energy (2).
Porma River (upper section to Porma reservoir, inclusive)	Reservoir in León (Boñar)	D	<i>Resolution of 25 May 1998</i>	• Purpose/use of reservoir water: irrigation (2).
Esla River (and tributaries, until the Riaño reservoir)	Reservoir in León (Cremenes)	D	<i>Resolution of 25 May 1998</i>	• Purpose/use of reservoir water: Flood control (2).
Carrión River (upper section to Camporredondo and Compuerto reservoirs, incl.)	Both reservoirs in Palencia (Velilla de Río Carrión)	D	<i>Resolution of 25 May 1998</i>	• Purpose/use of Camporredondo reservoir water: Irrigation and energy (2). • Purpose/use of Compuerto reservoir water: Irrigation, water supplies, and energy (2).
Pisuerga River (upper section to Aguilar de Campoo, Requejada and Cervera-Ruesga reservoirs, incl.)	Aguilar de Campoo reservoir: Palencia (Aguilar de Campoo) Requejada reservoir: Palencia (Cervera)	D	<i>Resolution of 25 May 1998</i>	• Purpose/use of both reservoirs: Irrigation and energy (2).
Arlanzón River (upper section to Arlanzón and Uzquiza reservoirs, incl.)	Arlanzón reservoir: Burgos (Villasur de Herreros) Uzquiza reservoir: Burgos (Villasur de los Herreros)	D	<i>Resolution of 25 May 1998</i>	• Purpose/use of Arlanzón reservoir: irrigation and water supplies (2). • Purpose/use of Uzquiza reservoir: Water supplies (2).
Duero River (upper section, La Cuerda del Pozo reservoir and section from the reservoir to Soria city)	La Cuerda del Pozo reservoir: Soria (Vinuesa)	D	<i>Resolution of 25 May 1998</i>	• Purpose/use of reservoir water: irrigation, water supplies, and energy (2).

Duración River (from its source to the head of Las Vencias reservoir, including Burgomillodo reservoir)	Las Vencias reservoir: Segovia (Fuentidueña) Burgomillodo reservoir: Segovia (Carrascal del Río)	D	<i>Resolution of 25 May 1998</i>	Purpose/use of Las Vencias reservoir water: Energy (2). Purpose/use of Burgomillodo reservoir water: Energy (2).
Eresma River (from source to reservoir, until Segovia)		D	<i>Resolution of 25 May 1998</i>	
Moros River (from source to Espinar and Tejo reservoirs)	Espinar reservoir: Segovia (Espinar) Tejo reservoir: Segovia (Espinar)	D	<i>Resolution of 25 May 1998</i>	Purpose/use of both reservoirs: Water supplies (2).
Voltoya River (from the source to Los Serones reservoir, inclusive)	Los Serones reservoir: Avila (Ojos Albos and Santa María)	D	<i>Resolution of 25 May 1998</i>	Purpose/use of reservoir water: Water supplies (2).
Tormes River (from the source to Santa Teresa reservoir, inclusive)	Santa Teresa reservoir: Salamanca (Montejo de Salvaterra)	D	<i>Resolution of 25 May 1998</i>	Purpose/use: Irrigation and energy (2).
Agueda River (upper section and tributaries, until the Agueda reservoir)	Agueda reservoir: Salamanca (Zamara and Pastores)	D	<i>Resolution of 25 May 1998</i>	Purpose/use of reservoir water: Irrigation (2).
Almar River (from source to El Milagro reservoir)	El Milagro reservoir: Avila (Mirueña de los Infanzones)	D	<i>Resolution of 25 May 1998</i>	Purpose/use of reservoir water: Water supplies (2).
Alberche River (source, El Burguillo reservoir and the rest until the Community of Madrid)	Reservoir: Avila (El Tiemblo)	T	<i>Resolution of 25 May 1998</i>	Purpose/use of reservoir water: Irrigation and energy (2). Main centres affected are El Tiemblo, Las Navas del Marqués.
Cuerpo de Hombre River (from source to Béjar)		T	Resolution of 25 May 1998	
Cadagua River (upper section and Ordunte reservoir)	Reservoir: Burgos (Valle de Mena)	N-II	Resolution of 25 May 1998	Purpose/use of reservoir water: urban water supplies (to Bilbao) (2).

In this autonomous community, several rivers with severe quality problems relevant to water supply and a high phosphate content have been identified. For these rivers, firm conclusions cannot be reached because an exhaustive investigation beyond the scope of this report would be required. Nonetheless, they are listed below. It is interesting to mention that some of the reservoirs identified as Grey Zones by the Urban Waster Water Directive are found on these rivers. Likewise, on some of these rivers the upstream sections have been declared Sensitive Zones, that is, the sections that do not have extreme problems.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Grey (91/271/EEC) - monitoring/ investigations suggested	Almendra reservoir (on the Tormes River, Salamanca, Almendra and Villar del Buey)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: irrigation (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Aldeadávila reservoir (on the Duero River, Salamanca, Aldeavila de la Ribera)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: Energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Saucelle reservoir (on the Saucelle River, Salamanca, Saucelle)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: Energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	San Román reservoir (on the Duero River, Zamora, Pereruela)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: Energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Torrelara reservoir (on the Magdalena River, Segovia, Muñopedro)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: irrigation (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).

Grey (91/271/EEC) - monitoring/ investigations suggested	Los Rábanos reservoir (on the Duero River, Soria, Los Rábanos)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: irrigation (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Villalcampo reservoir (on the Duero River, Zamora, Villalcampo)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: Energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Castro reservoir (on the Duero River, Zamora, Fonfría)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: Energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Linares del Arroyo reservoir (on the Riaza River, Segovia, Madruelo)	The reservoir itself	D	Mesoeutrophic according to ref. (3).	Purpose/use: irrigation and energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Río Frío reservoir (onf the Frío River, Segovia, Segovia)	The reservoir itself	D	Mesoeutrophic according to ref. (3).	Purpose/use: Water supplies (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Villameca reservoir (on the Tuerto River, León, Quintana del Castillo)	The reservoir itself	D	Mesoeutrophic according to ref. (3).	Purpose/use: irrigation and energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Cernadilla reservoir (on the Tera River, Zamora, Cernadilla)	The reservoir itself	D	Mesoeutrophic according to ref. (3).	Purpose/use: energy (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).
Grey (91/271/EEC) - monitoring/ investigations suggested	Casares reservoir (on the Casares River, León, Rodiezmo)	The reservoir itself	D	Mesoeutrophic according to ref. (3).	Purpose/use: Industrial uses (2). Substantial differences between two sampling campaigns, it is advisable to compare with a specific campaign (3).

Grey (91/271/EEC) - monitoring/ investigations suggested	Las Vencias reservoir (Duratón River, Segovia, Fuentidueña)	The reservoir itself	D	Eutrophic according to ref. (3).	Purpose/use: Energy (2). The upper section of the river, up to the reservoir is designated as a sensitive area.
Sensitive Area	La Aceña reservoir (on the Aceña River, Avila, Peguerinos)	The reservoir itself	T	Eutrophic according to ref. (4).	Purpose/use: Water supplies (2). Coincident data from 1990 and 1994 campaigns made by different research bodies.
Sensitive Area	Sobrón reservoir (on the Ebro River, Burgos, Bozoo and Burguenda)	The reservoir itself	E	Eutrophic according to ref. (5).	Purpose/use: Energy (2).
Vulnerable Zone	Oroncillo River (Burgos, Miranda de Ebro)	River and tributaries, and basin area	E	Identified as affected by agricultural nitrate pollution (8).	Coincides with an area (around Miranda de Ebro) of notable industrial activity (5). Investigation to determine likely industrial and urban contribution to pollution, and its use for water supply is recommended (see next line).
Grey (91/271/EEC) - monitoring/ investigations suggested	Oroncillo River (Burgos, Miranda de Ebro)	The river itself	E	Coincides with an area (around Miranda de Ebro) of notable industrial activity (5) and urban agglomerations.	Investigation to determine likely industrial and urban contribution to pollution, and use for water supply is recommended (see previous line).
Vulnerable Zone	HU 2.06 Esla - Valderaduey	Zone of irrigation and dry farming	D	<ul style="list-style-type: none"> Identified as affected by agricultural nitrate pollution in (1) and (8), with very high values. High nitrate concentrations recorded permanently or occasionally at several monitoring points over a large area (9). 	Coincides with zones of irrigation (11), farming and livestock, mainly cows (3) and (10).
Vulnerable Zone	HU 2.17 Region of Los Arenales	Area between Salamanca, northern Ávila, Segovia and the Duero River	D	<ul style="list-style-type: none"> Identified as affected by agricultural nitrate pollution in ref. (1) and (8). High nitrate concentrations recorded permanently or occasionally at many monitoring points and in a 	Coincides with an area of intense farming and livestock activity (pork and cattle). In livestock raising, the pig density is noteworthy (10), and in agriculture, dry farming predominates, these being the major nitrate sources (1). Deep pollution recorded (8).

				large area between Salamanca and Segovia (9), as well as in the Adaja River.	
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 2.07 Páramo de Torozos	The HU and surrounding irrigated areas	D	<ul style="list-style-type: none"> Identified as a zone to be kept “under surveillance” in ref. (8). Contains an area from north to south with permanent or occasional high nitrate levels (9) and is surrounded by irrigation area (3 and 11). 	
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 2.13 Páramo de Cuellar	Entire HU	D	<ul style="list-style-type: none"> Identified as a zone to be kept “under surveillance” in ref. (8). Presents permanent or occasional high nitrate levels throughout its extension (9) and is located in an area of intense pig farming with some irrigation (3, 10 and (11). 	
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 2.15 and 2.16 Almazán basin and Southern Almazán	Entire HUs, including Duero irrigation areas	D	<ul style="list-style-type: none"> Identified as a zone to be kept “under surveillance” in ref. (8). Presents high nitrate concentrations in isolated points (9). 	Coincides with areas that historically have mixed farming and livestock raising (9); irrigated land around the Duero (3 and 11).

Following is a list of the rivers of the Community of Castilla y León in which quality problems or the presence of phosphates have been identified that make their waters unsuitable for water supply.

<i>Affected water body</i>	<i>Area to investigate</i>	<i>River basin</i>	<i>Observations</i>
Alagón River, section in Castilla-León	River and tributaries	T	<ul style="list-style-type: none"> • Does not meet requirements for water supplies along the entire length. (4). • Possible candidate for Vulnerable Zone because it traverses irrigated areas (11).
Cuerpo de Hombre River (from Béjar to the Alagón River)	Section and tributaries	T	<ul style="list-style-type: none"> • Does not meet requirements for water supplies along the entire length. • The upper section has been designated a Sensitive Area to Béjar. Use as water supply pending confirmation.
Bernesga River from León	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems due to urban and industrial effluents, showing high phosphate concentrations (3).
Carrión River from Palencia	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems due to urban and industrial effluents, with high phosphate concentrations (3).
Pisuerga River from Valladolid	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems due to urban and industrial effluents, with high phosphate concentrations (3). • The upper section has been designated a Sensitive Area.
Arlanzón River from Burgos	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems due to urban and industrial effluents, with high phosphate concentrations (3). • The upper section has been designated a Sensitive Area.
Tormes River from Salamanca	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems of urban and industrial effluents (3). • The upper section has been designated a Sensitive Area. • It probably has the same problems as the Bernesga, Arlanzón, Pisuerga and Carrión rivers, but data confirming this are lacking (3).
Adaja River from Ávila	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems due to urban and industrial effluents, with high phosphate concentrations (3). • It probably has the same problems as the Bernesga, Arlanzón, Pisuerga and Carrión rivers, but data confirming this are lacking (3).
Duero River from Zamora	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems due to urban and industrial effluents, with high phosphate concentrations (3). • It probably has the same problems as the Bernesga, Arlanzón, Pisuerga and Carrión rivers, but data confirming this are lacking (3).
Eresma River from Segovia	Section and tributaries	D	<ul style="list-style-type: none"> • Section with problems due to urban and industrial effluents, with high phosphate concentrations (3). • The upper section has been designated a Sensitive Area. • It probably has the same problems as the Bernesga, Arlanzón, Pisuerga and Carrión rivers, but data confirming this are lacking (3).

The designation of special areas in compliance with Directives EEC/91/271 and EEC/91/676 in Castilla y León does not reflect the relevant water quality status in the region. Regarding the designation of Sensitive Areas, the various documents processed highlight that the main problems exist in the river sections where particular measures have not been taken, whilst the effective designations have covered those areas showing, in general, good quality. After analysing the criteria for designation, the regional government decision can only be understood when linked to the mere preservation of the main water bodies used for water supply. In addition, the application of nature conservation EU Directives might also be relevant, since classified watercourses roughly coincide with the network of regional nature reserves. Investigations covering the Duero River section and the mid- and lower sections of the main tributaries downstream the main population centres are strongly recommended.

The classification of Vulnerable Zones does not cover the main areas showing relevant water quality problems either. Effective designation covers a minimum extension of the areas identified as having groundwater pollution from agricultural sources. Indeed, descriptions found in regional government documents (e.g. references 9 and 10) indicate that this administration is aware of the extent of nitrate pollution in the region. Given the importance of agricultural and farming land uses in the region, the designation of additional areas (e.g. Esla - Valderaduey and Los Arenales) and further research into potentially polluted zones (e.g. Almazán and Páramo de Torozos) is advisable.

1. Varela Sánchez, 1991. *"Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear"*. Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT (1991) *Inventario de presas españolas*. Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT (1994) *Plan Hidrológico del Duero*. Confederación Hidrográfica del Duero. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
4. MMA (1996?). *Plan Hidrológico de la Cuenca del Tajo*. Confederación Hidrográfica del Tajo. Ministerio de Medio Ambiente. Secretaría de Estado de Aguas y Costas. Dirección General de Obras Hidráulicas y Calidad de Aguas. Madrid.

5. MOPT (1992) *Plan Hidrológico de la Cuenca del Ebro*. Confederación Hidrográfica del Ebro. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
6. MOPT (1992) *Plan Hidrológico Norte I*. Confederación Hidrográfica del Norte. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
7. MOPT (1992) *Plan Hidrológico Norte II*. Confederación Hidrográfica del Norte. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
8. Determinación de masas de agua afectadas realizada por el MMA para Castilla y León (Informes Especiales de las Confederaciones Hidrográficas del Ebro y del Duero).
9. Junta de Castilla y León (1997) *Libro Verde del Medio Ambiente en Castilla y León*. Consejería de Medio Ambiente y Ordenación del Territorio. Junta de Castilla y León. Valladolid.
10. Junta de Castilla y León (1993) *Plan Director de Infraestructura Hidráulica Urbana. Plan Regional de Saneamiento*. Revisión de 1993. Junta de Castilla y León, Consejería de Obras Públicas y Ordenación del Territorio. Valladolid.
11. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis*. Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.

10.1

GENERAL DESCRIPTION

Water basins:	<p>Ebro River: (15,408 Km², 47.25% of the territory of the autonomous community).</p> <p>Inland water basins of Catalonia (16,600 Km², 52% of the autonomous community).</p> <p>Júcar River (280 Km², 0.75% of the Catalonian territory, in the province of Tarragona).</p>
Economic activities:	Industry, particularly around Barcelona and on the Tarragona coast. Farming and livestock raising also are important, especially in Lleida (combined with the Catalonian irrigated areas of the Ebro water basin). The coast has areas of mass tourism (e.g. the Costa Brava).
Observations:	In general, the natural alkalinity of the Ebro water basin mitigates eutrophication. Samples made between 1973 and 1991 do not show a trend toward growth (5).

10.2

*DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS**Vulnerable zones*

In this autonomous community there are three water basins, two of them under the responsibility of the national government (Ebro and Júcar) and one under the responsibility of the autonomous community (Inland water basins of Catalonia). The only information available for the internal water basins of Catalonia is that of the relevant Hydrological Plan, which does not cover the issue of Vulnerable Zones. Besides, it is not known whether this autonomous community has prepared reports leading to determining the vulnerable zones that should be declared.

Therefore, the core information analysed for this report is that of the identification of affected bodies of water prepared by the Ministry (6), the content of which is summarised below:

- In the Ebro River basin, only 3 HU have been identified as ground water bodies affected by nitrate pollution. No watercourse or reservoir was identified.
- In the Júcar water basin, no groundwaters were identified as affected. With regard to surface waters and reservoirs, the Basin Authority stated that in no case had the limit of 50 mg/l been exceeded.

- As for reservoir eutrophication, the Basin Authorities of the Ebro and Júcar have stated that the limiting factor is phosphorus. Nonetheless, the Ebro Authority has stated that agricultural sources are a major influence.

Sensitive Areas

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. Later, the State Resolution of 25 May 1998 publicly acknowledged the sensitive areas for which it is responsible (Ebro). Therefore, sensitive areas located in the inland water basins of Cataluña (most of the main rivers) or coastal areas (only Port dels Alfacs and El Fangar) have not been officially reported. These are, therefore, considered unofficial.

Coastal Sensitive Areas and Vulnerable Zones

Although information to this effect has not been available, it has been assumed that the autonomous community used data from the surveillance network for the quality of coastal waters, which has been carrying out summer campaigns since 1990.

CATALONIA

MAPA A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL VULNERABLE ZONES

1. Alt Empordá, Baix Empordá, Pla de l'Estany and Gironés
2. Maresme
3. Osona
4. Alt Camp, Baix Camp and Tarragonés
5. Baix Penedés
6. Noguera, Segarra, Urgall, Plá d'Urgell and Segriá

OFFICIAL SENSITIVE AREAS.

7. River Segre and tributaries
8. River Ebro and tributaries, along Tarragona Province

UNOFFICIAL SENSITIVE AREAS.

9. Riera de Portbou
10. Riera de Valleta
11. River Muga and Tributaries
12. River Fluviá and tributaries
13. River Ter and tributaries
14. River Daró and tributaries
15. Riera de Calonge
16. River Ridaura
17. Riera de Tossa
18. River Tordera and tributaries
19. Riera de Vallalta
20. Riera d'Argentona
21. River Besós, Mongent and Cánoves
22. River Congost
23. Tenes Estuary (not shown)
24. Caldes Estuary (not shown)
25. River Llobregat
26. Ribes Estuary (not shown)
27. Torrent de Pedrell (not shown)
28. River Foix
29. Torrent Corbeteja (not shown)
30. Bisbal Estuary
31. Creixel Estuary
32. River Gaiá and tributaries
33. River Francolí
34. Maspujols Estuary

35. D'Alforja Estuary
36. River Llastres
37. Riudecanyes Estuary
38. El Fangar
39. Port dels Alfacs
40. River Senia and tributaries
41. River La Garona and tributaries

CATALONIA

MAPA B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Black

1. Lower Ebro and Delta
2. Segre foodplain aquifer

VULNERABLE ZONES

Legislation:

Autonomous Community: Decree 283/1998 (Catalonia), 21 October, for the designation of vulnerable zones in relation with nitrate pollution of agricultural origin (Official Journal: Diari Oficial de la Generalitat de Catalunya n°2760, 6 November 1998).

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Official publication</i>
Area 1: Alt Empordà, Baix Empordà, Pla de L'Estany, Gironès	Albons, El Far d'Empordà, Avinyet de Puigventos, Banyoles, Bàscara, Bellcaire d'Empordà, Bordils, Borrassà, Cabanes, Cabanelles, Celrà, Crevià de Ter, Siurana, Colomers, Cornellà del Terri, Corçà, Flaçà, Foixà, Fontanilles, Fontcoberta, Garrigàs, Garrigoles, Gualta, Jafre, Juià, Llers, Navata, Ordis, Palau de Santa Eulàlia, Palol de Revardit, Parlavà, La Pera, Pontós, Rupià, Sant Jordi Desvalls, Sant Joan de Mollet, Sant Julià de Ramis, Sant Marti Vell, Sant Miquel de Fluvià, Sant Mori, Santa Llogaia d'Alguma, Saus, Serra de Daró, La Tallada d'Empordà, Torroella de Fluvià, Ultramort, Ventalló, Verges, Vilabertran, Viladasens, Viladamat, Vilademuls, Vilafant, Vilaur, Vilamacolum, Vilamalla, Vilasacra, Vilopriu	CIC	Decree 283/1998 of 21 October
Area 2: Maresme	Alella, Arenys de Mar, Arenys de Munt, Argentona, Cabrera de Mar, Cabrils, Calella, Canet de Mar, Dosrius, Malgrat de Mar, El Masnou, Mataró, Montgat, Palafolls, Pineda de Mar, Premià de Mar, Sant Iscle de Vallalta, Sant Andreu de Llavaneres, Sant Cebrià de Vallalta, Vilassar de Dalt, Vilassar de Mar, Premià de Dalt, Sant Pol de Mar, Santa Susanna, Sant Vicenç de Montalt, Teià, Triana	CIC	Decree 283/1998 of 21 October
Area 3: Osona	Balenyà, Calldetenes, Gurb, Malla, Manlleu, Les Masies de Roda, Les Masies de Voltregà, Muntanyola, Oris, Perafita, Roda de Ter, Sant Boi de Lluçanès, Sant Hipòlit de Voltregà, Sant Julià de Vilatorrada, Sant Pere de Torelló, Santa Cecília de Voltregà, Santa Eugènia de Verga, Santa Eulàlia de Riuprimer, Santa Maria de Corcó, Sant Vicenç de Torelló, Seva, Sobremunt, Taradell, Tona, Torelló, Vic	CIC	Decree 283/1998 of 21 October
Area 4: Alt Camp, Baix Camp and Tarragonès	Alcover, Les Borges del Camp, Botarell, Cambrils, Els Garidells, La Maso, El Mila, Montbrió del Camp, Mont-roig del Camp, El Morell, Nulles, Els Pallaresos, Perafort, La Pobla de Mafumet, Puigpelat, Reus, Riudoms, El Rourell, La Secuita, La Selva del Camp, Vallmoll, Vilallonga del Camp, Vilanova D'Escornalbou, Vinyols I Els Arcs	CIC	Decree 283/1998 of 21 October
Area 5: Baix Penedès	Sant Jaume del Domenys, La Bisbal del Penedès, Llorenç del Penedès, L'Arboç, Banyeres del Penedès, Santa Oliva	CIC	Decree 283/1998 of 21 October

Area 6: Noguera, Segarra, Urgell, Pla D'Urgell and Segrià	Agramunt, Els Alamus, Anglesola, Artesa de Lleida, Barbens, Belianes, Belcaire D'Urgell, Bell-Lloc D'Urgell, Bellpuig, Bellvis, Castellnou de Seana, Castellsera, Cervera, Ciutadilla, Estaras, Fondarella, Foradada, La Fuliola, Golmés, Granyanella, Granyena de Segarra, Guimera, Guissona, Ivars D'Urgell, Linyola, Malda, Massoteres, Miralcamp, Mollerusa, Montoliu de Segarra, Montornes de Segarra, Nalec, Les Oluges, Els Omells de Na Gaia, Ossó de Sió, El Palau D'Anglesola, Penelles, El Poal, Preixana, Preixens, Puigverd D'Agramunt, Sant Guim de Freixenet, Sant Ramon, Sant Guim de la Plana, Sidamon, Talavera, Tarrega, Tarroja de Segarra, Termens, Tornabous, Torregrossa, Vallbona de les Monges, Vallfogona de Balaguer, Verdu, Vilagrassa, Vilanova del Bellpuig, Vila-Sana, Vilanova de la Barca, Sant Marti de Riucorb, Ribera D'Ondara, Torrefeta I Florejacs, Els Plans de Sio	E	Decree 283/1998 of 21 October
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SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring "Sensitive" areas in the inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998). Sensitive Areas within the Catalan Inland Basins and the coast are considered unofficial.

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
El Segre: From its source to the confluence with the Ebro, and tributaries		E	Resolution of 25 May 1998	<ul style="list-style-type: none"> Population centres under obligation by the Directive: Agramunt/ Balaguer /Cervera/ Lleida/ Fondarella, Mollerusa, Palau d'Anglesona /Golmés, Vilanova de Bellpuig/ Guissona/ Montferrer/ Puigcerdá/ Tárrega The Oliana reservoir (on the Segre River, Lerida) is eutrophic according to ref. (5). Purpose/use: irrigation and energy (2) On the Noguera Pallaresa River, tributary of the Segre, ref. (5) reports that there are two mesoeutrophic reservoirs (Tarn reservoir, purpose/use: irrigation and energy, and Tremp reservoir) and one mesoeutrophic reservoir (Camarasa reservoir., purpose/use: energy and urban water supplies).

				<ul style="list-style-type: none"> • A tributary of the Segre, the Noguera Ribagorzana River, crosses the boundary of the Autonomous Community of Aragón. This tributary contains two reservoirs, Escales and Canelles, that were not designated sensitive areas in Aragón but have been identified as Grey Zones by the Waste Water Directive in this autonomous community (see Aragón). • Official designation
Ebro River: from its source to the confluence with the Segre and the mouth, and tributaries		<i>E</i>	<i>Resolution of 25 May 1998</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Amposta/ Deltebre/ Mora la Nueva, Mora d'Ebre/ Tortosa, Roquetes • Official designation
Riera de Portbou	<i>Girona (Portbou)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Riera de Valleta	<i>Girona (La Valleta)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
La Muga and tributaries	<i>Girona (Alt Empordà to the Bay of Roses)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Figueres, Vilafant
El Fluvià and tributaries	<i>Girona (Alt Empordà to the Bay of Roses)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Olot, La Vall d'en Bas, Les Presses • Unofficial
El Ter and tributaries	<i>Girona (Gironès and Baix Empordà)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Banyoles, Porqueres, Cornellá de Terri, Camós / Camprodon/ Cassa de la Selva/ Girona, Bescanó, Salt, Sarriá de Ter/ Manlleu, Les Masies, St. Hipòlit de Voltregà/ Ripoll/ Taradell/ La Vall del Ges/ Vic, Gurb, Calldetenes, Santa Eugènia de Berga • Unofficial
Daró River and tributaries	<i>Girona (Baix Empordà)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: La Biscal d'Empordà, Corçá • Unofficial
Riera de Calonge	<i>Girona (Alt Empordà to the Bay of Palamòs)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Riera de Tossa	<i>Girona (La Selva - Tossa)</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Riudaura River		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial

La Tordera and tributaries	<i>Girona - Barcelona</i>	<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Sant Celedoni / Santa Coloma de Farners/ Sils, Vidreres • Unofficial
Riera de Vallalta		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Riera d'Argentona		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Río Besós: Mongent River from the source to its confluence with the Cánoves estuary, including tributaries		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Bigues i Riells • Unofficial
Congost River: From its source to the Garriga, and tributaries		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Centelles • Unofficial
Tenes estuary From its source to Lliça d'Amunt, and tributaries		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Sant Feliu de Codines • Unofficial
Caldes estuary From its source to Caldes de Montbuí, and tributaries; Ripoll River From its source to Castellar del Vallés, and tributaries; Sec River: from its source to Sant Quirze		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Sant Quirza Safaja • Unofficial
Llobregat River: from its source to Sant Feliú de Llobregat, and tributaries, except the Rubí estuary, from Terrassa to the confluence with the Llobregat		<i>CIC</i>	<i>None</i>	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Abrera, Olesa, Esparraguera, Collbató / Berga/ Castellbell i El Vilar, Castellgalí, St. Vicenç de C., Vacarisses (parte) / Gironella/ Igualada, Odena, Santa Margarida de Montbui, Vilanova del Camí/ Manresa, Sant Joan de Vilatorrada /Martorell, Sant Esteve Serovires/ Monistrol de Montserrat /Navarcles, Santpedor, Sant Fruitós B. / Piera/ La Pobla de Claramunt, La Torre de C. /Capellades/ Sallent, Artés/ Sant Sadurní d'Arnoia, Subirats/ Solsona/ Súria/ Torrelavit, Sant Pere de Riudebitlles, Sant Quintí de Mediona • Unofficial

Ribes estuary from its source to the mouth and tributaries, Canyelles estuary and Jafra estuary		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Torrent de Pedrell		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Foix River: From its source to the mouth and tributaries		CIC	None	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Villafranca del Penedés, Sant Martí, Santa Margarida i els Monjos, Sant Cugat, Sesgarrigues • Unofficial
Torrent Coberteja		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Bisbal estuary and tributaries		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Creixell estuary		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
El Gaiá and tributaries		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Francolí River: From its source to the mouth and tributaries		CIC	None	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Valls • Unofficial
Maspujols estuary		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
d'Alforja estuary		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Llastres River		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
La Garona to the frontier and tributaries		CIC	None	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Vielha, Mijaran / Naut, Aran • Unofficial

Riudecanyes estuary		CIC	None	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Mont- Roig del Camp • Unofficial
Sènia River and tributaries		CIC	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive. • Unofficial
Port dels Alfacs (Montsiá region)			None	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: Sant Carles de la Ràpita • Unofficial
El Fangar (lower Ebro)			None	<ul style="list-style-type: none"> • Population centres under obligation by the Directive: L' Ampolla • Unofficial

(*) It is considered that the Spanish authorities have not formally designated Less Sensitive Areas. However, according to pseudo-official information (Medio Ambiente en España 1997, MMA) it has been determined that the coast of Catalonia is a less sensitive area, with the exception of Port dels Alfacs and El Fangar, which have been declared sensitive areas.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	HU 09.31 Lower section and delta of the Ebro River Coastal waters of Port dels Alfacs and El Fangar.	Ebro River delta: Aquifer, lower section of the Ebro and sloped water basin	E	<ul style="list-style-type: none"> • HU 09.31 has been identified as severely polluted by agricultural residues in ref. (5) and (6). • The lower Ebro and Delta is a long- established, intensely irrigated area (12). • In turn, ref. (1) emphasizes the large volume of nitrogen fertilizers that the delta receives, but does not have detailed data. • Coastal eutrophication in El Fangar and Els Alfacs (Prat et al., 1988; Vidal et al., 1989; Vidal , 1994) • Coastal lagoons have high nitrate concentrations (López and Tomàs, 1989) • Further references supporting designation are (9, 10 and 11). 	<ul style="list-style-type: none"> • Port dels Alfacs and El Fangar have been designated coastal sensitive areas. • This is a 450 Km² area with a history of intensive farming activity. • Intensive agricultural practices are the most important factor in the pollution of coastal waters.
Vulnerable Zone	HU 09.30 Segre floodplain	Aquifer and section of the Segre associated with the sloped water basin	E	<ul style="list-style-type: none"> • Ref. (6) notes pollution and recommends follow-up and ref. (1) highlights ground water pollution under the irrigated areas around the Segre. • Coincides with an area of intensive agriculture and livestock raising (mainly pork) located in the zone of influence of the irrigated areas of the Ebro in Lérida (12) 	This means an enlargement of the Vulnerable Zone “Area 6: Noguera, Segarra, Urgell, Pla D’Urgell and Segrià

Note 1: Several issues were analysed to determine the grey and black coastal areas. These include coastal morphology, regional hydrology, and the population density near the coast and population centres of more than 10,000 inhabitants. Agricultural development of the autonomous community, particularly irrigation, the presence of coastal aquifers with a high degree of nitrate pollution (MOPT, 1988) and technical information (Prat et al., 1988, López and Tomàs, 1989; Vidal et al., 1989; Vidal, 1994) were also considered.

The Autonomous Community of Cataluña has designated more sensitive areas and vulnerable zones than any other community. In general, all the sensitive areas are watercourses and all the Vulnerable Zones are groundwaters. Many of the watercourses declared Sensitive Areas run through one of the Vulnerable Zones.

There is good coverage of Vulnerable Zones and Sensitive areas in Catalonia, according to the information processed for this report. However, there is evidence that the Lower Ebro and Delta should be designated and the existing Vulnerable Zone 6 should be enlarged.

1. Varela Sánchez, 1991. "Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear".
2. MOPT 1991. *Inventario de presas españolas*. Dirección General de Obras Hidráulicas del Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT 1992. *Plan Hidrológico de la Cuenca del Júcar*. Confederación Hidrográfica del Júcar. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas. Ministerio de Obras Públicas y Transportes. Madrid.
4. Generalitat de Catalunya 1993?. *Plan Hidrológico de las Cuencas Internas de Cataluña..* Departament de Política Territorial i Obres Públiques, Departament de Medi Ambient, Generalitat de Catalunya, Barcelona.
5. MOPT 1992. *Plan Hidrológico de la Cuenca del Ebro*. Confederación Hidrográfica del Ebro. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
6. Determinación de las masas de aguas afectadas por nitratos realizada por el Ministerio de Medio Ambiente (Informes de la Confederación hidrográfica del Júcar y Ebro para Nitratos).
7. Orden de 13 de Agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Ebro, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 222, de 16 septiembre 1999).

8. Orden de 13 de Agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Júcar, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
9. Ibáñez, C.; A. Rodrigues-Capítulo and N. Prat 1995. *The combined impacts of river regulation and eutrophication on the dynamics of the salt wedge and the ecology of the lower Ebro River (North-East Spain)*. In: *The Ecological Basis for River Management*, edited by D. M. Harper and A.J.D. Ferguson. John Wiley and Sons Ltd.
10. Prat, N and C. Ibáñez 1995. Effects of water transfer projected in the Spanish National Hydrological Plan on the ecology of the lower river Ebro (N.E. Spain) and its Delta. *Wat. Sci. Tech.* Vol **31**, no 8, pp. 79-86.
11. Rodrigues-Capítulo, A.; A. España, C. Ibáñez and N. Prat 1994. Limnology of natural wells in the Ebro Delta (NE Spain). *Verh. Internat. Verein. Limnol.* **25**, pp 1430-1433, june 1994.
12. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis*. Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.

11.1 GENERAL DESCRIPTION

Total area:	41,602 Km ²
Water basins:	River Tagus River Guadiana (56.14% of the territory) River Guadalquivir
Economic activities:	Mainly agriculture and farming. Industry is not large, and agglomerates along the Guadiana main section. Power generation (hydro- and nuclear) is significant.
Observations:	Extension of irrigated areas: 234,000 ha. Large volume of water stored in reservoirs.

11.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

11.2.1 Vulnerable zones

The Identification of affected ground and surface water bodies is the responsibility of the Ministry of the Environment (5). As regards groundwaters, the ITGME identified four hydro-geology units (HU) as affected: 2 in the Guadiana water basin and 2 in the Tagus water basin. As regards surface waters, the Tagus Basin Authority has stated that there are no surface waters in which the limit of 50 mg/l has been exceeded and that reservoir eutrophication is not due to agricultural pollution. The Guadiana Basin Authority affirms that "the established limits are not regularly exceeded" for nitrate levels and that the limiting factor in eutrophic reservoirs is phosphate.

In spite of having identified groundwater bodies as affected by nitrate pollution, this autonomous community communicated to the national Ministry of the Environment, in a letter dated 22 May 1997, that Extremadura would not designate Vulnerable Zones for the following reasons:

1. The designation should be completed with a more exhaustive study than that supplied by the national Ministry of the Environment on affected water bodies. This study would determine the agricultural origin of nitrate pollution.
2. The Laboratory of Environmental Quality of the General Directorate of the Environment in Extremadura was developing an "Analysis Plan" for potentially affected water bodies. In this plan, surface and groundwater would be studied (*Note, according to a telephone conversation with one

of the responsible technicians, there were not enough resources for the development of this study).

3. The autonomous community wished to establish an agreement with the ITGME to study the aquifers of the Tagus and Guadiana river basins. This would be the framework to identify affected waters, their current use, and the vulnerability of aquifers with potentially harmful farming practices (*Note, according to a telephone conversation with one of the responsible technicians, this agreement was not reached).
4. The regional Ministry of Agriculture had prepared a Code of Good Farming Practices (*Note: the official publication of this Code¹ expressly mentions that its effective use by farmers would minimise nitrate pollution and prevent the declaration of Vulnerable Zones, where it would be obligatory to restrict certain farming practices).

The communication concluded by saying that when sufficient information became available, Vulnerable Zones would be declared, if studies showed them to be necessary.

11.2.2

Sensitive Areas

Declared by the Resolution of 25 May 1998 of the Ministry of the Environment.

¹ Orden de 24 de noviembre de 1998, por la que se publica el Código de Buenas Practicas Agrarias de Extremadura (Official Journal: Diario Oficial de Extremadura nº 141, de 10 de diciembre de 1998).

EXTREMADURA

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL SENSITIVE AREAS.

1. Brovales Reservoir (River Brovales)
2. Valuengo Reservoir (River Ardilla)
3. Alange Reservoir (River Matachel)
4. Piedra Aguda Reservoir (River Olivenza)
5. Prosperina Reservoir (River Pardillas)
6. Cornalvo Reservoir (River Albarregas)
7. Zalamea Reservoir (River Ortigas)
8. Cijara Reservoir (River Guadiana)
9. La Cumbre Reservoir (River Magasquilla)
10. Mdroñeras Reservoir (River Aguijal)
11. Borbollón Reservoir (River Arrago)
12. Montehermoso Reservoir (River Paz)

EXTREMADURA

MAP B: SUGGESTED DESIGNATION

VULNERABLE ZONES

Black

1. Vegas Bajas
2. Vega Alta (Western Sector)
3. Tiétar
4. Moraleja

SENSITIVE AREAS

Black

5. Villar del Rey Reservoir (River Zapatón)
6. Orellana Reservoir (River Guadiana)
7. Zújar Reservoir (River Zújar)
8. Arrocampo Reservoir (River Arrocampo)
9. Valdecañas Reservoir (River Tagus)
10. Torrejón- Tajo Reservoir (River Tagus)
11. Torrejón- Tiétar Reservoir (River Tiétar)
12. Guadiloba Reservoir (River Guadiloba)
13. Alcántara Reservoir (River Tagus)
14. Jerte- Plasencia Reservoir (River Jerte)
15. Salor Reservoir (River Salor)
16. Cedillo Reservoir (River Tagus, bordering Portugal)
17. Guijo de Granadilla Reservoir (River Alagón)
18. Valdeobispo Reservoir (River Alagón)
19. Portaje Reservoir (River Alagón)

VULNERABLE ZONES

Non-designation has been recently recognised by Order of 30 november 1999 (Extremadura), on the declaration of non-existence of Vulnerable Zones regarding nitrate pollution within the territory of the Autonomous Community of Extremadura (Official Journal: Boletín Oficial de Extremadura nº 147, of 16 december 1999).

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring “Sensitive” areas in the inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998).

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Brovaes reservoir (on the Brovaes River)	Badajoz (Jerez de los Caballeros)	GN	Resolution of 25 May 1998	Purpose/use: irrigation (2).
Valuengo reservoir (on the Ardila River)	Badajoz (Jerez de los Caballeros)	GN	Resolution of 25 May 1998	Purpose/use: Irrigation and energy (2).
Alange reservoir (on the Matachel River)	Badajoz (Alange)	GN	Resolution of 25 May 1998	Purpose/use: Irrigation, water supplies, and energy (2).
Piedra Aguda reservoir (on the Olivenza River)	Badajoz (Olivenza)	GN	Resolution of 25 May 1998	Purpose/use: Irrigation and water supplies (2).
Proserpina reservoir (on the Pardillas River)	Badajoz (Mérida)	GN	Resolution of 25 May 1998	Purpose/use: Water supplies, irrigation, and recreation (2).
Cornalvo reservoir (on the Albarregas River)	Badajoz (Mérida)	GN	Resolution of 25 May 1998	Purpose/use: irrigation (2).

Zalamea reservoir (on the Ortigas River)	Badajoz (Zalamea de la Serena)	GN	Resolution of 25 May 1998	Purpose/use: Irrigation (2).
Cijara reservoir (on the Guadiana River)	Cáceres (Alia)	GN	Resolution of 25 May 1998	Purpose/use: irrigation and energy (2). Also classified by Castilla-La Mancha
La Cumbre reservoir (on the Magasquilla River)	Cáceres (La Cumbre)	T	Resolution of 25 May 1998	Purpose/use: Urban water supplies (2).
Madroñeras reservoir (on the Aguijal River)	Cáceres (Madroñeras)	T	Resolution of 25 May 1998	Purpose/use: Urban water supplies (2).
Borbollón reservoir (on the Árrago River)	Cáceres (Santibáñez el Alto)	T	Resolution of 25 May 1998	Purpose/use: Irrigation and energy (2).
Montehermoso reservoir (on the Paz River)	Cáceres (Montehermoso)	T	Resolution of 25 May 1998	Purpose/use: Urban water supplies (2).

In this autonomous community, rivers with bad quality levels for water supply and a high phosphate content have been identified. For these rivers, firm conclusions cannot be reached because an exhaustive investigation beyond the scope of this report would be required. Nonetheless, they are listed below for information purposes.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to be designated</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	HU 04.09 Vegas Bajas.	Irrigated area	GN	Identified as a HU with problems by ref. (1) and (3). Identified as an affected body of water in ref. (5). Irrigated area of intensive agriculture (7).	Purpose/use of water at sampling points: Water supplies to urban and non-urban centres, agriculture, and livestock (5).
Vulnerable Zone	HU 04.08 Vega Alta (western sector)	Irrigated area	GN	Identified as a HU with problems by ref. (1) and (3). Identified as an affected body of water in ref. (5). Irrigated area of intensive agriculture (7).	Purpose/use of water at sampling points: agriculture, livestock (5)
Vulnerable Zone	HU 03.09 Tiétar	Irrigated area of the Tiétar River	T	Identified as a HU with problems by ref. (1) and (4). Ref. (4) emphasises a high nitrate concentration. Identified as an affected water body in ref. (5), which indicates that, if current land uses continue, this situation will deteriorate. Area of irrigated cropland (7).	Purpose/use of water at sampling points: Water supplies to urban and non-urban centres, agriculture, livestock, and unknown (5). The monitoring network seems to be insufficient. This region contains 14,500 ha of irrigated land.

Vulnerable Zone	HU 03.13 Moraleja	Irrigated land of Alagón and Ambroz, to the north and west of Plasencia	T	Identified as a HU with problems by ref. (1). Identified as an affected water body in ref. (5), which indicates that, if current land uses continue, this situation will deteriorate. Area of irrigated cropland (7).	Purpose/use of water at sampling points: Water supplies and agriculture. (2). The region and surrounding areas contain 34,000 ha of irrigated land.
Sensitive Area	Villar del Rey reservoir (on the Zapatón River, Badajoz, Villar del Rey)	The reservoir itself	GN	Eutrophic according to ref. (3).	Purpose/use of reservoir water: Water supplies (2).
Sensitive Area	Orellana reservoir (on the Guadiana River, Badajoz, Orellana)	The reservoir itself	GN	Mesoeutrophic according to ref. (3 and 8).	Purpose/use of reservoir water: Irrigation, water supplies, and energy (2).
Sensitive Area	Zújar reservoir (on the Zújar River, Badajoz, Castuera and Esparragosa)	The reservoir itself	GN	Mesoeutrophic according to ref. (3).	Purpose/use of reservoir water: Irrigation, water supplies, and energy (2).
Sensitive Area	Arrocampo reservoir	The reservoir itself	T	Hypereutrophic according to ref. (4).	Purpose/use: Industrial water supplies (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Valdecañas reservoir (River Tagus)	The reservoir itself	T	Eutrophic according to ref. (4). Hipereutrophic as in (8).	Purpose/use: Irrigation and energy (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Torrejón - Tajo reservoir (River Tagus)	The reservoir itself	T	Eutrophic according to ref. (4). Hipereutrophic as in (8).	Purpose/use: Energy (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Torrejón - Tiétar reservoir (River Tiétar)	The reservoir itself	T	Eutrophic according to ref. (4).	Purpose/use: Energy (2). Campaigns of 1990 and 1994 show similar trophic status.

Sensitive Area	Jerte - Plasencia reservoir	The reservoir itself	T	Eutrophic according to ref. (4).	Purpose/use: Irrigation and urban water supplies (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Alcántara reservoir (River Tagus)	The reservoir itself	T	Eutrophic according to ref. (4). Hipereutrophic as in (8).	Purpose/use: Energy (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Guadiloba reservoir (River Guadiloba)	The reservoir itself	T	Eutrophic according to ref. (4).	Purpose/use: Urban water supplies (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Salor reservoir (River Salor)	The reservoir itself	T	Eutrophic according to ref. (4).	Purpose/use: Irrigation (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Cedillo reservoir (River Tagus, bordering Portugal)	The reservoir itself	T	Eutrophic according to ref. (4).	Purpose/use: Energy (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Guijo de Granadilla reservoir (River Alagón)	The reservoir itself	T	Mesoeutrophic according to ref. (4). Eutrophic as in (8).	Purpose/use: Energy (2). Campaigns of 1990 and 1994 show similar trophic status.
Sensitive Area	Valdeobispo reservoir (River Alagón)	The reservoir itself	T	Mesoeutrophic according to ref. (4).	Purpose/use: Irrigation and energy (2). Campaigns of 1990 and 1994 show similar trophic status.

Sensitive Area	Portaje reservoir (River Alagón)	The reservoir itself	T	Mesoeutrophic according to ref. (4).	Purpose/use: Energy (2). Campaigns of 1990 and 1994 show similar trophic status.
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Following is a list of the rivers of the Community of Extremadura in which quality problems or the presence of phosphates have been identified that make their waters unsuitable for water supply.

<i>Affected water body</i>	<i>Area to investigate</i>	<i>Water basin code</i>	<i>Observations</i>
The Tagus River running through the autonomous community, to Alcántara reservoir, inclusive, and Torrejón-Tajo reservoir	River and tributaries including the Alcántara and Torrejón-Tajo reservoirs	T	<ul style="list-style-type: none"> Does not meet conditions for water supply in this section and has problems of effluents upstream to water supply intake points (4). Possible candidate for Vulnerable Zone because it traverses irrigated areas (7). The Tagus across Extremadura consists of a series of consecutive reservoirs, most of which have been classified or are proposed for designation.
Tietar River to the Torrejón-Tiétar reservoir	Section and tributaries	T	<ul style="list-style-type: none"> Problems due to effluents upstream to water supply intake points in Jarandilla and Talayuela (4). This section coincides with the Vera region, which contains numerous population centres. Possible candidate for Vulnerable Zone because it traverses irrigated areas (7)
Alagón River	River and tributaries	T	<ul style="list-style-type: none"> Does not meet requirements for water supplies along the entire length (4). Possible candidate for Vulnerable Zone because it traverses irrigated areas (7). High water storage along this water course. Many reservoirs proposed for designation or already classified.

11.4

REGIONAL CONCLUSION

According to the information available for this report, the Autonomous Community of Extremadura has failed to designate the number and extension of special areas to comply with the requirements of Directives 91/271/EEC and 91/676/EEC.

The official designation of Sensitive Areas has covered a number of reservoirs, but many others have been identified that require such a classification. These are located in the Guadiana and the Tagus Basins. Eutrophication data within the Tagus have been considered particularly reliable, since independent campaigns carried out in 1990 and 1994 by different research bodies showed similar results.

As for Vulnerable Zones, four main areas are clear candidates for designation according to the information processed in the report. These roughly coincide with the main irrigated plots within Extremadura. Regardless of the need for further institutional research claimed by the regional authorities, there seems to be enough evidence for the designation of Vulnerable Zones in this Autonomous Community.

11.5

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12.1 GENERAL DESCRIPTION

Water basin:	Norte I (76.6% of the water basin) Coastal Galicia (no data)
Economic activities:	Farming and livestock raising; quarrying; fishing and marine farming.
Observations:	There is no monitoring network for groundwaters in Norte I (the aquifers are not very important). A regional Decree (11) set the framework for the production of the Coastal Galicia Hydrological Plan, the current status of which is not known.

12.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

12.2.1 Vulnerable zones

The Identification of surface and underground bodies of water affected by nitrates is the responsibility of the State (Norte River I inter-community water basin) and of the Autonomous Community of Galicia (coastal Galicia intra-community system).

In the Norte water basin, no underground water body was identified as affected. According to the ITGME report (6), the reasons for this are: No ground water monitoring network has been established in this autonomous community because there are no major aquifers (with the exception of the floodplain aquifers of the lower Miño River and Xinzo de Limia). Therefore, there is only information about certain uses, compiled by specific ITGME studies in 1991 and 1992. However, information is scant and outdated so no water body is identified as affected. In any case, two aquifers are mentioned as having nitrate problems (the lower Miño River floodplain, around Tuy, and the Miño-Terra Chá, where agricultural and livestock activities are intensive). On the other hand, the analytical data of the ITGME corresponding to the first and second campaigns of 1995 (10) of NO₃ content at supply points found no sample containing over 50 mg/l.

As for the surface waters of the Norte basin, the relevant Basin Authority declared the existence of a sampling point with more than 50 mg/l in 1994 (Miño River at La Guardia). However, the body of water was not identified as affected for pollution was mainly salinity and attributed to marine intrusion rather than agriculture. At 8 sampling stations values over 25 mg/l were recorded, all due to direct effluents. Finally, with respect to reservoir

eutrophication, phosphates were determined to be the limiting factor, and none of the cases of eutrophication were attributed to agricultural pollution.

In coastal Galicia, according to a telephone conversation with the responsible technical official, there has been no systematic and reliable analysis. The only available studies show that the problem is not nitrate but bacterial pollution.

This autonomous community made a report on the implementation of Directive 91/676 in February 1997, as required by the national Ministry of the Environment following a demand before the European Court of Justice by the European Commission. The report addressed agricultural and livestock activities in Galicia. The analysis of this report and those produced by ITGME and the Norte Basin Authority, which did not identify water bodies affected by nitrates, shows that there are no zones vulnerable to nitrate pollution of agricultural origin in Galicia. Therefore, there is no need to classify Vulnerable Zones in Galicia.

12.2.2 *Sensitive Areas*

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. The only sensitive area designated was done so at the request of the autonomous community, which has not emitted any legislation that publicly acknowledges this declaration.

12.2.3 *Sensitive Areas and Vulnerable Zones on the coast*

This autonomous community made a report in November 1998 on coastal eutrophication in response to a demand made by the national Ministry of the Environment in September 1998. In this report, the autonomous government of Galicia used the data of the Department of Analysis of the Center for Quality Monitoring of the Marine Environment of the Galician government, which periodically samples estuaries (40 points) and other coastal areas (17 points). The autonomous government used the results of the analysis and abundant technical information available (Alvarez-Salgado et al., 1993, 1996 and 1997) to identify the Pontevedra estuary as the only sensitive area and to indicate that agricultural nitrate pollution is absent (CCCMM, 1998). Although we have not been able to consult specific data, we did have access to the conclusions drawn from the data. The basic idea is that the usual hydrographic regime favours estuarine circulation, impeding the accumulation of continental water in the estuary and producing more water renovation than expected (Alvarez et al., 1993). In this situation, the flow of freshwater contributes little to estuary dynamics, and therefore the effects of the nutrients and contaminants it may transport are negligible (Alvarez et al., 1997).

GALICIA

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

UNOFFICIAL SENSITIVE AREAS

1. Estuary of Pontevedra

GALICIA

MAP B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Grey

1. Lower Miño
2. Miño Terra Chá (not shown)
3. Upper Miño

SENSITIVE AREAS

Black

4. Las Conchas Reservoir (River Limia, Orense)
5. Belesar Reservoir (River Miño, Lugo)
6. Frieira Reservoir (River Miño, Pontevedra)
7. Estuary of Ferrol

Grey

8. Bao Reservoir (Bibey River, Orense)
9. San Esteban Reservoir (River Sil, Orense), San Martín Reservoir (River Sil, Lugo), Sequeiros Reservoir (River Sil, Lugo) and Montefurado (River Bibey).
10. Castrelo Do Miño Reservoir (River Miño, Orense)
11. Estuary of Vigo
12. Estuary of Arousa
13. Estuary of Betanzos
14. Velle Reservoir (River Miño, Orense) (not shown).

VULNERABLE ZONES

The Autonomous Community of Galicia has declared that no vulnerable zones exist, although this declaration has not been officially acknowledged.

SENSITIVE AREAS

No official announcement exists for this classification. Therefore, it is considered as an unofficial designation.

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Estuary of Pontevedra, from Cabicastro to Cape Udra	<i>Pontevedra</i>	GC	<i>None</i>	<ul style="list-style-type: none">• Population centres under obligation by the Directive: Bueu, Marín, Poio, Pontevedra and Sanxenxo-Portonovo).• Unofficial designation.

(*) It is considered that the Spanish authorities have not formally designated Less Sensitive Areas. However, according to pseudo-official information (Medio Ambiente en España 1997, MMA) it has been determined that the entire coast of Galicia is a less sensitive area, with the exception of the sensitive area mentioned and the rest of the estuaries, which are considered Normal Zones.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 01.26 Lower Miño Floodplain aquifer and River Miño in La Guardia	Agricultural areas around Tui and La Guardia	N-I	<ul style="list-style-type: none"> ITGME mentions the existence of high nitrogen values (highest value 55 mg/l) (6). The Basin authority mentions samples with 130 mg/l nitrate content. In 1994 (6). 	<ul style="list-style-type: none"> Not identified as affected by pollution in ref. (6). Generally highlighted as a case of saline intrusion rather than agricultural nitrate pollution.
Grey (91/676/EEC) - monitoring/ investigations suggested	Miño-Terra Chá aquifer	Agricultural areas of Terra - Chá	N-I	<ul style="list-style-type: none"> ITGME mentions that high nitrogen values have been detected (highest value 60 mg/l), mentioning that this is a region with major agricultural and livestock development (6). 	<ul style="list-style-type: none"> Not identified as affected by pollution in ref. (6). Should be determined whether nitrogen levels are permanent.
Grey (91/676/EEC) - monitoring/ investigations suggested	Alto Miño	Upper Miño River irrigation areas	N-I	<ul style="list-style-type: none"> Identified as contaminated by nitrates in the information of the national Ministry of the Environment (map provided by the European Commission for this report). 	<ul style="list-style-type: none"> The only information available is the location on the map. There is an irrigated area nearby (13).
Sensitive Area	"Las Conchas" reservoir (in the Limia River, Orense)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir is moderately eutrophic (3) or eutrophic (12). Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Sensitive Area	"Belesar" reservoir (on the Miño River in Lugo)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir is moderately eutrophic (3) or mesotrophic (12). Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Sensitive Area	"Frieira" reservoir (the Miño River in Pontevedra)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir is moderately eutrophic (3) or eutrophic (12). Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Grey (91/271/EEC) - monitoring/ investigations suggested	"Bao" reservoir (on the Bibey River in Orense)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir has incipient eutrophication (3, 12). Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)

Grey (91/271/EEC) - monitoring/ investigations suggested	"San Esteban" reservoir (on the Sil River in Orense)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir has incipient eutrophication (3). Eutrophic as in (12). Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Grey (91/271/EEC) - monitoring/ investigations suggested	"Velle" reservoir (on the Miño River in Orense)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir has incipient eutrophication (3). According to (12), it is eutrophic. Phosphorus is the limiting factor (6) 	Purpose/use: Water supplies (2).
Grey (91/271/EEC) - monitoring/ investigations suggested	"San Martín" reservoir (on the Sil River in Lugo)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir has incipient eutrophication (3) Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Grey (91/271/EEC) - monitoring/ investigations suggested	"Sequeiros" reservoir (on the Sil River in Lugo)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir has incipient eutrophication (3) Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Grey (91/271/EEC) - monitoring/ investigations suggested	"Montefurado" reservoir (on the Bibey River)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir has incipient eutrophication (3) Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Grey (91/271/EEC) - monitoring/ investigations suggested	"Castrelo Do Miño" reservoir (on the Miño River, Orense)	The reservoir itself	N-I	<ul style="list-style-type: none"> The reservoir has incipient eutrophication (3) Phosphorus is the limiting factor (6) 	Purpose/use: energy (2)
Sensitive Area	Estuary of Ferrol	Estuary		<ul style="list-style-type: none"> A closed estuary with scant water renovation, surrounded by large population centres. It does not have values different from other estuaries, but at least it has the same characteristics as the Pontevedra estuary, which has been declared sensitive. Some authors consider that human activity is affecting the ecosystem of the estuaries (Wyant and Reguero, 1989). 	<p>The same criterion should have been applied as for the Pontevedra estuary.</p> <p>The regional Decree setting up the lines for the Coastal Galicia Hydrological Plan (11) mentions that this Estuary needs sanitation.</p>
Grey (91/271/EEC) - monitoring/ investigations suggested	Estuary of Vigo	Estuary		<ul style="list-style-type: none"> A closed bay with intermediate water exchange, but the water basin is densely populated. Some authors consider that human activity is affecting the ecosystem of the estuaries (Wyant and Reguero, 1989). 	<p>A study should be made of whether human activity modifies the environment</p> <p>The regional Decree setting up the lines for the Coastal Galicia Hydrological Plan (11) mentions that this Estuary needs sanitation.</p>

Grey (91/271/EEC) - monitoring/ investigations suggested	Estuary of Arousa	Estuary		<ul style="list-style-type: none"> • A closed bay with intermediate water exchange, but the water basin is densely populated. • Some authors consider that human activity is affecting the ecosystem of the estuaries (Wyant and Reguero, 1989). 	<p>A study should be made of whether human activity modifies the environment</p> <p>The regional Decree setting up the lines for the Coastal Galicia Hydrological Plan (11) mentions that this Estuary needs sanitation.</p>
Grey (91/271/EEC) - monitoring/ investigations suggested	Estuary of Betanzos	Estuary		<ul style="list-style-type: none"> • A closed bay with intermediate water exchange, but the water basin is densely populated. • Some authors consider that human activity is affecting the ecosystem of the estuaries (Wyant and Reguero, 1989). 	<p>A study should be made of whether human activity modifies the environment</p>

Note 1: According to data from the Norte Basin Authority (6), there are 8 surface water sampling points in which nitrogen concentrations are over 25 mg/l, but they were located in areas of effluents and were limited. These points could not be identified.

Note 2: Several issues were considered to determine the grey and black coastal areas. These include the coastal morphology, regional hydrography, the population density near the coast and population centres of more than 10,000 inhabitants. In addition, the agricultural development of the autonomous community, and miscellaneous technical information (Alvarez-Salgado et al., 1993, 1996, 1997 and 1998; Nogueira et al. 1997; Fraga and Bakun, 1993; Prego, 1992; Wyatt and Reguera, 1989; Figueiras and Niell, 1987; Tilstone et al., 1994) was analysed. A report from the Center for Quality Monitoring of the Marine Environment (CCCMM, 1998) was also used.

The Autonomous Community of Galicia does not seem to be taking the adequate steps to comply with Directives 91/271/EEC and 91/676/EEC regarding the designation of Sensitive Areas and Vulnerable Zones. Only one Sensitive Areas has been classified in the region (Estuary of Pontevedra), whilst there is evidence that four other areas match the criteria for designation (one estuary and three reservoirs), and eight further sites show problems that should be investigated.

The situation does not seem particularly severe regarding the classification of Vulnerable Zones, but three areas show quality problems that may be due to pollution from agricultural sources. These should be addressed properly.

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13.1 GENERAL DESCRIPTION

Total area:	5,034 Km ² .
Water basins:	Ebro River: 5.87% of the river basin).
Economic activities:	Industry and agriculture. Land dedicated to irrigation, according to 1997 data extends to 45,954 Ha, with a total water demand of 210 Hm ³ .

13.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

13.2.1 Vulnerable zones

The Identification of affected water bodies is the responsibility of the national Ministry of the Environment. The Ebro Basin Authority was responsible for carrying out the identification (4):

1. Groundwater: Two hydrogeology units (HU) were identified, one shared with the autonomous community of Navarra.
2. Surface water: None has been identified in this autonomous community.
3. Reservoirs: The Ebro Basin Authority attributes eutrophication exclusively to phosphorus. However, the existence of major agricultural inputs is mentioned.

This autonomous community prepared a report in June 1997 (6) describing the different aquifers of La Rioja:

- Systems 64 (Montes Obarenes), 65 (Condado de Treviño and Sierra de Cantabria) and 63 (Sierra de la Demanda and Sierra de Cameros) have good quality water and nitrates were not detected in the samples analysed. In system 63 the nitrate level increases in sources closer to the river, although specific data are not provided.
- The Oja aquifer has the greatest water demand and regime of use in the autonomous community. It is associated with the Oja or Glera rivers. Hydraulic river-aquifer behaviour and the direction of hydraulic flow are well known. With respect to the nitrate problem, a program of sampling and analysing 58 wells is in effect and has revealed the following situation:

* In the central part of the valley, levels are under 25 mg/l

- * Concentrations begin to increase and reach values of more than 50 mg/l in secondary aquifers, particularly the Zamaca Valley and marginal areas of Villalobar. In this region water is used for irrigation. Runoff contaminates the areas around the aquifer.
 - * Generally speaking, water quality deteriorates with respect to conductivity and nitrate content from south to north. However, the water obtained from the aquifer does not show nitrate levels in excess of threshold values.
 - * There is no point of water capture destined for drinking water that presents a nitrate problem.
- The Ebro aquifer supplies important localities in lower La Rioja. This system includes the floodplain terraces of the Ebro and its tributaries. The surface points sampled have yielded diverse results, including values of less than 25, 25 to 50, and over 50 depending on the point of perforation and time of year when the sample is obtained. The limit of 50 mg/l has not been exceeded in analyses of human water supplies.

The report mentions that the HU were identified by the Ebro Basin Authority in accordance with criteria established by consensus with ITGME for the declaration of vulnerable zones. These are:

- a) That the water is destined for human water supplies
- b) That aquifer vulnerability exists
- c) That the source of pollution is agriculture.

Therefore, as in the description of the aquifers made by the autonomous community, it is concluded that “aquifers are not polluted”, since, although there is mild pollution in marginal areas (Oja aquifer) or pinpointed areas (Ebro I floodplain aquifer), these areas are not used for human water supplies.

With regard to the ITGME criteria, the report indicates that water supplies are not included in nitrate-affected areas, so it was difficult to determine hydro-geological criteria. However, in general terms, irrigation is considered to be the main factor in the process of nitrate pollution and there are many gaps in knowledge of the dynamics of this process and the specific causes of this type of pollution are unknown.

For these reasons, the conclusion was reached that “requirements were not met” for the declaration of Vulnerable Zones. Nonetheless, this and the follow-up of the identified zones should be examined.

The report states that it is not yet necessary to declare Vulnerable Zones and that work is being done to put an action programme into practice, including:

1. Continuation of the application of the “Plan for the construction of the necessary hydraulic works for improving water supplies.”
2. Compilation and updating of all information on the hydrogeology of the autonomous community. Development of complementary studies to

improve knowledge of the hydro-geological characteristics of the aquifers, their chemical quality, etc.

3. Creation of a permanent surveillance system and follow-up of a ground water observation and sampling network.
4. Preparation of aquifer vulnerability maps. This work will be carried out first in areas at risk.
5. Adoption of a code of good farming practices.
6. Preparation and initiation of a field plan for experimentation and demonstration. Simultaneously, information on the influence of ploughing and fertilising on crop yields and their effects on soil and ground water pollution will be compiled and updated.
7. Campaign to inform and prepare farmers.

It should be noted that 4 months before the report described was prepared in La Rioja, the regional Government Council had agreed, following the criteria of the ITGME, to declare that the requirements for declaring Vulnerable Zones had not been met. The Council also decided the action plan described to be initiated (Resolution of the Government Council of La Rioja, 6 February 1997, which was officially published in February 1999, Boletín Oficial de La Rioja nº 19, 13 February 1999). The only difference between the two documents is that the Resolution of the Government Council did not mention the "Plan for the construction of the necessary hydraulic works for improving water supplies." The discrepancy in dates is probably due to the demands of the Commission and needs of the proceedings brought before the European Court of Justice. The current status of the action programme planned for La Rioja is not known.

Finally, it should be mentioned that there must have been some type of co-ordination between the autonomous communities of La Rioja and Navarra, because they followed the same criteria and there are even paragraphs in the reports and Resolutions of the Government Councils that coincide.

13.2.2 *Sensitive Areas*

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. Later, the state Resolution of 25 May 1998 publicly acknowledged the sensitive areas.

LA RIOJA

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL SENSITIVE AREAS

1. Pajares Reservoir (River Piqueras)
2. Mansilla Reservoir (River Najerilla)
3. González- Lacasa or Ortigosa Reservoir (River Iregua)

LA RIOJA

MAP B: SUGGESTED DESIGNATION

VULNERABLE ZONES.

Black

1. Oja floodplain (or Glera)
2. Ebro I floodplain aquifer

VULNERABLE ZONES

Vulnerable Zones have been declared non-existent: Agreement of the Government Council, 6 febrero 1999 (Official Journal: Boletín Oficial de la Rioja nº 19, de 13 de febrero de 1999).

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring "Sensitive" areas in the inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998).

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Pajares reservoir (on the Piqueras River)	Logroño (Lumbreras)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: irrigation and energy (1) • No population centres under obligation by the Directive.
Mansilla reservoir (on the Najerilla River)	Logroño (Mansilla)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: irrigation and energy (1) • No population centres under obligation by the Directive. <p>Mesoeutrophic according to ref. (3).</p>
González-Lacasa reservoir (on the Albercos River)	Logroño (Ortigosa de Cameros)	E	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: irrigation and water supplies (1) Supplies Logroño (8). • No population centres under obligation by the Directive.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	HU 09.24. Oja floodplain (or Glera) aquifer	Irrigation area	E	<ul style="list-style-type: none"> Identified as an affected body of water in ref. (4). Mentioned as being generally affected by pollution, with more intense pollution in the area of Bañares-Villalobar de Rioja. Ref. (6) reports that concentrations reach values of more than 50 mg/l, particularly in the Zamaca Valley and marginal areas in Villalobar. In this region the water is used for irrigation. Runoff contaminates the areas around the aquifer. According to the hydrological plan (3), nitrate concentrations exceed 50 mg/l. There is some irrigation (7). 	<ul style="list-style-type: none"> It was not declared because concentrations did not exceed 50 mg/l at the points of human water supplies (6). According to the Hydrological Plan (3), the connection with watercourses makes the floodplain aquifer vulnerable to pollution.
Vulnerable Zone	HU 09.25, Ebro I floodplain aquifer (specifically, the floodplain of the Tirón and Najerilla)	Irrigation area	E	<ul style="list-style-type: none"> Identified as an affected body of water in ref. (4). It is also mentioned that the Ebro floodplain contains important irrigated areas and abundant urban water supplies. Ref. (6) recognises that concentration exceeds 50 mg/l in some points. According to the hydrological plan (3), concentrations above 50 mg/l are generalised. It is an irrigation area (7). 	<ul style="list-style-type: none"> Shares this floodplain with Navarra. It was not declared because concentrations did not exceed 50 mg/l at the points of human water supplies (6). According to the Hydrological Plan (3), the connection with watercourses makes the floodplain aquifer vulnerable to pollution.

Note 1: The Hydrological Plan of the Ebro water basin establishes the following eutrophication categories in reservoirs. Hypereutrophic, Eutrophic, Mesoeutrophic, Oligomesoeutrophic and Oligoeutrophic. Given the impossibility of comparing these categories with OECD categories, we chose to include all categories related with the plan as Grey or black zones, with the sole exception of those included in the Oligoeutrophic category.

The autonomous community of La Rioja has promoted specific studies under correct methodologies, but it is not known whether action to address the deterioration of groundwater quality has been undertaken. Indeed, despite evidence that certain areas within the autonomous community should have been designated as Vulnerable Zones, no classification has been made. The regional government determined that further investigations were needed in order to ensure that nitrate pollution in their groundwater was coming from agricultural sources and, therefore, the most adequate measures to mitigate and prevent that kind of pollution would be the designation under the Nitrates Directive.

Regarding the classification of Sensitive Areas, coverage is sufficient according to the information available.

1. Varela Sánchez, 1991. "Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear". Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. "Inventario de presas españolas". Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT (1992) Confederación Hidrográfica del Ebro. Plan Hidrológico. Propuesta de Proyecto de Directrices. Tomo IV: Resumen. Ministerio de Obras Públicas Y Transportes. Secretaría de Estado para las Políticas del Agua y Medio Ambiente. Dirección General Hidráulica.
4. Determinación de masas de aguas afectadas por nitratos de origen agrario para la Comunidad Autónoma de La Rioja (Informe CH Ebro).
5. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Ebro, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 222, de 16 de septiembre 1999).
6. Informe sobre la problemática de la contaminación de acuíferos producidos por nitratos y la declaración de Zonas Vulnerables (6 de junio de 1997). Dirección General de Investigación y Desarrollo Rural y Dirección General de Calidad Ambiental del Gobierno de la Rioja.

7. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis.*
Dirección General de Planificación Rural y Medio Natural, Secretaría
General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de
Agricultura, Pesca y Alimentación.

14.1 GENERAL DESCRIPTION

Water basins:	Tagus
Economic activities:	Mostly services and industry. Irrigation is concentrated around the Jarama, Henares and Tajo-Tajuña rivers. There are extensive areas of dry farming around the Henares and Alberche rivers.
Observations:	Madrid contains 14.3% of the Tajo water basin, as well as 80% of the population and 70% of the industry in this basin.

14.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

14.2.1 VULNERABLE ZONES

This autonomous community has not declared any vulnerable zone because no nitrate-affected body of water is considered to exist (Order of 13 May 1998-Boletín Oficial de la Comunidad de Madrid nº 130).

14.2.2 SENSITIVE AREAS

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. Official publication by means of State Resolution of 25 May 1998.

MADRID

MAPA A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL SENSITIVE AREAS.

1. Pinilla Reservoir (River Lozoya)
2. Riosequillo Reservoir (River Lozoya)
3. Puentes Viejas Reservoir (River Lozoya)
4. El Villar Reservoir (River Lozoya)
5. El Atazar Reservoir (River Lozoya)
6. Miraflores Reservoir (River Miraflores)
7. El Vellón or Pedrezuela Reservoir (River Guadalix)
8. Manzanares el Real or Santillana Reservoir (River Manzanares)
9. Navacerrada Reservoir (River Navacerrada)
10. Navalmedio Reservoir (River Navalmedio)
11. La Jarosa Reservoir (River La Jarosa)
12. Valmayor Reservoir (River Aulencia)
13. San Juan Reservoir (River Alberche)
14. Picadas Reservoir (River Alberche)
15. El Pardo Reservoir (River Mnzanares).

MADRID

MAPA B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Grey

1. Jarama River foodplain aquifer
2. La Alcarria aquifer and Tagus and Tajuña foodplains

14.2.3

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 by the Secretary of State for Waters and Coasts, declaring “Sensitive” areas in the inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998).

<i>Zone</i>	<i>Province and municipalities</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Pinilla reservoir (on the Lozoya River)	Madrid (Pinilla del Valle)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: Water supplies (2). • Population centres affected by the Directive: Rascafría, Alameda del Valle, Pinilla del Valle, Lozoya.
Riosequillo reservoir (on the Lozoya River)	Madrid (Buitrago)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: Water supplies (2). • Population centres affected by the Directive: Canencia, Garganta de los Montes, Gargantilla de Lozoya. • Eutrophic according to (6).
Puentes Viejas reservoir (on the Lozoya River)	Madrid (Paredes)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: Water supplies (2). • Population centres affected by the Directive: Villavieja de Lozoya, Braojos, Gascones, La Serna del Monte, Buitrago de Lozoya
El Villar reservoir (on the Lozoya River)	Madrid (Mangirón)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: Water supplies (2). • No population centres affected by the Directive.
El Atazar reservoir (on the Lozoya River)	Madrid (Patones y Atazar)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: Water supplies (2). • No population centres affected by the Directive. • Eutrophic according to (6).
Miraflores reservoir (on the Miraflores River)	Madrid (Miraflores)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: Water supplies • No population centres affected by the Directive.
El Vellón or Pedrezuela reservoir (on the Guadalix River)	Madrid (Pedrezuela)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> • Purpose/use of reservoir water: Water supplies (2). • Population centres affected by the Directive: Burtarviejo, Valdemanco, Miraflores de la Sierra, Guadalix de la Sierra

Manzanares el Real or Santillana reservoir	Madrid (Miraflores and Soto del Real)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Population centres affected by the Directive: Becerril de la Sierra, El Boalo, Manzanares el Real, Soto del Real.
Navacerrada reservoir (on the Navacerrada River)	Madrid (Navacerrada)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: Water supplies (2). No population centres affected by the Directive.
Navalmedio reservoir (on the Navalmedio River)	Madrid (Cercedilla)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: Water supplies (2). No population centres affected by the Directive.
La Jarosa reservoir (on the La Jarosa River)	Madrid (Guadarrama)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: Water supplies (2). No population centres affected by the Directive.
Valmayor reservoir (Aulencia River)	Madrid (Valdemorillo)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: Water supplies Population centres affected by the Directive: Collado illalba, Collado Mediano, Alpedrete, Moralarzal, Navacerrada, San Lorenzo del Escorial, El Escorial, Cercedilla, Los Molinos, Guadarrama. Hipereutrophic according to (6).
San Juan reservoir (on the Alberche River)	Madrid (San Martín de Valdeiglesias)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: Irrigation and energy (2) Population centres affected by the Directive: San Martín de Valdeiglesias, Pelayos de la Presa, Robledo de Chavela. Eutrophic according to (6).
Picadas reservoir (on the Alberche River)	Madrid (San Martín de Valdeiglesias)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: Irrigation and energy (2) No population centres affected by the Directive. Hipereutrophic according to (6).
El Pardo reservoir (on the Manzanares River)	Madrid (Manzanares)	T	Resolution of 25 May 1998	<ul style="list-style-type: none"> Purpose/use of reservoir water: Regulation (2). Population centres affected by the Directive: Colmenar Viejo

14.3

SUGGESTED DESIGNATIONS

Identification of areas as candidates for classification as vulnerable is based on information from (1) and (3). In this case, the Ministry of the Environment (ITGME) did not identify bodies of water affected by agricultural pollution. As regards sensitive areas, the Autonomous Community seems to have designated all the areas in the community requiring this classification. However, references to rivers where problems of water supply quality have been identified are included. For these rivers, firm conclusions cannot be reached because an exhaustive investigation beyond the scope of this report would be required.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Grey (91/676/EEC) - monitoring/ investigations suggested	Jarama River floodplain aquifer (intersection of HU Madrid - Talavera, Guadalajara and Torrelaguna-Jadraque)	Farmland along the upper and mid-Jarama floodplain	T	<ul style="list-style-type: none"> • Areas with a high degree of nitrate pollution (50-100 mg/l) of agricultural origin (1). 	<p>Includes irrigated land around the Jarama River (5).</p> <p>The sector of this HU in Castilla-La Mancha has been identified as Vulnerable Zone (grey).</p>
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 3.06 La Alcarria (southeastern area of the Community of Madrid) and Tagus and Tajuña floodplains	Farmland in this area, including the Tagus and Tajuña irrigated plots	T	<ul style="list-style-type: none"> • Areas with a high degree of nitrate pollution (>100 mg/l) of agricultural origin (1) and (3). • High nitrate concentrations are recorded in extensive dry-farming areas around the Henares (1). 	<p>Includes irrigated areas around the Henares, Aranjuez and Estremera (6), and dry-farming areas around the Henares.</p> <p>Southern neighbouring The sector of this HU in Castilla-La Mancha has been identified as Vulnerable Zone.</p>

Set out below is a list of the rivers of the Community of Madrid in which problems of quality have been identified (3) that make their waters unsuitable for water supply.

<i>Affected water body</i>	<i>Area to designate</i>	<i>Water basin code</i>	<i>Observations</i>
Manzanares River	From its source to Santillana reservoir	T	<ul style="list-style-type: none"> • Santillana reservoir is a Sensitive Area
Lozoya River	All	T	<ul style="list-style-type: none"> • The reservoirs on this river are Sensitive Areas
Guadalix River	Section downstream from the El Vellón reservoir	T	<ul style="list-style-type: none"> • El Vellón reservoir is a Sensitive Area • Area of influence of the Vulnerable Zone (Grey) 03.05 identified.
Jarama River	From its confluence with the Guadalix River	T	<ul style="list-style-type: none"> • Includes the area of irrigated land of the Jarama, within the Vulnerable Zone (Grey) 03.05 identified.
Aulencia River	From its source to Valmayor reservoir, inclusive	T	<ul style="list-style-type: none"> • Valmayor reservoir is a Sensitive Area
Alberche River	Until Picadas reservoir	T	<ul style="list-style-type: none"> • Picadas reservoir is a Sensitive Area • Area of irrigation of Alberche, in the Vulnerable Zone 03.05 identified. • The upper Alberche is Sensitive Area in Castilla y León.
Cofio River	Until the Alberche River	T	<ul style="list-style-type: none"> • Area of irrigation of Alberche, in the grey Vulnerable Zone 03.05 identified.

The identification of affected waters and the designation of Sensitive Areas in compliance with Directive 91/271/EEC have been comprehensive in Madrid Autonomous Community. The majority of the reservoirs fall under this designation, but the need still exists to investigate several surface watercourses that show poor quality. These investigations should include the likely use of that water for urban supplies.

Regarding Vulnerable Zones, there are no designations within Madrid region, and no affected bodies of water were identified by the national authorities in charge. No specific working agreement with the ITGME was established either. Nevertheless, alternative sources of information point out that problems of groundwater pollution by agricultural nitrates do exist in at least two areas of this autonomous community, which coincide with sectors of irrigated farming (Jarama and Tagus-Tajuña systems). These two areas should be further investigated. The apparent little interest to investigate pollution by nitrates and classify areas under Directive 91/676/EEC might be due to the relatively little importance of agricultural practice within Madrid Autonomous Community.

1. Varela Sánchez, 1991. "Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear". Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. "Inventario de presas españolas" 1991. Ed. Dirección General de Obras Hidráulicas. Ministerio de Obras Públicas y Transportes. Madrid.
3. MMA 1996?. *Plan Hidrológico de la Cuenca del Tajo*. Confederación Hidrográfica del Tajo. Ministerio de Medio Ambiente. Secretaría de Estado de Aguas y Costas. Dirección General de Obras Hidráulicas y Calidad de Aguas. Madrid.
4. Determinación de masas de agua afectadas realizada por el MMA para la Comunidad de Madrid (Informe especial ITGME para Nitratos; Informe de la Confederación Hidrográfica del Tajo sobre aguas superficiales).
5. MAPA (1995) Avance del Plan Nacional de Regadíos. Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Dirección General de Planificación Rural y del Medio Natural. Ministerio de Agricultura, Pesca y Alimentación, Madrid.

6. Álvarez Cobelas, M.; P. Muñoz Ruíz and A. Rubio Olmo 1991. *La Eutrofización de las Aguas Continentales Españolas*. Centro de Investigaciones del Agua, Consejo Superior de Investigaciones Científicas. Febrero, 1991.

15.1 *GENERAL DESCRIPTION*

Water basins: Segura and Guadalquivir

Economic activities: Agriculture in the entire territory and industrial and mining activities in Cartagena. Seasonal tourism concentrates on the coast.

15.2 *DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS*15.2.1 *Vulnerable zones*

The national Ministry of the Environment (5) carried out the Identification of nitrate-affected surface and ground water. The responsibility for the Identification of coastal and marine waters belonged to the autonomous community.

Affected groundwater bodies were identified by the ITGME (5): 2 clearly polluted HU (07.28 and 07.21) and 5 HU with local pollution. With regard to the surface waters, the Segura Basin Authority (5), based on analytical series from October 1979 to March 1995 of the COCA, COAS and ICA networks, mentioned 8 points where 50 mg/l had been exceeded. With respect to reservoirs, lakes, estuaries and coastal waters, the confederation indicates (5) "that they do not have data complementary to those of the ITGME". The autonomous community made a "Report - Proposal for the non-declaration of vulnerable zones" (General Directorate of Water, 3 April 1997), to which access was not granted.

In the Order of 11 May 1998 (10), the regional Minister of the Environment, Agriculture and Water agreed, in view of the report - proposal mentioned, not to designate any zone and to initiate a "Programme for Nitrate Surveillance and Monitoring" for the purpose of confirming or correcting the non-declaration. This Order has not been made public officially.

15.2.2 *Sensitive Areas*

Only one coastal sensitive area has been designated: Mar Menor, although the designation has not been made public officially. Therefore this designation is considered as unofficial.

<i>Zone</i>	<i>Province</i>	<i>River basin</i>	<i>Official publication</i>	<i>Observations</i>
Mar Menor	Murcia	SG	None	Population centres under obligation by the Directive: Manga del Mar Menor, Playa Honda, Cabo de Palos, San Pedro del Pinatar, Lo Pagán, Los Alcázares, San Javier, Santiago de la Ribera.

(*) It is estimated that the Spanish authorities have not formally designated Less Sensitive Areas. However, according to pseudo-official information (Medio Ambiente en España 1997, MMA) it has been determined that the entire coast of Murcia is a less sensitive area, with the exception of the Bay of Cartagena, which has been declared a normal area.

15.2.3 *Sensitive Areas and Vulnerable Zones on the coast*

There is no information that the autonomous community has identified any zone of coastal and marine waters as affected by agricultural pollution. The information used by the environmental authorities in charge of designations is not known either.

MURCIA

**MAPA A: VULNERABLE ZONES AND SENSITIVE AREAS
DESIGNATED (OFFICIAL AND UNOFFICIAL)**

UNOFFICIAL SENSITIVE AREAS.

1. Mar Menor

MURCIA

MAPA B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Black

1. Guadalentín Valley
2. Cartagena farming region ("Campo de Cartagena")

Grey

3. Upper Segura Valley
4. Middle and lower Segura Valley
5. Santomera Reservoir (River Santomera)
6. Alfonso XII Reservoir (River Quipar)
7. Valdeinfierno Reservoir (River Luchena)

SENSITIVE AREAS

Grey

8. Santomera Reservoir (River Santomera)
9. Alfonso XII Reservoir (River Quipar)
10. Valdeinfierno Reservoir (River Luchena)
11. Argos Reservoir (River Argos)
12. Port of Cartagena

SUGGESTED DESIGNATIONS

In this autonomous community there are two rivers where problems of water supply quality have been identified. For these rivers, firm conclusions cannot be reached because an exhaustive investigation beyond the reach of this report would be required. Nonetheless, they are listed below.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to be designated</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	HU 7.28 Guadalentín Valley	Irrigated farmland	SG	<ul style="list-style-type: none"> • Identified as a HU with problems by ref. (1), (4) and (7). • Identified as an affected body of water in ref. (5). • Area of intensive farming, including significant pork livestock figures. • It is an intensely irrigated area (11). 	<ul style="list-style-type: none"> • Uses of the sampling points mentioned in the ITGME report (5): Water supplies to a non-urban nucleus and medicinal mineral water.
Vulnerable Zone	HU 7.31 Cartagena farming region ("Campo de Cartagena")	Irrigated farmland	SG	<ul style="list-style-type: none"> • Identified as a HU with problems by ref. (1), (4) and (7). • Identified as an affected body of water in ref. (5). • It is an area of intensive farming. • It is an intensely irrigated area (11). 	<ul style="list-style-type: none"> • Uses of the sampling points mentioned in the ITGME report (5): Water supplies to a non-urban nucleus, medicinal mineral water, and agriculture. • The designation by the Nitrates Directive complements the designation of the Mar Menor as a sensitive area by the WasteWaters Directive, because part of the contaminating load of this area comes from farming activity in the Cartagena farming region. • This HU is shared with Valencia, which has not designated it.

Grey (91/676/EEC) - monitoring/ investigations suggested	HU 7.23 Upper Segura Valley	Irrigated farmland	SG	<ul style="list-style-type: none"> Identified as a HU with problems by ref. (1) and (4). Identified as an affected body of water in ref. (5). Clear signs of pollution, but the monitoring network seems to be insufficient. Most of the points register 25-50 mg/l Intensive farming area. It is an intensely irrigated area (11). 	Uses of the sampling points mentioned in the ITGME report (5): Water supplies and agriculture. Some nitrate values are >100 mg/l
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 7.24 Middle and lower Segura Valley	Irrigated farmland	SG	<ul style="list-style-type: none"> Nitrate pollution mentioned in ref. (4) and (1), which report values >150 mg/l in the region of Murcia - Santomera. 	Not identified by ref. (5).
Grey (91/676/EEC) - monitoring/ investigations suggested --- Grey (91/271/EEC) - monitoring/ investigations suggested	Santomera reservoir (Santomera River, Cehegín, Murcia)	Reservoir and slope water basin	SG	<ul style="list-style-type: none"> Eutrophic according to ref. (4), which expressly mentions agriculture as a cause of eutrophication in the reservoirs of the Segura River basin. 	Purpose/use of reservoir water: Irrigation and water regulation (2). Candidate for both designations, since it is eutrophic and shows high levels of nitrate from agricultural sources.
Grey (91/676/EEC) - monitoring/ investigations suggested --- Grey (91/271/EEC) - monitoring/ investigations suggested	Alfonso XII reservoir (Quipar River, in Calasparra, Murcia)	Reservoir and slope water basin	SG	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (4), which expressly mentions agriculture as a cause of eutrophication in the reservoirs of the Segura River basin. 	Purpose/use of reservoir water: irrigation (2). Candidate for both designations, since it is eutrophic and shows high levels of nitrate from agricultural sources.
Grey (91/676/EEC) - monitoring/ investigations suggested --- Grey (91/271/EEC) - monitoring/ investigations suggested	Valdeinfierno reservoir: (Luchena River, Lorca, Murcia).	Reservoir and slope water basin	SG	<ul style="list-style-type: none"> Mesoeutrophic according to ref. (4). Ref. (4) also mentions expressly that reservoir eutrophication in this basin is of agricultural origin. 	Purpose/use of reservoir water: irrigation (2). Candidate for both designations, since it is eutrophic and shows high levels of nitrate from agricultural sources.

Grey (91/271/EEC) - monitoring/ investigations suggested	Argos reservoir (on the Argos River, Murcia, Cehegín)	The reservoir itself	SG	<ul style="list-style-type: none"> According to ref. (4) the Argos reservoir is eutrophic, the only one in the basin whose state cannot be attributed to agricultural pollution. However, the Argos River receives untreated wastewater from Caravaca and Cehegín. 	<p>Purpose/use: irrigation (2).</p> <p>The Argos River is mentioned in the table of rivers with problems (see below)</p>
Grey (91/271/EEC) - monitoring/ investigations suggested	Port of Cartagena	The port itself		<ul style="list-style-type: none"> Closed bay and a large population in the water basin 	This region had characteristics of a sensitive area, but corroborating information has not been found.

Note 1: In order to determine the grey and black coastal areas, the coastal morphology, the regional hydrography, the population density near the coast and population centres of more than 10,000 inhabitants were considered. In addition, data were managed on the agricultural development of the autonomous community, particularly irrigation, the presence of coastal aquifers with a high degree of nitrate pollution (MOPT, 1989) and technical information (López and Tomàs, 1989).

Below are listed the rivers of the Murcia region in which quality problems have been identified

<i>Affected water body</i>	<i>Area to be designated</i>	<i>River basin</i>	<i>Observations</i>
Argos River	River	SG	<ul style="list-style-type: none"> According to ref. (5), HU. 07.16 (Argos) suffers episodes of nitrate pollution. The limit of 50 mg/l has been exceeded on one occasion (1992: 82 mg/l). Uses of the sampling points mentioned in the ITGME report (5): Industry. According to ref. (4) the Argos reservoir is eutrophic, the only one in the basin whose state cannot be attributed to agricultural pollution. However, the Argos River receives untreated wastewater from Caravaca and Cehegín.
Segura River	Segura River and the area of the water basin occupied by irrigated farmland.	SG	<ul style="list-style-type: none"> Identified as affected by agricultural nitrate pollution (5) Nitrate values > 50 mg/l in 1982, 1990 and 1994 (5) indicate established pollution.

The region of Murcia should have designated large areas as Vulnerable Zones and a number of sites are also clear candidates to be classified as Sensitive Area. Therefore, the relevant authorities do not seem to be taking adequate steps as to comply with the obligations of Directives 91/271/EEC and 91/676/EEC. The reasons behind the non-designation of sites under the Nitrates Directive are not known, although a specific report was produced for these purposes (Report - Declaration of non-designation of Vulnerable Zones). It is clear, from the information processed, that the "Campo de Cartagena" and "Valle del Guadalentín" should be Vulnerable Zones, and that the Segura Valley should be properly investigated to establish the extent of pollution by nitrates from agricultural sources.

Regarding Sensitive Areas, additional efforts should be made so as to guarantee the compliance with the objectives of the Waste Waters Directive in the region of Murcia.

1. Varela Sánchez, 1991. "Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear". Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. "Inventario de presas españolas" Ed. Dirección General de Obras Hidráulicas. Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT 1992. *Plan Hidrológico del Guadalquivir*. Confederación Hidrográfica del Guadalquivir. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas. Madrid.
4. MMA 1997. *Plan Hidrológico de la Cuenca del Segura. Memoria (Tomos I y II)*. Confederación Hidrográfica del Segura. Secretaría de Estado de Aguas y Costas. Dirección General de Obras Hidráulicas y Calidad de Aguas. Ministerio de Medio Ambiente, Madrid.
5. Determinación de las masas de agua afectadas por nitratos realizada por el MMA para la Comunidad Autónoma de Murcia (Informe especial ITGME sobre masas de aguas subterráneas afectadas por nitratos de origen agrario en Murcia; Informe de la Confederación Hidrográfica del Segura). Informes inéditos.
6. Confederación Hidrográfica del Guadalquivir, 1997. *Informe de aplicación del Real Decreto 261/96 al ámbito de gestión de la Cuenca del Guadalquivir*. Confederación Hidrográfica del Guadalquivir, Comisaría de Aguas. Abril, 1997. Informe inédito.

7. Información de ANSE para la Queja comunitaria SG(99) A/4085.
8. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Segura, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
9. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Guadalquivir, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
10. Orden de 11 de mayo de 1998, del Consejero de Medio Ambiente, Agricultura y Agua sobre la no designación de zonas vulnerables.
11. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis.* Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.

16.1 GENERAL DESCRIPTION

Water basins: Norte (Norte III: 20% of the water basin).
Ebro River: (5.87% of the river basin).

Economic activities: Agriculture, livestock, and industry along the Ebro River.

16.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

16.2.1 Vulnerable zones

The Ministry of the Environment (5) carried out the Identification of nitrate-affected bodies of water.

In the case of the Ebro water basin: 3 HU (09.25, 09.26 and 09.27) were identified as groundwater bodies subject to nitrate pollution. No running waters or reservoirs were identified.

In the case of the Norte water basin: the ITGME did not identify any groundwater bodies as affected. With regard to surface waters, the Norte Basin Authority declared that points with more than 50 mg/l were non-existent. At 8 sampling stations values over 25 mg/l were recorded, all due to direct effluents. Finally, with respect to reservoir eutrophication, the limiting factor was phosphates and none of the cases of eutrophication were attributed to agricultural pollution.

This autonomous community prepared a report (8) stating the bodies of water affected by nitrate pollution of agricultural origin in Navarra. These were the groundwaters of the “floodplain aquifer of the Ebro River and tributaries” (constituted by HU 09.26 - floodplain of the Ebro II- and part of HU 09.25 - floodplain of the Ebro I - and 09.27 - floodplain of the Ebro II). According to this report, a methodology consisting mainly of two phases had been followed:

PHASE I: Quantification of pollution (hydro-geological criteria and use and water quality criteria)

PHASE II: Definition of possible Vulnerable Zones (basically agricultural criteria). This phase was only carried out if the analysis is positive in the previous phase.

The criteria used to declare Vulnerable Zones were described as being the result of consensus with the ITGME, being:

- a) That the water is destined for human water supplies
- b) That hydro-geological vulnerability exists
- c) That the source of pollution was agricultural practice.

According to the report, water supplies are not included in nitrate-affected areas, so it was difficult to determine hydro-geological criteria. However, in general terms, irrigation is considered to be the main factor in the process of nitrate pollution and there are many gaps in the understanding of the dynamics of this process and the specific causes of this type of pollution are unknown.

For these reasons, it was concluded that “requirements were not met” for the declaration of Vulnerable Zones. However, it is mentioned that a series of “delicate” zones of intensive agriculture have been identified, which should be the object of further study and surveillance in order to declare them Vulnerable Zones, if needed. These “delicate” zones are not described in the report.

Consequently, the report recommends non-declaration of Vulnerable Zones and proposes the following lines of action:

1. Design and implementation of a quality monitoring network to improve the reliability and coverage of the present network.
2. Preparation of aquifer vulnerability maps.
3. Adoption of a code of good farming practices.
4. Awareness campaign to inform and prepare farmers.
5. Scientific studies in order to understand the pollution process and carry out an Action Plan that, among other things, fills the knowledge gaps that have been detected.

Therefore, this autonomous community has stated that the requirements for the declaration of Vulnerable Zones had not been met in the Council Resolution of the Government of Navarra on 26 May 1997. This resolution recommended to the regional Departments of the Environment and Agriculture that the action plan proposed in the report (8) be put into practice.

On 16 October 1998, a public call for bids was made for the “Plan of action for the protection of groundwater against nitrates of agricultural origin” (Resolution 2432/1998, BOA n° 128 of 26 October 1998). The contract was awarded on 31 December 1998, and was allocated over 37 million pesetas.

It is necessary to note that there must have been some co-ordination between the autonomous communities of La Rioja and Navarra, because they followed the same criteria and there are even paragraphs in the reports and Resolutions of the Government Councils that coincide. This is consistent with the location of the area with the highest potential to become a Vulnerable Zone: the Ebro Valley, which is also the boundary between both regions.

16.2.2 *Sensitive Areas*

Sensitive areas have not been designated in this autonomous community.

NAVARRA

MAPA B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Black

1. Ebro I, II and III aquifers

SENSITIVE AREAS

Black

2. Alloz Reservoir (River Salado)

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to be designated</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zone	Ebro I (HU 9.25),	Farming area.	E	<ul style="list-style-type: none"> Ebro I identified as a nitrate-affected body of water in ref. (5). Area of irrigation (9). 	<ul style="list-style-type: none"> Shares this floodplain with La Rioja. According to the Hydrological Plan (3), the connection with watercourses makes the floodplain aquifer vulnerable to pollution.
	Ebro I I (HU 9.26)		E	<ul style="list-style-type: none"> Ebro II identified as a nitrate-affected body of water in ref. (5). Moreover, ref. (5) identifies it as one of the most intensely and generally affected aquifers of the Ebro River basin. Area of irrigation (9). 	<ul style="list-style-type: none"> According to the Hydrological Plan (3), the connection with watercourses makes the floodplain aquifer vulnerable to pollution.
	Ebro III (HU 9.27) floodplain aquifers		E	<ul style="list-style-type: none"> Ebro III identified as a nitrate-affected body of water in ref. (5). Area of irrigation (9). 	<ul style="list-style-type: none"> Shares this floodplain with Aragón. According to the Hydrological Plan (3), the connection with watercourses makes the floodplain aquifer vulnerable to pollution.
Sensitive Area	Alloz reservoir (on the Salado River, Navarra, Yerri and Guesalaz)	The reservoir itself	E	<ul style="list-style-type: none"> Eutrophic according to the hydrological plan (3). Mesoeutrophic according to the report of the Ebro Hydrographic Confederation (5). 	<ul style="list-style-type: none"> Purpose/use: irrigation and energy (2). Not identified as affected waters in (5), for pollution was linked to phosphates.

Note 1: According to data from the Norte Basin Authority (6), there are 8 surface water sampling points in which nitrogen concentrations are over 25 mg/l, but they were located in areas of effluents and were of rather local extent. These points could not be identified.

Note 2: The Hydrological Plan of the Ebro basin establishes the following eutrophication categories in reservoirs. Hypereutrophic, Eutrophic, Mesoeutrophic, Oligomesoeutrophic and Oligoeutrophic. Given the impossibility of comparing these categories with OECD categories, we chose to include all categories related with the plan as Grey or black zones, with the sole exception of those included in the Oligoeutrophic category.

16.4

REGIONAL CONCLUSION

Navarra shows a conscious attitude regarding the implementation of Directive 91/676/EEC. The regional government promoted specific studies under correct methodologies and took action to address the deterioration of groundwater quality. However, despite evidence that certain areas within the autonomous community should have been designated as Vulnerable Zones, no classification was made. The regional government determined that further investigations were needed in order to ensure that nitrate pollution in their groundwater was coming from agricultural sources and, therefore, the most adequate measures to mitigate and prevent that kind of pollution would be the designation under the Nitrates Directive.

Regarding the classification of Sensitive Areas, coverage is sufficient according to the information available, and only minor gaps have been identified.

16.5

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2. MOPT 1991. "Inventario de presas españolas". Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT (1992) Confederación Hidrográfica del Ebro. Plan Hidrológico. Propuesta de Proyecto de Directrices. Tomo IV: Resumen. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas del Agua y Medio Ambiente. Dirección General Hidráulica.
4. MOPT (1992). Confederación Hidrográfica del Norte. Plan Hidrológico Norte III. Propuesta de Directrices. Vol. I: Memoria and Vol. II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
5. *Determinación de masas de aguas afectadas por nitratos de origen agrario para la Comunidad Autónoma de Navarra (Informe CH Ebro e Informe CH Norte).*
6. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Ebro, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 222, de 16 de septiembre 1999).

7. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo de los Planes Hidrológicos de cuenca Norte I, Norte II y Norte III, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
8. Informe en relación con la posible declaración de Zonas Vulnerables a la contaminación producida por nitratos de origen agrario (21 de mayo de 1997). Departamento de Medio Ambiente, Ordenación del Territorio y Vivienda de la Diputación Foral de Navarra.
9. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis*. Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.

17 *BASQUE COUNTRY*

17.1 *GENERAL DESCRIPTION*

Water basins:	Norte River (Norte III: 75% of the water basin and 98% of the population). Ebro River: 3.19% of the river basin.
Economic activities:	Guipuzcoa, Vizcaya and Alava are intensely industrialised on the Cantabrian fringe.
Coastal eutrophication:	The Estuaries of Bilbao, Plentzia, Guernika and Bay of Pasajes are eutrophic (according to the Norte Hydrological Plan).

17.2 *DESIGNATED SENSITIVE AREAS AND VULNERABLE ZONES*

17.2.1 *Vulnerable zones*

The Identification of surface and groundwater bodies affected by nitrates is the responsibility of the State (Norte I and II and Ebro inter-community water basins) (5). The Identification of coastal waters affected by nitrates is the responsibility of the autonomous community.

In the Norte water basin, no underground water body was identified as affected. The ITGME has a very limited monitoring network (only 7 monitoring points). In the ITGME report, although no body of water was identified as affected, it is mentioned that “the appearance of ammonium and sometimes nitrates is common, although local and sporadic, in the following HU: San Sebastián, Tolosa, Izarraitz, Oiz and Aizgorri, which are attributed to effluents and livestock”. These zones are declared a future risk.

With regard to the surface waters of the Norte River basin, the Norte Basin Authority declared one point with more than 50 mg/l (Deva in Elgoibar). At 8 sampling stations values over 25 mg/l were recorded, all due to direct effluents. Finally, with respect to reservoir eutrophication, the limiting factor was phosphates and none of the cases of eutrophication was attributed to agricultural pollution.

In the Ebro River basin, 2 HU have been identified as affected by nitrate pollution (09.09, Vitoria floodplain and UH 09.27 Sierra de Cantabria) . In running waters, no point was identified. As for reservoir eutrophication, the hydrographic confederation attributes it to phosphates, although a major contribution by agriculture is mentioned.

This autonomous community prepared a brief Justification Memorandum of the declaration of the single Vulnerable Zone (eastern sector of the HU of Vitoria), which included a map (8). To summarise, of the three sectors of HU 09.09 (western, eastern and Dulantzi), only the eastern sector was declared because of its greater level of development. This sector contains a large number of points where readings are above 50 mg/l. The Memorandum is based on analytical monitoring series mainly from 1986 to 1993. The series can be distinguished into two stages: the first one (1983-1990) consists of general campaigns involving a large number of points, and the second one (1990-1993) takes a smaller number of monitoring points that were sampled every two weeks. The map enclosed with the Memorandum includes hydrological and agronomic data.

17.2.2 *Sensitive Areas*

The sensitive areas were determined in 1993. The areas were included in the National Plan for Wastewater Treatment, although they do not figure in the officially published plan. Later, the State Resolution of 25 May 1998 publicly acknowledged the sensitive areas for which the Ministry of the Environment is responsible. Therefore, the 3 sensitive coastal areas effectively designated in this autonomous community have not received official public recognition.

17.2.3 *Sensitive Areas and Vulnerable Zones on the coast:*

The information sources on which the government based the declaration are unknown. However, access has been granted to a report by AZTI for the Basque Country's Ministry of the Environment (AZTI, 1996). The report contains conclusions and identifications of sensitive areas that do not coincide fully with the areas expressly designated. The report was prepared using field data collected by the coastal waters quality network of the Basque government. An attempt was made to identify sensitive areas, but the criteria used were different from those of Directive 91/271/EEC. Additional criteria used were the recreational value of the body of water, the presence of wetlands, the value of marine resources and the relationship with areas of natural interest. Likewise, this autonomous community has recently made a study to determine the state of eutrophication of its marine area within the context of application of the OSPAR Convention. As for specific values, the average values of sampling results from the Coastal Waters Quality Network of the Basque Country Government (RCALGB) have been provided for the purposes of this report.

BASQUE COUNTRY

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

OFFICIAL VULNERABLE ZONES

1. Vitoria - Gasteiz aquifer (east)

UNOFFICIAL SENSITIVE AREAS.

2. Estuary of Mundaka
3. Bay of Pasajes
4. Estuary of Bidasoa

BASQUE COUNTRY

MAPA B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES

Grey

1. Vitoria (western and Dulantzi)
2. Sierra de Cantabria farmland

SENSITIVE AREAS

Black

3. Ullivarri or Zadorra Reservoir (River Zadorra)
4. Urrúnaga Reservoir (River Engracia)
5. Estuary of Nervioi
6. Estuary of Butroi
7. Estuary of Lea
8. Estuary of Deva
9. Estuary of Urola
10. Estuary of Oria
11. Estuary of Urumea

Grey

12. Deva in Elgoibar
13. Aixola Reservoir (River Aixola)
14. Estuary of Barbadún
15. Estuary of Artibai

VULNERABLE ZONES

Legislation

Autonomous Community: Decree 390/1998, 22 December, establishing guidelines for the designation of zones vulnerable to water pollution by nitrates of agricultural origin, and approving the agricultural Code of Good Practice of the Autonomous Community of the Basque Country (Official Journal: Boletín Oficial del País Vasco nº 18, 27 January 1997).

<i>Zone</i>	<i>Province (and municipalities)</i>	<i>Water basin code</i>	<i>Official publication</i>	<i>Observations</i>
Hydro-geological unit Vitoria - Gasteiz, (eastern sector)	Alava (Vitoria)	E	Decree 390/1998	<ul style="list-style-type: none"> • Ref. (5) identified HU 09.09 Vitoria as an affected body of water, indicating that the most serious problems were to be found in the eastern sector. • Ref. (8) confirms the severity of pollution in the eastern sector.

SENSITIVE AREAS

Designated by the autonomous community, but not officially made public. Therefore, these areas are considered as unofficial designations.

<i>Zone</i>	<i>Province and municipalities</i>	<i>Official publication</i>	<i>Observations</i>
Estuary of Mundaka (Urdaibai, Biosphere Reserve)	Vizcaya (Mundaka)	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive.
Mouth of the Bidasoa River	Guipuzcoa (Hondarribia)	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive.
Bay of Pasajes	Guipuzcoa (Pasaia)	None	<ul style="list-style-type: none"> • No population centres under obligation by the Directive.

(*) It is considered that the Spanish authorities have not formally designated Less Sensitive Areas. However, according to semi-official information (Medio Ambiente en España 1997, MMA) it has been determined that the entire coast of Basque Country is a less sensitive area, with the exception of the sensitive areas mentioned. No normal zone exists.

<i>Suggested Designation</i>	<i>Affected water body</i>	<i>Area to be designated</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 09.09 Vitoria, western and Dulantzi sectors	Farming areas	E	<ul style="list-style-type: none"> The map enclosed in ref. (8) indicates that outside the designated Vulnerable Zone, there are many points at which levels are over 50 mg/l. Ref. (5) identified all the HU. 	<ul style="list-style-type: none"> Ref. (8) does not mention at any time the criteria for not designating the entire HU as a Vulnerable Zones. The map enclosed in ref. (8) shows that the designated Vulnerable Zones borders the city of Vitoria, so the waters of the eastern sector may supply this city.
Grey (91/676/EEC) - monitoring/ investigations suggested	HU 09.07 Sierra de Cantabria,	Farming areas	E	<ul style="list-style-type: none"> Ref. (5) identified this HU. 	<ul style="list-style-type: none"> Mild and local nitrate pollution
Grey (91/271/EEC) - monitoring/ investigations suggested	Deva in Elgoibar	Affected River section	N-III	<ul style="list-style-type: none"> According to data of the Basin Authority (5), 54.4 mg/l NO³ were recorded, from urban and industrial waste waters 	<ul style="list-style-type: none"> This should be cross-checked with new campaigns. The possible use of the Deva for water supplies should be investigated.
Sensitive Area	Ullibarri reservoir (on the Zadorra River, Alava, Arrazua and Urbarrundia)	The reservoir itself	E	<ul style="list-style-type: none"> Eutrophic according to the report of the Ebro Hydrographic Confederation (5) Mesoeutrophic according to the Ebro Hydrological Plan (3), eutrophic according to (10). 	<ul style="list-style-type: none"> Purpose/use: Energy and water supplies (2) Ref. (5) did not determine it as an affected water body, by attributing the cause of eutrophication to phosphates, but generally recognised that there were inputs of agricultural origin.
Sensitive Area	Urrúnaga reservoir (on the Engracia River, Alava, Villa Real)	The reservoir itself	E	<ul style="list-style-type: none"> Eutrophic according to the report of the Ebro Basin Authority (5). Mesoeutrophic according to the Ebro Hydrological Plan (3), eutrophic according to (10). 	<ul style="list-style-type: none"> Purpose/use: Energy and urban and industrial water supplies (2). Ref. (5) did not determine it as an affected water body, by attributing the cause of eutrophication to phosphates, but generally recognised that there were inputs of agricultural origin in the basin.
Grey (91/271/EEC) - monitoring/ investigations suggested	Aixola reservoir (on the Aixola River, Vizcaya, Zaldibar)	The reservoir itself	N-III	<ul style="list-style-type: none"> Moderately eutrophic according to ref. (4). 	<ul style="list-style-type: none"> Purpose/use: Water supplies (2). Of concern because the source of eutrophication is not known.
Sensitive Area	Estuary of Nerbioi to	The Estuary		<ul style="list-style-type: none"> A closed bay with limited water exchange 	<ul style="list-style-type: none"> It is clearly an estuary to be

	the Abra Exterior (exclusive)			<ul style="list-style-type: none"> • AZTI (1996) identifies it as eutrophic • The nutrient load is very high (RCALGB⁴; Iriarte et al., 1998) • Recognised as eutrophic in the hydrological plan (4). 	<ul style="list-style-type: none"> • declared as sensitive area. • 1908s data show hipereutrophic status in the whole watercourse (10).
Sensitive Area	Estuary of Butroi (Plentzia)	The Estuary		<ul style="list-style-type: none"> • A closed bay with limited water exchange • The nutrient load is very high (RCALGB; Iriarte et al. , 1998) • AZTI (1996) did not consider it eutrophic, but reported the presence of abundant solids in suspension • Recognised as eutrophic in the hydrological plan (4) 	<ul style="list-style-type: none"> • Likely to be eutrophic once the turbidity problems are solved. • The river Butroi showed hipereutrophic values [1980s data] (10).
Sensitive Area	Estuary of Lea	The Estuary		<ul style="list-style-type: none"> • A closed bay with limited water exchange • The nutrient load is very high (RCALGB; Iriarte et al. , 1998) • AZTI (1996) did not consider it eutrophic, but reported the presence of abundant solids in suspension 	<ul style="list-style-type: none"> • Likely to show eutrophic status once the turbidity problems are solved.
Sensitive Area	Estuary of Deba	The Estuary		<ul style="list-style-type: none"> • A closed bay with limited water exchange • The nutrient load is very high (RCALGB; Iriarte et al. , 1998) • AZTI (1996) did not consider it eutrophic, but reported the presence of abundant solids in suspension 	<ul style="list-style-type: none"> • Likely to be eutrophic after resolving the turbidity problems. • High nitrate levels have been identified in the River at Elgoibar.
Sensitive Area	Estuary of Urola	The Estuary		<ul style="list-style-type: none"> • A closed bay with limited water exchange • The nutrient load is very high (RCALGB; Iriarte et al. , 1998) • AZTI (1996) did not consider it eutrophic, but reported the presence of abundant solids in suspension 	<ul style="list-style-type: none"> • Likely to be eutrophic after resolving the turbidity problems.
Sensitive Area	Estuary of Oria	The Estuary		<ul style="list-style-type: none"> • A closed bay with limited water exchange • AZTI (1996) identifies it as eutrophic • The nutrient load is very high (RCALGB; Iriarte et al. , 1998) 	<ul style="list-style-type: none"> • It is unjustifiable that it has not been declared a sensitive area.
Sensitive Area	Estuary of Urumea	The Estuary		<ul style="list-style-type: none"> • A closed bay with limited water exchange • The nutrient load is very high (RCALGB; 	<ul style="list-style-type: none"> • Likely to be eutrophic after resolving the turbidity

⁴ RCALGB in the Coastal Water Quality Network of the Basque Government

				<p>Iriarte et al. , 1998)</p> <ul style="list-style-type: none"> • AZTI (1996) did not consider it eutrophic, but reported the presence of abundant solids in suspension 	<p>problems.</p>
<p>Grey (91/271/EEC) - monitoring/ investigations suggested</p>	<p>Estuary of Barbadún</p>	<p>The Estuary</p>		<ul style="list-style-type: none"> • A closed bay with limited water exchange, but the water basin is not overly populated. • Nutrient concentrations indicate an almost eutrophic situation (Coastal Water Quality Network of the Basque Government). • AZTI (1996) did not consider it eutrophic, but reported the presence of abundant solids in suspension 	<ul style="list-style-type: none"> • A study should be made as to whether it will prove eutrophic after solving the turbidity problem. • 1980s data show hypertrophic phosphorus values in the Barbadún River (10).
<p>Grey (91/271/EEC) - monitoring/ investigations suggested</p>	<p>Estuary of Artibai</p>	<p>The Estuary</p>		<ul style="list-style-type: none"> • A closed bay with limited water exchange, but the water basin is not overly populated. • Nutrient concentrations indicate an almost eutrophic situation (Coastal Water Quality Network of the Basque Government). • AZTI (1996) did not consider it eutrophic, but reported the presence of abundant solids in suspension 	<ul style="list-style-type: none"> • A study should be made of whether it will prove eutrophic after solving the turbidity problem.

Note 1: According to data from the Norte Basin Authority (5), there are 8 surface water sampling points where nitrogen concentrations are over 25 mg/l, but they were located in areas of effluents and were of limited extent. These points could not be identified. With respect to ground water, it should be kept in mind that the ITGME report (5) mentioned 5 zones of potential risk: San Sebastián, Tolosa, Irazaitz, Oiz and Aizgorri.

Note 2: The grey and black coastal areas were determined using information on coastal morphology, regional hydrography, the population density near the coast and population centres of more than 10,000 inhabitants. In addition, the agricultural development of the autonomous community, the data of the Coastal Water Quality Network (RCALB) and the data interpretation made by AZTI (AZTI, 1996 and personal communication) were used. The Hydrological Plans of the Norte I and II Basin Authority and diverse technical information (Bode, 1990; Bode y Fernández, 1992; Bode et al., 1996; Iriarte et al, 1998) were also processed.

Note 3: Data from the 1980s (10) show high phosphorus values indicating eutrophic or even hipereutrophic status of several rivers in the Basque Country. These are the Rivers Zadorra, Baias and Barbadún, in Álava; and the Rivers Butrón, Ibaizábal, Kadagua and Nervión, in Vizcaya. It has not been possible to determine whether such a trophic status remains in these rivers, and it is likely that treatment works might have improved water quality. Specific studies are recommended.

The Autonomous Basque government has provided several documents produced for the designation of Vulnerable Zones and Sensitive Areas. Recent information has showed that problems exist mainly regarding the designation of Sensitive Areas on the coastal fringe, where seven estuaries have been identified as requiring this classification and two others require further research. Surface waters have also been identified for designation.

Like in the other autonomous communities within the Norte Water Basin, groundwater pollution by nitrates from agricultural sources are not extremely severe. This is due to a variety of factors such as predominant land use and local climate, and supports the lack of candidate zones in this basin. This is not the case for the groundwaters within the Ebro basin, where two areas should be investigated, since there is some evidence that nitrate pollution owing to agricultural practice exists

1. Varela Sánchez, 1991. "Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear". Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. "Inventario de presas españolas". Dirección General de Obras Hidráulicas, Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT (1992) Confederación Hidrográfica del Ebro. Plan Hidrológico. Propuesta de Proyecto de Directrices. Tomo IV: Resumen. Ministerio de Obras Publicas Y Transportes. Secretaría de Estado para las Políticas del Agua y Medio Ambiente. Dirección General Hidráulica.
4. MOPT (1992). Confederación Hidrográfica del Norte. Plan Hidrológico Norte III. Propuesta de Directrices. Vol. I: Memoria and Vol. II: Propuesta de Directrices. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
5. Determinación de masas de aguas afectadas por nitratos de origen agrario para la Comunidad Autónoma de Navarra (Informe ITGME, Informe CH Ebro e Informe CH Norte).
6. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Ebro, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 222, de 16 de septiembre 1999)

7. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo de los Planes Hidrológicos de cuenca Norte I, Norte II y Norte III, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
8. Protección de las aguas contra la contaminación producida por nitratos usados en la agricultura. Declaración de la Zona Vulnerable Unidad Hidrogeológica Vitoria, sectores Oriental. Dirección de Aguas del Departamento de Transportes y Obras Públicas del Gobierno Vasco (18 de mayo de 1998)
9. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis*. Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.
10. Álvarez Cobelas, M.; P. Muñoz Ruíz and A. Rubio Olmo 1991. *La Eutrofización de las Aguas Continentales Españolas*. Centro de Investigaciones del Agua, Consejo Superior de Investigaciones Científicas. Febrero, 1991.

18.1 GENERAL DESCRIPTION

River Basins: **Júcar** (91,5% of the Valencian territory)
Ebro (3,5 % of the basin is in Valencia)
Segura (5% of the basin in Valencia).

Economic Activity: Irrigated farming along the Jucar River Basin, mainly on the coastal plains. Along the coast, but mainly in Alicante, seasonal mass tourism is an important activity. Industry has specialised in services linked to tourism. In addition, shoe manufacture, textile and toy manufacturing plants are located in Alicante province.

18.2 DESIGNATED VULNERABLE ZONES AND SENSITIVE AREAS

18.2.1 Vulnerable Areas

The Ministry of Environment (6) established the continental and groundwater affected by nitrate pollution. The Autonomous Community made designation for coastal and marine waters.

Several HU below the agricultural plains were identified as affected groundwater bodies by the ITGME. In relation to groundwater and reservoirs:

According to the Jucar Basin Authority, the 50 mg/l limit has never been exceeded in groundwater, nor reservoirs. In relation to eutrophication of reservoirs, it is to depend solely on phosphorus.

The Segura Basin Authority declared 3 sites along the Segura River, across the Valencia region, where the 50 mg/l limit has been exceeded. In relation to eutrophication of reservoirs and lakes, no data complementary to ITGME data are available.

No surface water body affected by nitrates in Valencia (or underground water bodies) have been designated by the Ebro Basin Authority.

Data supplied for Valencia region have been very limited. It is not known whether autonomous community reports have been prepared for the selection of vulnerable areas. The only information made available is a list of municipalities included within Vulnerable Zones (see Annex I) and a letter, in reply to the report team's request for information, stating that:

“more or less intensive farming areas” have been declared Vulnerable Zones, affecting water bodies established by the Ministry, and “other areas where supply problems due to an excess of nitrates had been recorded”, which are

vulnerable to pollution due to their high porosity, fissure structure or karsification.

Therefore, the designations have been aimed to protection of groundwaters only and the prevailing criterion has been the fact that waters were used for water supply.

Currently, the General Directorate for Environmental Quality of the Autonomous Community is working on a draft bill for official designation of Vulnerable Zones.

18.2.2 *Sensitive Areas*

Identification of sensitive areas was carried out in 1993. Areas were included in the National Plan for Waste Waters Treatment, even though they were not recorded in the official publication of the Plan. Later, the state resolution of 25 May 1998 published to those Sensitive Areas under the Ministry of the Environment (continental waters and some humid zones associated in coastal areas). No official notification has been given of other designated coastal areas.

18.2.3 *Sensitive Areas and Vulnerable Areas on the coast*

Data used by environmental authorities in charge of making designations are unknown. The regional government states that it is currently studying the trophic status of coastal waters.

VALENCIA

MAP A: VULNERABLE ZONES AND SENSITIVE AREAS DESIGNATED (OFFICIAL AND UNOFFICIAL)

UNOFFICIAL VULNERABLE ZONES.

1. Coastal Plains of Oropesa, Torreblanca, Castellón, Sagunto, Valencia (N and S) and Gandía-Denia

OFFICIAL SENSITIVE AREAS.

2. Guadalest Reservoir (River Guadalest)
 1. Tous Reservoir (River Júcar)
 2. Tibi Reservoir (Monegre River)
 3. Albufera (Valencia)
 4. Marjal de Cabanes (Castellón)
 5. Marjal de Pego- Oliva (Alicante- Valencia)
 6. Salinas de Santa Pola
 7. El Hondo de Elche
 8. Torrevieja and La Mata Lagoon
 9. Bergantes River (within Valencia)
 10. Amadorio Reservoir (River Amadorio) (not shown)

UNOFFICIAL SENSITIVE AREAS.

11. Oropesa- Benicassim Coastal Area
12. Bay of Cullera
13. San Antonio Cape Coastal Area
14. Ifach Rock Coastal Area
15. Bay of Benidorm

VALENCIA

MAP B: SUGGESTED DESIGNATIONS

VULNERABLE ZONES.

Black

1. Vinaroz - Peñiscola farmland plains
2. Cartagena field (Pilar de la Horadada)

Grey

3. Lower Segura and Huerta de Alicante

SENSITIVE AREAS.

Grey

4. Cuevas, Veo, Rambla de la Viuda, Mijares, Palancia, Bº Carraixet and Turia Rivers
5. Forata Reservoir (River Magro)
6. Bellus Reservoir (River Albaida)

VULNERABLE AREAS

Not published by official publications. Therefore, all these areas are considered as unofficial designations.

<i>Area</i>	<i>Province (and Municipalities)</i>	<i>Water basin code</i>	<i>Official Publication</i>	<i>Observations</i>
Coastal Plains of Oropesa-Torreblanca; Castellón; Sagunto; Valencia N, and S. & Gandía-Denia.	Castellon, Valencia and Alicante (See Annex)	J	None	<ul style="list-style-type: none"> • Designation is aimed at protecting from agricultural pollution those groundwaters (UH 08.11, 08.12) which have been identified as affected water bodies. • Pollution on lower courses of those rivers linked to aquifers that are prevalingly polluted by agricultural nitrates is indirectly addressed. (E.g. Magro, Júcar, Serpis, Monnegre & Belcaire rivers) (3 and 1). These rivers have not been taken into account.. • Indirectly, coastal eutrophication along the Castellon coast between Torreblanca and Castellon and along the Valencia coast between the south of this capital city and Pego (intensive agriculture practice is to blame for this pollution) is addressed. Coastal eutrophication has not been taken into account for designations. • The whole area is intensely irrigated (10). The network of irrigation channels shows hipereutrophic status (11).

SENSITIVE AREAS

Legislation:

State: Resolution of 25 May 1998 issued by the Secretary of State for Waters and Coasts, declaring "Sensitive" areas in the inter-community water basins (Official Journal: Boletín Oficial del Estado nº 155, 30 June 1998, correction of errata: BOE nº 189, 8 August 1998).

In addition, there are some coastal Sensitive areas that have been unofficially designated.

<i>Area</i>	<i>Province and Municipalities</i>	<i>Water basin code</i>	<i>Official Publication</i>	<i>Observations</i>
Amadorio reservoir (on the Amadorio River)	Alicante (Villajoyosa)	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Purpose/use: Irrigation (2). • No population centres obliged by the Directive.
Guadalest reservoir (on the Guadalest River)	Alicante (Guadalest)	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Purpose/use: Irrigation and Water Supply (2). • No population centres obliged by the Directive.
Tous reservoir (on the Jucar River)	Valencia (Tous)	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Purpose/use: Irrigation and Water Supply (2). • No population centres obliged by the Directive.
Tibi reservoir (on the Monegre River)	Alicante (Tibi)	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Purpose/use: Irrigation (2). • Affected towns: Ibi
Albufera	Valencia	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Protected wetland • Affected towns: Alginet, Sollana, Benifaió, El Perellonet, El Saler, Sueca. • Hipertrophic according to (11).
Marjal de Cabanes	Castellón	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Protected wetland • Affected towns: Torreblanca.
Marjal de Pego-Oliva	Alicante - Valencia	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Protected wetland • Affected towns: Pego.
Salinas de Santa Pola	Alicante	J	Resolution of 25 may 1998.	<ul style="list-style-type: none"> • Protected wetland • Affected towns: Santa Pola.

El Hondo de Elche- Crevillente	Alicante	SG	Resolution of 25 may 1998.	<ul style="list-style-type: none"> Protected wetland Affected towns: Crevillente.
Torrevieja & La Mata Lakes	Alicante	SG	Resolution of 25 may 1998.	<ul style="list-style-type: none"> Protected wetland No population centres obliged by the Directive.
Bergantes River, through the Valencia Community	Castellón (Maestrazgo)	E	Resolution of 25 may 1998.	<ul style="list-style-type: none"> No population centres obliged by the Directive. It is within the Guadalope sub-basin, which was classified Sensitive Area in Aragón.
Oropesa -Benicassim - Castellón coastal area	Castellón (Oropesa, Benicassim and Castellon)		None	Towns affected by the Directive: Benicassim, Oropesa & Castellón de la Plana
Bahía de Cullera Bay of Cullera	Valencia (Cullera)		None	Town affected by the Directive: Cullera
San Antonio Cape coastal area	Alicante		None	Towns affected by the Directive: Denia, Ondara y Pedreguer.
Ifach Rock coastal Area	Alicante		None	Town affected by the Directive: Calpe
Bay of Benidorm	Alicante		None	Towns affected by the Directive: Benidorm, Alfaz del Pi, Finestrat, Villajoyosa

(*) It is considered that the Spanish authorities have not formally designated Less Sensitive Areas. However, according to semi-official information (Medio Ambiente en España 1997, MMA) some have unofficially been classified. In Valencia, it has been determined that the entire coast is normal, with the exception of the sensitive areas mentioned. No Less Sensitive Areas exists.

<i>Suggested Designation (Grey/Black)</i>	<i>Affected water body</i>	<i>Area to be designated</i>	<i>Water basin code</i>	<i>Justification</i>	<i>Observations</i>
Vulnerable Zones	HU 08.10 Plana de Vinaroz- Peñíscola	Vinaroz irrigated area	J	<ul style="list-style-type: none"> • Aquifers polluted from agricultural nitrates, according to (1) and (3). • Established as affected water body by (6). • It is an intensely irrigated area (10). 	<ul style="list-style-type: none"> • An adequate designation should include rivers flowing across the Plana: Cenia, Cervol and Seco Rivers. • Adjacent to the lower Ebro and Delta zone in Catalonia.
Vulnerable Zone	HU 07.31 Cartagena field (Southern Alicante)	Pilar de la Horadada Irrigated Area	SG	<ul style="list-style-type: none"> • Polluted aquifers according to (1) and (4). • Established as affected water body by (6). • It is an intensely irrigated area (10). 	<ul style="list-style-type: none"> • Shared with Murcia. Adjacent to "Segura River Middle and Lower Valleys"
GREY (91/676/EEC)- Monitoring/investi gations suggested	UH 07.24 Vega Media y Baja del Segura ; Lower Segura River (Vega Baja) and Huerta de Alicante (Orchard Area)	Irrigation areas at Elche and Alicante Orchard Area	SG	<ul style="list-style-type: none"> • Polluted aquifers according to (1) and (4), linked to the Segura River, also showing pollution from agricultural nitrates: >50 mg/l of nitrates in 1982, 1985 and 1990 (6) • Aquifers with incipient pollution near 50 mg/l according to (1) in the Huerta de Alicante. • It is an intensely irrigated area (10). 	<ul style="list-style-type: none"> • Aquifers shared with Murcia. Adjacent to "Campo de Cartagena" • The River flows across intensive irrigated areas.
GREY (91/271/EEC)- Monitoring/investi gations suggested	Cuevas, Veo, Rambla de la Viuda Mijares, Palancia, Bº Carraixet, & Turia Rivers	Water courses	J	<ul style="list-style-type: none"> • According to (3), they show a pollution load from agricultural nitrates, as well as industrial and urban sources. 	<ul style="list-style-type: none"> • Further research is suggested on pollution outlined by (3). • These are rivers linked to the Planas designated as Vulnerable Areas
GREY (91/271/EEC)- Monitoring/investi gations suggested	Forata reservoir (on the Magro River, Valencia)	The reservoir itself	J	<ul style="list-style-type: none"> • Tendency towards eutrophication (3) 	<ul style="list-style-type: none"> • Purpose/use: Irrigation (2).

GREY (91/271/EEC)- Monitoring/investi gations suggested	Bellus reservoir (on the Albaida River, Valencia)	The reservoir itself	J	• Tendency towards eutrophication (3)	• Purpose/use: Irrigation (2).
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Note 1: The variety of issues considered when establishing grey and black coastal areas include: coastal morphology, hydrography of the area, population density next to coast and population centres with over 10,000 inhabitants. In addition, the agricultural development of the autonomous community, particularly irrigation, existence of coastal aquifers with high nitrate pollution (MOPT, 1996) and technical information (López and Tomàs, 1989; Aznar et al., 1991; Torres and Soler, 1995) have also been processed. No other areas additional to those already identified by the relevant authorities have been identified.

In spite of the limited information made available for the purposes of this report, it is possible to conclude that Vulnerable Zones (unofficial) and Sensitive Areas (official and unofficial) provide large coverage to water quality problems relevant to Directives 91/676/EEC and 91/271/EEC, respectively.

The regional authorities are taking the adequate steps for the designation of Vulnerable Zones, although two areas have been left out: the Vinaroz coastal plains and the Huerta de Alicante and Campo de Cartagena section of this community. These areas are adjacent to areas identified in neighbouring autonomous communities (Catalonia and Murcia, respectively). Regarding the classification of Sensitive Areas, a few reservoirs and watercourses should be investigated, since some data indicate relevant pollution problems. Particular attention should be paid to the use of these water bodies for water supply.

MUNICIPALITIES FOR ASSIGNING VULNERABLE AREAS WITHIN THE VALENCIA COMMUNITY

VALENCIA				
Ador	Benaguassil	Emperador	Lloc Nou de Fenollet	Real de Gandía
Alaquas	Benavites	Faura	Lloc Nou de S. Jeroni	Ribarroja del Turia
Albal	Beneixida	Favara	Llombai	Riola
Albalat de la Ribera	Benetuser	Foios	Loriguilla	Rocafort
Albalat dels Sorells	Beniarjó	Fortaleny	Lugar Nuevo de la	Rotgla y Corbera
Albalat dels Tarongers	Benicull	Gandía	Corona	Rotova
Alberic	Benifaió	Gavarda	Manises	Sagunt
Alboraia	Benifairó de les Valls	Genovés	Manuel	San Antonio de Benageber
Albuixec	Benifairó de Valldigna	Gilet	Massalaves	Sant Joan D'Enova
Alcacer	Benifla	Godella	Naquera	Sedavi
Alcanter del Xuquer	Benimodo	Guadassuar	Novelé	Sellent
Alcudia de Crespins	Benimuslem	Guardamar	Oliva	Senyera
Aldaia	Beniparrell	L'Alcudia	Paiporta	Silla
Alfajar	Benissano	L'Eliana	Palma de Gandía	Simat de Valldigna
Alfauir	Betera	L'Enova	Palmera	Sollana
Alfara de Algimia	Bonrepós y Mirambell	La Font d'en Carros	Paterna	Sueca
Alfara del Patriarca	Burjassot	La Granja la Costera	Pedralba	Sumacarcer
Albarb	Canals	La Llosa de Ranes	Petres	Tavernes Blanques
Algar de Palancia	Canet d'en Berenguer	La Pobla de Farnalls	Picanya	Tavernes de Valldigna
Algemesí	Carcaixent	La Pobla Llarga	Picassent	Torrella
Alginet	Carcer	Llanera de Ranes	Piles	Torrent
Almassera	Carlet	Llaurí	Pobla de Vallbona	Valencia
Almisserat	Castellonet	Massalfassar	Polinya	Vilamarxant
Almoines	Catadau	Massamagrell	Potries	Vilanova de Castelló (Castelló de la Ribera)
Almussafes	Catarroja	Massanassa	Puçol	Villalonga
Alquería de la Comtesa	Corbera	Meliana	Quart de les Valls	Vinalessa
Alzira	Cotes	Miramar	Quart de Poblet	Xàtiva
Antella	Cullera	Mislata	Quartell	Xeraco
Barx	Daimus	Moncada	Rafelbunyol	Xeresa
Barxeta	Estubeny	Museros	Rafelcofer	Xirivella
Bellreguard	El Puig	Lliria	Rafelguaraf	

NOTE: Related to UH 08.21 Plana de Sagunto, 08.25 Plana de Valencia Norte, 08.26 Plana de Valencia Sur, & Plana de Gandía Denia

ALICANTE	CASTELLÓN	
Beniarbeig Benidoleig Benimelí Denia La Sagra Ondara Orba Pedreguer Pego Rafol de Almunia Sanet y Negrals Setla, Mirarrosa y Miraflor (Els Poblets) Tormos Vergel Xabia	Alfondeguilla Alcora ¹ Almassora Almenara Alquerías del niño Perdido Artana Beniccassim Betxi Borriol Burriana Cabanès Castellón La Llosa Moncofar Nules Onda ² Oropesa Pobla Tornessa Sant Joan del Moró	Tales Vall D'Uxó Vila - Real Vilafamés Vilavella Xilxes NOTE: (1) Alcora and Maria Cristina reservoirs are included. (2) Siche reservoir is included (3) Municipalities match those at HU 08.11: Plana de Oropesa - Torreblanca, UH 08. 12 Plana de Castellón and part of UH 08. 21 Plana de Sagunto (shared with Valencia)
NOTE: Municipalities match HU 08.47 Peñón-Montgó-Bernia-Benisa		

1. Varela Sánchez, M 1991. *Situación de la contaminación por nitratos en las aguas subterráneas del territorio peninsular y Balear*. Ed. Ministerio de Obras Públicas y Transportes. Madrid.
2. MOPT 1991. *Inventario de presas españolas*. Dirección General de Obras Hidráulicas del Ministerio de Obras Públicas y Transportes. Madrid.
3. MOPT 1992. Hydrological Plan for the Jucar River Basin. Jucar River Hydrographic Confederation, Secretary of State for Water and Environmental Policies. General Directorate for Hydraulic Works. Ministry of Public Works and Transport. Madrid.
4. MMA 1997. *Plan Hidrológico de la Cuenca del Segura*. Confederación Hidrográfica del Segura. Secretaría de Estado de Aguas y Costas. Dirección General de Obras Hidráulicas y Calidad de Aguas. Ministerio de Medio Ambiente, Madrid.
5. MOPT 1992. *Plan Hidrológico de la Cuenca del Ebro*. Confederación Hidrográfica del Ebro. Ministerio de Obras Públicas y Transportes. Secretaría de Estado para las Políticas de Agua y Medio Ambiente. Dirección General de Obras Hidráulicas.
6. Determinación de las masas de agua afectadas por nitratos realizada por el MMA para la Comunidad Autónoma de Valencia (Informe especial ITGME sobre Valencia para Nitratos; Informes de la Confederación hidrográfica del Júcar, Segura, y Ebro para Nitratos).
7. Orden de 13 de agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Segura, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
8. Orden de 13 de Agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Ebro, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 222, de 16 septiembre 1999).
9. Orden de 13 de Agosto de 1999, por la que se dispone la publicación de las determinaciones de contenido normativo del Plan Hidrológico de cuenca del Júcar, aprobado por el RD 1664/1998 de 24 de julio (BOE nº 205, de 27 agosto 1999).
10. MAPA 1995. *Avance del Plan Nacional de Regadíos. Informe de Síntesis*. Dirección General de Planificación Rural y Medio Natural, Secretaría General de Desarrollo Rural y Conservación de la Naturaleza, Ministerio de Agricultura, Pesca y Alimentación.

11. Álvarez Cobelas, M.; P. Muñoz Ruíz and A. Rubio Olmo 1991. *La Eutrofización de las Aguas Continentales Españolas*. Centro de Investigaciones del Agua, Consejo Superior de Investigaciones Científicas. Febrero, 1991.

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