2.2 WATER

Water is a basic resource for our society and especially for our economy. Every bit as important as energy, soil, forests and materials, it is conditioned, to a large degree, by its scarcity and the variable nature of its availability.

Raising the quality of water supplies, achieving water bodies which comply with minimum quality and hygiene requirements and ensuring the conservation of aquatic resources - in particular the vulnerable ones - and avoiding over-exploitation are all basic principles for water management.

Sustainable management of water and its international governance were on the agendas of the Rio+20 Conference. We must bear in mind that water resources are extremely vulnerable to the effects of climate change. Water shortages can affect the natural environment (natural habitats, aquatic and continental ecosystems, biodiversity, forests, etc.) and many of the main economic sectors (agriculture, energy, tourism, health, human security, etc.).

In Spain, it would appear that climate change leads to a reduction of the water resources, due to the increase in the temperature and the drop in the rainfall. The socio-economic and environmental consequences of this may be very serious. Ensuring quality and supply so as to

guarantee natural requirements and socio-economic needs must be a priority of the management model. All this, in a framework consistent with the principles of adaptation to climate change.

MENSAJES CLAVE

Public water supply consumption in Spain has maintained the downward trend of the past five years. Daily water consumption per capita was 149 litres in 2009. In 2004, this consumption stood at 171 litres.

The relationship between water reserves and reservoir capacity decreased slightly, from 74.5% in 2010 to 62.5% in 2011. These values were higher than the average for the last 10 years, which was 56.5%.

The presence of chloride in coastal groundwater may be linked to the intense extraction of freshwater, as a result of which salt wedge intrusion occurs.

In 2011 the number of stations with lower organic pollution increased from 973 to 1094. In contrast, the stations with concentrations in excess of 10 mgO_2/l reduced.

The pollutant load compliance of wastewater treated in plants in 2010 stood at 84%.

In the 2011 bathing season, 14% of sampling points recorded an inland bathing water quality classification of "poor."

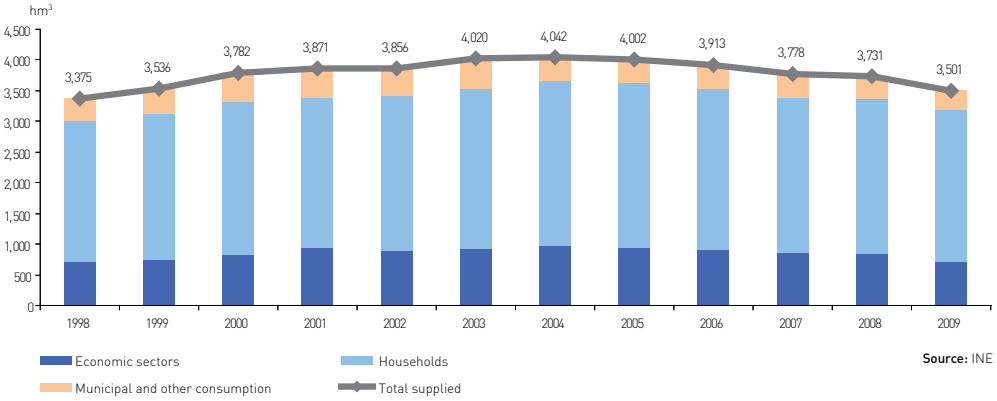
INDICATORS

- **Water consumption**
- **Reservoir water levels**
- **Nitrate pollution of groundwater**
- **Salinisation of groundwater bodies**
- **Organic pollution of rivers**
- **Treatment of urban wastewater**
- **Quality of inland bathing waters**

Water consumption

The decrease in consumption of urban water supplies has been consolidated in all sectors

BREAKDOWN BY SECTOR OF WATER DISTRIBUTION BY THE PUBLIC SUPPLY NETWORK



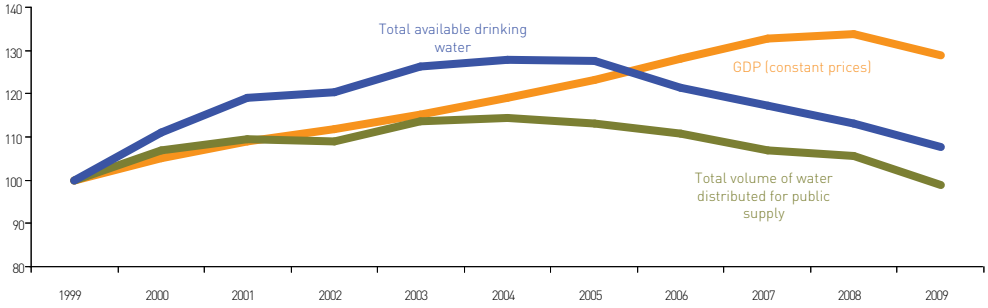
Source: INE

In 2009, the volume of water distributed for public supply was 3,501 hm^3. It was distributed for consumption by households, economic sectors (industry, services and livestock farming), as well as for municipal services, and dropped by 6.2% compared to 2008.

In Spanish households water consumption in 2009 stood at 149 litres per inhabitant per day, thus maintaining its downward trend. There has been a reduction of almost 13% in comparison to the water consumed by Spanish households five years ago. In the year 2004 consumption stood at 171 litres per inhabitant per day.

Water consumption, represented as total available drinking water and water distributed for public supply, maintained its downward trend of the last five years. In addition to the initial decrease - the impact of rational water use promotion policies -, since 2008 there has been a decrease in demand in the industrial and tourism sector as a result of the economic situation. This situation is reflected by the drop in the GDP.

COMPARISON BETWEEN WATER DISTRIBUTED FOR PUBLIC SUPPLY AND GDP (Index: 1999=100)



Source: Compilation based on data supplied by INE and MINETUR

The volume of irrigation water used in agricultural operations rose by 3.9% in 2009 as compared to 2008, standing at 15,909 hm^3.

NOTES

- Water distributed includes all water available in the public distribution network, plus all losses from the same. It is the sum amount of water collected by the supply company plus the net balance of water purchases and sales from and to other companies and local authorities.
- From 2007 onwards, the number of sectors included in the graph showing distribution of water for public supply has been reduced (the urban sector has been grouped with the other sectors category).

SOURCES

- Water consumption data: National institute of Statistics. Environment statistics. Environment statistics of water. In INEbase (http://www.ine.es/inebase/cgi):
  - Survey on water supply and sewerage (1996-2009).
  - Survey on the use of water in the agricultural sector (1999-2009).
  - Water consumption in industry.
- DP figures: Ministry of Industry, Energy and Tourism. La Energía en España 2010.

FURTHER INFORMATION

- http://www.ine.es

Reservoir water levels

Despite the decrease in water reserves in 2011, they are still above the average of the last ten years

HYDROLOGICAL TREND REPORT: CAPACITY (hm^3) AND RESERVES (%) IN PENINSULAR RESERVOIRS. Data as 3 January 2012

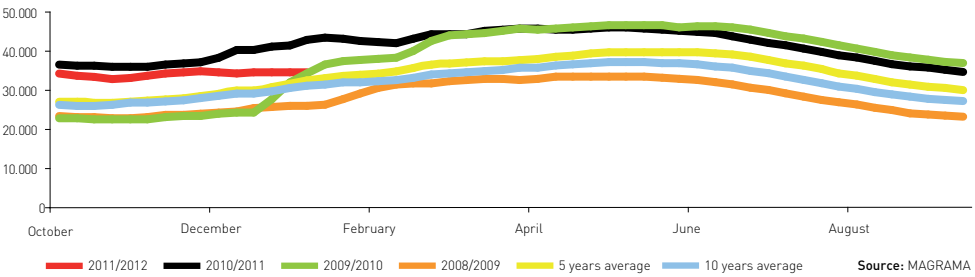
WATERSHED	Total reservoir capacity	Reserves	Reserves compared to total capacity (%)				
	hm^3	hm^3	2011	2010	2009	5-year average	10-year average
Atlantic	41,693	26,733	64.1	76.8	59.2	57.3	58.7
VMediterranean	13,897	7,803	56.1	67.8	57.3	49.9	49.6
Entire peninsula	55,590	34,536	62.1	74.5	58.7	55.5	56.5

Source: MAGRAMA

After five years of increases in peninsular water reserves, which reached 74,5% of total capacity in the year 2010, in 2011 these reserves decreased to 62.1%. This drop was seen in both watersheds, (reserves in the Atlantic watershed reached 64.1% of their capacity, while those in the Mediterranean watershed fell to 56.1%. Despite the decrease, they remained above the average for the last ten years.

The graph shows how, after a decrease in reserves in the autumn-winter of the 2010-2011 hydrological year, they increased in the spring of 2011, as rainfall was somewhat heavier than usual during this season, which gave way to an extremely dry summer and a drop in reserves that continued into the autumn of 2011. Despite this decrease, the beginning of the 20122011 hydrological year was characterised by peninsular water reserve figures that were higher than the averages for the last five and ten years.

PENINSULAR WATER RESERVES
Reservoir volume (hm^3)
Data from January 2012



Source: MAGRAMA

NOTES

- The Directorate-General for Water has developed a comprehensive system of hydrological indicators to predict drought conditions based on the volume of water stored in reservoirs, aquifers' piezometric levels, natural river inputs, and rainfall in representative stations. This system of indicators provides an objective characterisation of drought in each resource usage system and enables timely measures and actions to be applied at the pre-alert, alert and emergency stages.
- The hydrological year runs from 1 October to 30 September of the following year.

SOURCES

- Data provided by the Directorate-General for Water. Secretariat of State for the Environment. MAGRAMA.
- Meteorological Spanish Agency (AEMET), 2012. Climate report for the year 2011.

FURTHER INFORMATION

- http://www.magrama.es
- http://www.aemet.es

Nitrate pollution of groundwater

Consumption of water with high nitrate concentration may result in damage to health.

PERCENTAGE OF MONITORING STATIONS RECORDING NITRATE CONCENTRATIONS ABOVE 50 mg/l

RIVER BASIN DISTRICT	2007	2008	2009	2010
Cantabria	0.0	1.9	0.0	0.0
Basque Country-Inland Basins	0.0	0.0	0.0	0.0
Galicia-Coast	0.0	0.0	0.0	2.2
Miño-Sil	9.1	0.0	9.1	4.7
Segura	26.3	26.5	18.4	9.8
Andalusian Mediterranean Basin	N.A.	N.A.	N.A.	12.5
Andalusian Atlantic Basin	30.0	0.0	N.A.	12.7
Júcar	20.2	19.7	25.8	15.7
Duero	11.3	12.5	14.6	15.9
Tagus	24.1	2.7	16.7	17.1
Guadalquivir	27.5	42.5	30.3	30.9
Guadiana	30.2	26.8	28.7	33.1
Ebro	20.5	57.7	15.7	33.8
Gran Canaria	N.A.	N.A.	N.A.	35.7
Catalonia-Inland Basins	34.5	30.0	36.5	37.2
Balearic Islands	N.A.	N.A.	N.A.	44.7

Source: MAGRAMA

In order to monitor the quality of groundwater, the Water Framework Directive 2000/60/EC and Directive 2006/118/EC on the protection of groundwater against pollution and deterioration establish a series of indicators including nitrate concentration expressed in mg per litre (mg/l). These rules have been transposed into Spanish law under Royal Decree 1514/2009 of 22 October.

The appearance of nitrates in groundwater is often linked to unsuitable agricultural practices, such as the application of excessive amounts of nitrogen fertilisers, and also to indirect slurry spills and waste from livestock farming activities. Excessive ploughing of aquifer recharge areas may also mobilize the organic nitrogen content in the ground. Another significant cause is occasional direct pollution due to the presence of poorly-constructed boreholes, when aquifers are not properly insulated and pollution occurs via the bores or wells used for irrigation.

Ingesting water with levels higher than 50 mg/l may result in damage to human health, and therefore it is important to monitor the nitrate content of water.

The table shows the percentage points per district with annual average contents above 50 mg/l for the year 2010. Gran Canaria, and the Balearic Islands and Catalonia Inland Basins stand out, in this order, as the three districts with the highest percentage of stations recording average nitrate contents above 50 mg/l. The increase of nitrates in the River Ebro compared to those recorded in previous years is particularly striking. This result is conditioned by the fact that the network of monitoring points used in 2010 was significantly smaller. Some problem-free points have been abandoned and those which do have significant concentrations of nitrates have been maintained. This may bias the comparison with the figures for previous years.

NOTES

- The definition of vulnerable zones can be found in Directive 91/676/EEC, according to the pollution produced by nitrates and the run-off.
- Directive 2000/60/EC, which establishes a community framework for action in the field of water policy includes the need to prevent the pollution of groundwater as one of its objectives. To fulfil these objectives, programmes should be established with measures including those required in Directive 91/676/EEC, as well as others. In addition, the vulnerable zones identified in compliance with Directive 91/676/EEC are included in the register of protected areas of Directive 2000/60/EC.
- Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources, incorporated into Spanish law by Royal Decree 261/1996, stipulates that groundwaters are affected by this type of pollution when they contain more than 50 mg/l of nitrates, or could contain more than this level.
- As a consequence of the work undertaken whilst preparing the 2004-2007 four-yearly report for Directive 91/676/EEC, new monitoring stations were incorporated into both the control network for this Directive, and the chemical-status monitoring network established under Directive 2000/60/EC.

SOURCES

- Datos facilitados por la Subdirección General de Gestión Integrada del Dominio Público Hidráulico. Dirección General del Agua. Ministerio de Agricultura, Alimentación y Medio Ambiente.

FURTHER INFORMATION

- http://www.magrama.es
- http://www.eea.europa.eu

Salinisation of groundwater bodies

The Segura river basin registered the largest increase in percentage of stations with high chloride levels in 2010

PERCENTAGE OF STATIONS RECORDING CHLORIDE CONCENTRATIONS ABOVE 1,000 mg/l

DEMARCACIÓN HIDROGRÁFICA	2007	2008	2009	2010
Galicia-Coast	0.0	0.0	0.0	0.0
Basque Country-Inland Basins	0.0	0.0	14.3	0.0
Cantabria	0.0	0.0	0.0	0.0
Guadiana	0.0	0.0	0.0	0.0
Guadalquivir	0.0	0.0	0.0	0.0
Júcar	0.8	5.4	0.0	0.0
Ebro	0.1	0.0	0.0	0.0
Miño-Sil	N.A.	N.A.	N.A.	0.0
Andalusian Mediterranean Basin	N.A.	N.A.	N.A.	5.6
Gran Canaria	0	0	0	5.7
Andalusian Atlantic Basin	0.1	N.A.	N.A.	8.5
Balearic Islands	N.A.	N.A.	N.A.	8.6
Catalonia-Inland Basins	0.209	0.083	0.06	9.5
Segura	18.1	46.9	22.7	37.7

Source: MAGRAMA

No mixing of freshwater from the mainland with salt water from the sea occurs in coastal groundwater bodies. Since the sea contains more saline water it flows naturally into coastal aquifers, below the freshwater, like a wedge. The transition area is not a clear line; it is more of a variable-width interface where this mixing takes place.

If coastal aquifers are subjected to intense groundwater exploitation, the wedge of saline water moves further and further inland, and could reach an extreme whereby all freshwaters are replaced by brackish or even saline waters. Therefore a significant presence of chloride content in the coastal areas can be linked to the intense extraction of freshwater, which allows the salt wedge to flow inland.

In 2010, the increase of chloride in groundwater had a significant effect on the Segura river basin, and also on the Catalan Inland Basin district. No data is available for the Atlantic and Mediterranean basins.

The map above shows the coastal groundwater bodies and points with chloride concentrations above 1000 mg/l.

SOURCES

- Data provided by the Sub-Directorate-General for Integrated Public Water Resource Management. Directorate-General for Water. Ministry of Agriculture, Food and Environment.

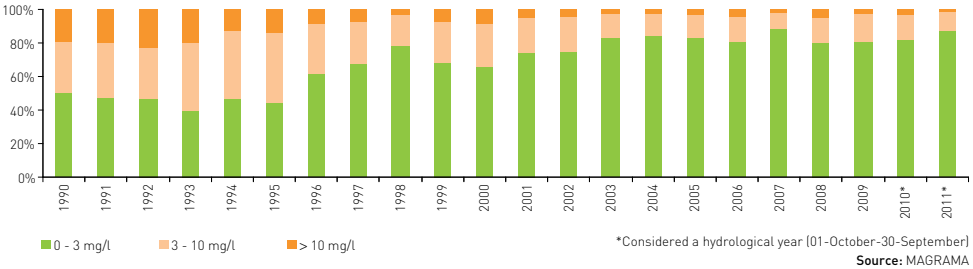
FURTHER INFORMATION

- http://www.magrama.es
- http://www.eea.europa.eu

Organic pollution of rivers

In 2011 there was a clear improvement both in the values of BOD_5 and in ammonium concentrations

PERCENTAGE OF MONITORING STATIONS BY AVERAGE BOD_5 (MG/L) IN THE PERIOD 1990-2011



*Considered a hydrological year (01-October-30-September)

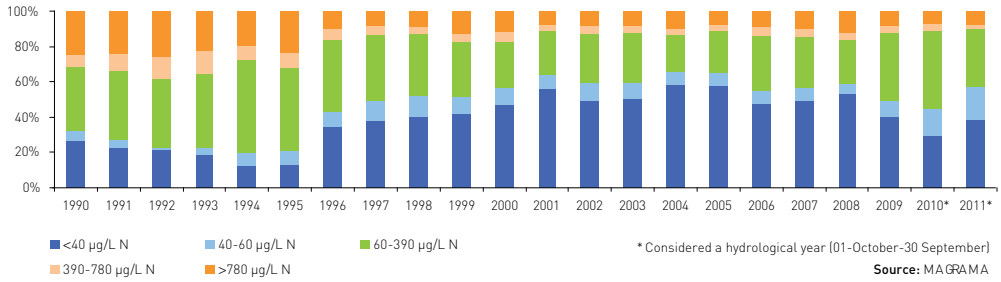
Source: MAGRAMA

Waste water from areas of housing and services, generated mainly by the human metabolism and domestic activities, is the main source of organic pollution in rivers. The indicators used most frequently to calculate this pollution are biochemical oxygen demand (BOD) and ammonium measured at the wastewater treatment plants.

The BOD is the amount of dissolved oxygen in water needed for the aerobic bacteria to oxidize all the biodegradable organic matter present in the water. BOD_5 values above 10 mgO_2/l are characteristic of highly polluted water, while values below 3 mgO_2/l indicate very low organic pollution. In accordance with these criteria, this indicator shows the percentage of monitoring stations in which the average BOD_5 value falls between three ranges: 0-3 mgO_2/l, 3-10 mgO_2/l and over 10 mgO_2/l. From the chart we may infer that in 2011 the number of stations with lower organic pollution increased from 973 to 1094. In contrast, the number of stations recording concentrations in excess of 10mgO_2/l fell, in this case from 37 to 17 stations, representing 1.77%.

Ammonium (NH_4) is the result of the degradation of nitrogenous organic material (urea, amino acids and proteins) by heterotrophic bacteria. The indicator shows the percentage of the monitoring stations in which the average ammonium concentration, measured in µg/l N, falls between the five ranges shown in the graph below.

PERCENTAGE OF MONITORING STATIONS BY AVERAGE AMMONIUM VALUE (MG/L N) IN THE PERIOD 1990-2011



* Considered a hydrological year (01-October-30 September)

Source: MAGRAMA

The percentages of stations recording lower concentrations stations (<40 µg/l (N) increased by 9.07% in comparison to the previous year, at the expense of the stations recording medium concentrations, the percentage of which dropped considerably. However, the percentage of stations with higher concentrations (> 780 µg/l (N) increased slightly (0,82%).

SOURCE

- Data provided by the Sub-Directorate-General for Integrated Public Water Resource Management. Directorate-General for Water. Ministry of Agriculture, Food and Environment.

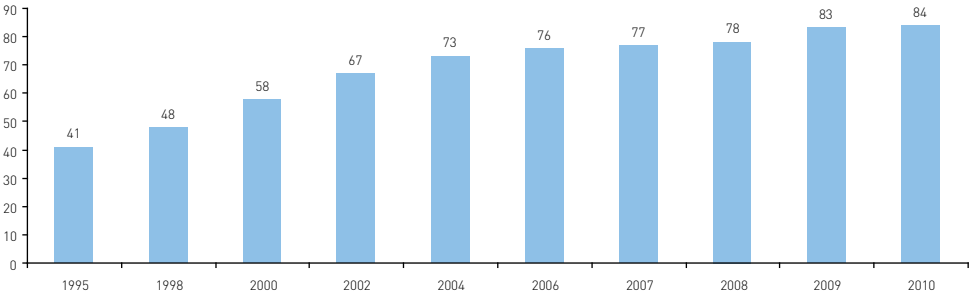
FURTHER INFORMATION

- http://www.magrama.es
- http://www.eea.europa.eu

Treatment of urban wastewater

In 2010, treated pollutant load compliance, expressed as a percentage of population equivalent, was 84%

DEGREE OF COMPLIANCE WITH DIRECTIVE 91/271/EC
(% p-e)



Source: MAGRAMA

In 2010, treated pollutant load compliance of wastewater treated in plants in accordance with the criteria laid down in Directive 91/271/EEC reached 84%. In six of the 19 autonomous regions compliance reached 100% and in 10, it exceeded 90%. Only four Autonomous Communities still had values lower than 75%.

In 2010, the pollutant load in Spain was estimated at 69,791,066 population equivalent distributed in 2,437 in urban agglomerations. Madrid, Andalusia and Catalonia are the Autonomous Communities with the highest pollutant load still to be treated.

COMPLIANCE OF LOAD AND OF NO. OF URBAN AGGLOMERATIONS ACCORDING TO DIRECTIVE 91/271/EEC AT 31 DECEMBER 2010 *

LOAD AND URBAN AGGLOMERATIONS	COMPLIANT	%	NON-COMPLIANT OR NO DATA AVAILABLE	%	TOTAL
Load (p-e)	58,881,344	84	10,909,722	16	69,791,066
Urban agglomerations (no.)	1,526	63	911	37	2,437

*Criterion in Accordance Art. 4: BOD and COD compliant. Compliance criterion Art. 4: > p-e 10,000, discharge into Sensitive Area, Compliant for the parameter/s corresponding to the sensitive area into which the discharge occurs according to data provided by the AC in the Q2011.
Notes: UA. Urban agglomerations.

The strategic framework for achieving the environmental objectives on water treatment in the Water Framework Directive, is shaped by the National Water Quality, Sewerage and Treatment Plan 2007-2015. It became the support instrument for autonomous communities and cities and local corporations in the field of wastewater treatment.

NOTES

- Directive 91/271/EEC, of the Council, of 21 May 1991 concerning urban wastewater treatment, amended by Directive 95/15/EC, of the Commission, of 27 February 1998, is intended to protect the environment against deterioration caused by urban wastewater discharges from urban agglomerations and by biodegradable wastewater from the agri-food industry. In addition to being transposed into law in each Member State, the Directive also imposed an obligation for wastewater to be collected using sewerage systems, for areas to be defined as sensitive and less sensitive, and for an implementation programme to be produced. In Spain, this programme took the form of the National Sewerage and Wastewater Treatment Plan (1995-2005), approved in a Resolution of 28 April 1995, the aims of which were continued by the National Water Quality, Sewerage and Treatment Plan 2007-2015 approved by the Council of Ministers in June 2007.

- Key definitions include the following:
  - Population equivalent (p.e.): biodegradable organic load with a 5-day Biochemical Oxygen Demand (BOD5) of 60 g of oxygen per day.
  - Urban agglomeration: area with a population and/or economic activities of sufficient concentration to justify collection of urban wastewater and transport of the same to a treatment facility or final discharge point.
  - Urban wastewater: domestic wastewater or a mixture thereof with industrial wastewater and/or rain run-off.
  - The pollutant load, or population equivalent, to be treated in urban agglomerations is established by: permanent population, seasonal population (which increases demand and pollutant load to be treated in areas, mainly on the coast, with a major tourist industry) and pollution from industry and farms connected to the urban sewerage system.

SOURCES

- Ministry of Agriculture, Food and Environment. Data provided by the Directorate-General for Water.

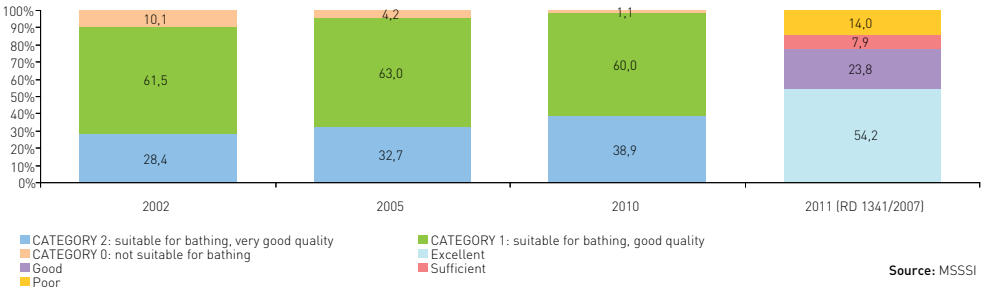
FURTHER INFORMATION

- http://www.magrama.es
- http://water.europa.eu/en/welcome

Quality of inland bathing waters

Under the new classification of the quality of inland bathing waters, in 2011 14% of sampling points are *poor quality*

QUALITY OF INLAND BATHING WATERS.
PERCENTAGE OF SAMPLING POINTS BY CATEGORY
Data from 2011 expressed through classification as per Royal Decree 1341/2007



Source: MSSSI

The 2011 bathing season was the first during which the criteria of the new legislation on bathing water was implemented and the new classification was used, which envisages four possible categories. From the lowest to the highest, they are: Poor bathing water quality, Sufficient bathing water quality, Good bathing quality water and Excellent bathing quality water).

Three of the 225 sampling points registered in the 2011 season have remained closed, so 222 have been operational. Classifications were performed for 214 of these and eight of them remained unclassified (no classification).

INLAND BATHING WATERS. 2011
NO. OF SAMPLING POINTS CLASSIFIED BY QUALITY CATEGORY

EXCELLENT	GOOD	SUFFICIENT	POOR	UNCLASSIFIED	TOTAL
116	51	17	30	8	222

Inland bathing water is classified by drawing up analysis bulletins. The number of bulletins used for the study on the series of data (seasons 2008 to 2011) to develop the classification of inland bathing waters was 6,139 analysis bulletins (84.6% of total), which includes programmed control bulletins and replacement samples. 12,327 determinations were used in inland waters (84.8% of the total).

NOTES

- In accordance with the terms of Directive 76/160/EEC, concerning the Quality of Bathing Water, the Ministry of Health, Social Policy and Equality submits an Annual Summary Report of Bathing Water Quality in Spain to the European Commission. This describes the key findings of hygiene monitoring of such waters.
- On 15 February 2006 , the new Bathing Water Quality Directive (2006/7/EC) was approved. Among other aspects, this directive modifies the current bathing water classification system, establishing four assessment categories, reducing the number of parameters considered and defining water quality at each point using a three-year average. This directive was transposed into Spanish law by Royal Decree 1341/2007.
- Under the new directive, classification should be performed using data from each season together with the data for the last 3 years. The new classification is as follows: poor, sufficient, good and excellent.
- This new classification was performed for the first time during the bathing season of the year 2011.

SOURCES

- Data provided by the Sub-Directorate-General for Environmental Health and Safety at Work. Ministry of Health, Social Policy and Equality (MSSSI).

FURTHER INFORMATION

- http://nayade.msc.es/Splayas/home.html
- http://ec.europa.eu