
2.2

WATER



2010 marked the tenth year since the Water Framework Directive came into effect. This regulation has been the driving force behind an extensive adaptation process, completely renewing water management with the main aims of preventing and reducing pollution, promoting sustainable water usage, protecting the environment, improving aquatic ecosystems and mitigating the effects of floods and droughts. The Directive's ultimate objective is to achieve good ecological and chemical status for all Community waters by 2015.

In line with the work carried out to meet the requirements set out in the Directive, in 2010 the MARM adopted Royal Decree 1161/2010, of 17 September, which amended Royal Decree 907/2007, of 6 July, on Water Planning Regulation. The Royal Decree introduces several changes as regards the responsibilities of Water Councils in river basin districts, allowing these to be adopted by other administrative bodies within the basins, or failing that, by the Basin Authorities themselves.

Water consumption continued to fall in all sectors and, in parallel, water reserves increased and are now well above the ten-year average. Although desalination capacity has increased, there has also been a fall in production of desalinated water in recent years.



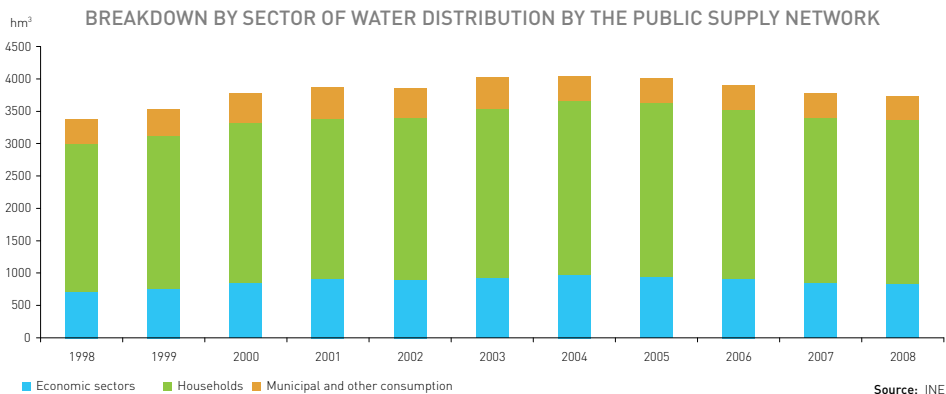
INDICATOR	GOAL	TREND
Water consumption	Reduce and optimise consumption	Household water consumption continues to fall
Reservoir water levels	Provide sufficient reserves to guarantee supply	Water reserves are increasing
Natural water resources	Implement water planning to ensure sufficient water resources and maintain water bodies in a satisfactory state	Natural water resources are improving
Brackish and sea water desalination	Increase available resources	Desalinated water production is decreasing
Nitrate pollution of groundwater	Minimise pollution	Status varies between river basin districts
Salinisation of groundwater bodies	Reduce salinisation and preserve catchments	Improving situation in the Mediterranean basins
Organic pollution of rivers	Achieve good ecological status in rivers	BOD ₅ levels remain stable, while average ammonium levels are increasing
Treatment of urban wastewater	Reduce the pollutant load to meet the targets of Directive 91/271/EC	Compliance levels are increasing
Quality of inland bathing waters	Maintain good health status of waters to ensure they remain suitable for bathing	Decreasing percentage of waters not suitable for bathing

2.2 WATER

Nitrate pollution of groundwater varies widely between river basin districts, as does salinisation of water bodies, although salinisation in Mediterranean river basin districts has reduced. Compliance with urban wastewater treatment criteria rose, inland bathing waters retained their good ecological status and the percentage of waters not suitable for bathing fell.

Water consumption

Water consumption continues to decrease in households, economic sectors and agricultural operations

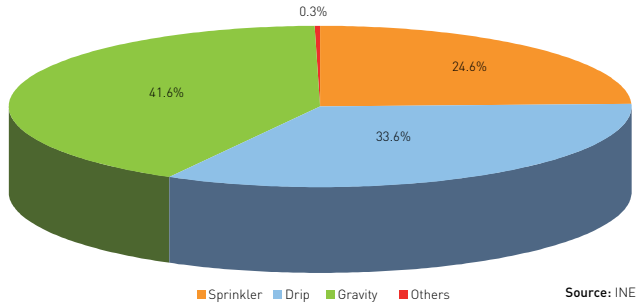


In 2008, the quantity of water delivered to urban public supply networks totalled 4,941 hm³. Of this amount, three quarters of the water registered, 3,731 hm³, was consumed by households, the various economic sectors (industry, services and livestock farming), and municipal services. This is a decrease of 1.2% compared to the previous year.

In Spanish households, water consumption is decreasing each year. In 2008, consumption stood at 154 litres per inhabitant per day; three litres less than 12 months previously.

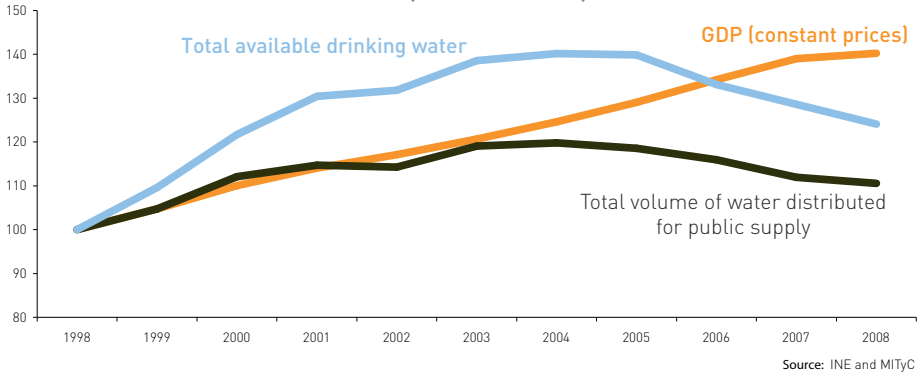
Water consumption in agricultural operations also decreased, dropping by 5.5% in comparison to the year before to 15,513 hm³. This reduction was seen across all of the irrigation techniques, with consumption decreasing by 5.5% in sprinkler irrigation, 6% in drip irrigation and 5.5% in gravity-fed irrigation. Nonetheless, the breakdown by irrigation type remains similar to that of 2007, with drip and sprinkler systems accounting for 58.2% of consumption in 2008.

BREAKDOWN OF WATER USE BY IRRIGATION SYSTEM TYPE (2008)



Water consumption (expressed as total available drinking water and water distributed for public supply) has clearly been decoupled from GDP growth since 2003. In 2007, GDP growth started to slow down, and then decreased further in 2009. These three variables will need to be monitored in the next few years to identify the changes taking place.

COMPARISON BETWEEN WATER DISTRIBUTED FOR PUBLIC SUPPLY AND GDP (index: 1998 = 1 00)



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 supply companies 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

- INE. Environment statistics. Environment statistics of water. In INEbase
 - *Survey on water supply and sewerage (1996–2008)*
 - *Survey on the use of water in the agricultural sector (1999–2008)*
 - *Water consumption in industry*
- GDP figures: *Energía en España 2009*, MITyC, Secretariat-General for Energy.

FURTHER INFORMATION

- <http://www.marm.es>
- <http://www.ine.es>

Reservoir water levels

Total reservoir water levels continue to increase, rising by 29.7% compared to the previous year

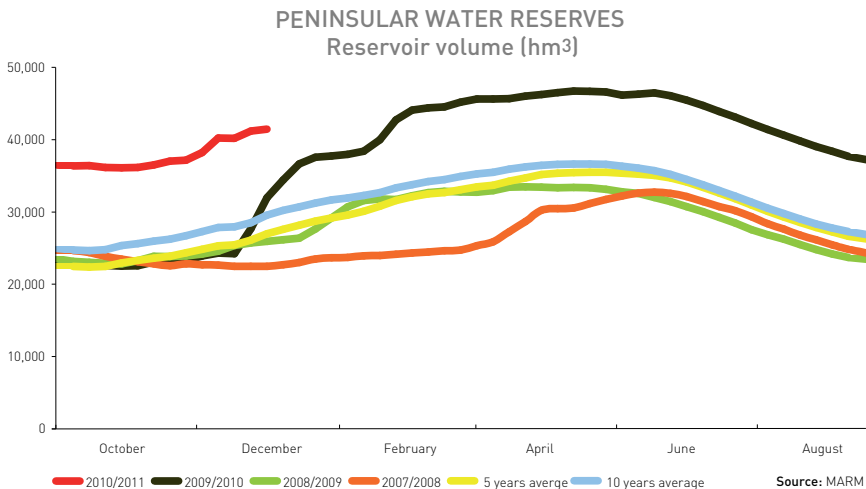
HYDROLOGICAL TREND REPORT: CAPACITY (HM³) AND RESERVES (%) IN PENINSULAR RESERVOIRS. Data as at 4 January 2011

WATERSHED	Total reservoir capacity	Reserves	Reserves compared to total capacity (%)				
	hm ³	hm ³	2010	2009	2008	5-year average	10-year average
Atlantic	41,685	31,996	76.8	59.2	46.6	51.5	57.4
Mediterran	13,901	9,431	67.8	57.3	50.9	44.4	48.0
Entire peninsula	55,586	41,427	74.5	58.7	47.7	49.7	55.1

Source: MARM

As was the case the year before, in 2010 water reserves continued to increase, rising by 29.7% in comparison with 2009. This trend was seen in both watersheds (reserves in the Mediterranean watershed increased by 20.5%, while those in the Atlantic watershed rose by 32.7%), producing overall reserves that were well above the average level of recent years.

The winter months produced high levels of rainfall, which classified 2010 as a “wet to very wet” year. This resulted in a significant increase in water reserves, which remained much higher than average despite a sharp decrease in summer, as the graph shows below.



Source: MARM

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

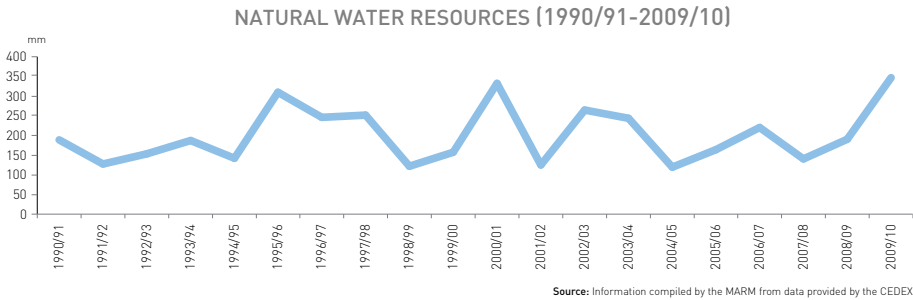
- Data provided by the Sub-Directorate-General for Sustainable Water Use and Planning. Directorate-General for Water. MARM.

FURTHER INFORMATION

- <http://www.marm.es>

Natural water resources

In 2009–2010 natural water resource levels were higher than the average of recent years



NATURAL WATER RESOURCES	Average for the period 1940/41–2009/10 (l/m ²)	Average for the last 5 years 2005/06–2009/10 (l/m ²)	2007/08 hydrological year (l/m ²)	2008/09 hydrological year (l/m ²)	2009/10 hydrological year (l/m ²)
TOTAL IN SPAIN	216.29	212.42	140.50	190.63	346.99

Source: Information compiled by the MARM from data provided by the CEDEX

The improvement that began in the 2008/09 hydrological year was continued in 2009/10, when Spain’s natural water resources reached 346.99 l/m², a level only exceeded in the 1940/41 (377.71 l/m²) and 1959/60 (360.25 l/m²) hydrological years. This very high level is mainly due to the copious rainfall throughout 2009/10.

In 2009/10, natural water resources in 74% of the country’s river basin districts exceeded the average of the last five years. The three to record the highest values were the Miño-Sil (455.36 l/m² above the average of the last five years), Guadalete and Barbate (421.91 l/m²) and Tinto, Odiel and Piedras (320.39 l/m²) river basin districts.

However, in 2009/10 natural water resources in six river basin districts were lower than the average of the last five years. These include the Basque Country Inland Basins, which recorded the biggest decrease of all the river basin districts (64.53 l/m² below the average of the last five years), the Catalonian Inland Basins (24.18 l/m²) and island of La Palma (15.57 l/m²).

NOTES

- Annual average natural water resources are calculated from the average monthly values obtained from the SIM-PA model developed by the CEDEX to simulate rainfall and inputs. This models the hydrological cycle throughout Spain (the values have been aggregated for both individual river basin districts and nationally) using a grid of 1-km² cells.
- Based on data for rainfall, potential evapotranspiration and the hydrological parameters, the model produces maps of the various forms of storage, soil moisture and aquifer volumes, as well as of the hydrological cycle's output variables, evapotranspiration and total run-off, calculating the latter as the sum amount of surface and underground run-off. The indicator is expressed in litres per m² (l/m²).
- The values are expressed in hydrological years, which begin in October and end in September.

SOURCES

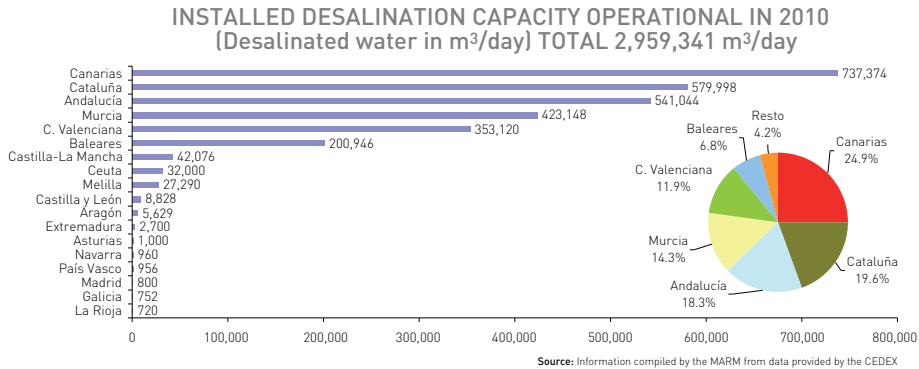
- Sub-Directorate-General for Sustainable Water Use and Planning. Directorate-General for Water. MARM.

FURTHER INFORMATION

- Libro Blanco del Agua en España (2000)
- <http://servicios2.mma.es/sia/indicadores>

Brackish and sea water desalination

In 2010, desalinated water production decreased in Spain



Given Spain’s limited water resources, desalination of brackish and sea water is one of the ways to obtain this vital liquid. Over the years, Spain’s operational desalination capacity has steadily increased and, in 2010, rose by 7.8% on 2009 to stand at 2,959,341 m³/day.

The two autonomous communities in which installed capacity grew in 2010 were Catalonia, with an increase of 200,000 m³/day, and the Balearic Islands, with an increase of 14,000 m³/day. As a result, Catalonia now has the second-highest desalination capacity among Spain’s autonomous communities, behind the Canary Islands.

DESALINATED WATER PRODUCTION IN SPAIN

Year	1990	2000	2004	2007	2008	2009	2010
hm ³ /day	0.10	0.70	1.40	1.66	1.94	1.92	1.71

Desalinated water production decreased in 2010 to 1.71 hm³/day. As was the case the year before, this decrease was due to an improvement in water reserves, which lowered demand and, subsequently, reduced production. The autonomous communities that produced the most desalinated water were the Canary Islands with 630,000 m³/day, Catalonia with 277,592 m³/day, Murcia with 251,133 m³/day and Andalusia with 220,192 m³/day.

Advances in desalination technology are going hand in hand with greater use of alternative energy sources. Some countries have studied the possibility of using electricity produced by tidal energy for desalination. Another possible alternative would be to power desalination plants with energy obtained from organic municipal waste.

SOURCES

- Centre for Hydrographical Studies. CEDEX.

FURTHER INFORMATION

- <http://www.hispagua.es>
- <http://www.marm.es>

Nitrate pollution of groundwater

Nitrate concentration in groundwater is linked to the pressure exerted by crop and livestock farming

PERCENTAGE OF MONITORING STATIONS RECORDING NITRATE CONCENTRATIONS ABOVE 50 MG/L

RIVER BASIN DISTRICT	2007	2008	2009	RIVER BASIN DISTRICT	2007	2008	2009
Miño-Sil	9.1%	0.0%	9.1%	Andalusia (Med.)	N.A.	N.A.	N.A.
Galicia-Coast	0.0%	0.0%	0.0%	Andalusia (Atl.)	30.0%	30.0%	N.A.
Basque Country I.B.	0.0%	0.0%	0.0%	Segura	26.3%	26.5%	18.4%
Bay of Biscay	0.0%	1.9%	0.0%	Júcar	20.2%	19.7%	25.8%
Douro	11.3%	12.5%	14.6%	Ebro	20.5%	57.7%	15.7%
Tagus	24.1%	2.7%	16.7%	Catalonian I.B.	34.5%	30.0%	36.5%
Guadiana	30.2%	26.8%	28.7%	Canary Islands	N.A.	N.A.	N.A.
Guadalquivir	27.5%	42.5%	30.3%				

Source: MARM 2010

Nitrate concentration in groundwater is linked to the pressure that crop and livestock farming exert on these waters' chemical status. Directive 2006/118 on the protection of groundwater against pollution and deterioration establishes a nitrate concentration limit value of 50 mg/l for groundwater to qualify for good chemical status.

The Catalonian Inland Basins, Guadiana and Guadalquivir river basin districts had the highest percentage of monitoring stations recording nitrate concentrations above 50 mg/l in 2007, 2008 and 2009 (around 30% in all three years).

NOTES

- The 2008 figures for the Ebro river basin district were higher than usual. This variation was due to bias in the sample, as the number of stations sampled was reduced. Moreover, the stations selected tended to be those where higher nitrate contents were expected. In 2009, the figures for the Ebro river basin district returned to normal, or better than normal, as the 15.7% concentration in 2009 was below 20%, the norm for this river basin district in previous years.
- Directive 2000/60/EC (WFD), which establishes the European framework for action in the field of water policy, includes among its objectives the need to prevent groundwater pollution. In order to meet these objectives, rafts of measures should be established that, among other aspects, include those set out in Directive 91/676/EEC.
- 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, defines groundwater as being affected by this type of pollution if the nitrate concentration is above 50 mg/l, or could potentially reach this level.
- Directive 2006/118 on the protection of groundwater against pollution and deterioration defines groundwater as having good chemical status when nitrate concentration (among other criteria) does not exceed 50 mg/l.
- The figures for the Tagus river basin district differ in this edition from those in the 2008 environmental profile as the data have been updated.

SOURCES

- Data provided by the Sub-Directorate-General for Integrated Public Water Resource Management. Directorate-General for Water. MARM.

FURTHER INFORMATION

- <http://www.marm.es>
- <http://www.eea.europa.eu>

Salinisation of groundwater bodies

Salt intrusion is decreasing in the Júcar and Segura river basins

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

RIVER BASIN DISTRICT	2007	2008	2009	RIVER BASIN DISTRICT	2007	2008	2009
Galicia-Coast	0%	0%	0%	Andalusia (Atl.)	0.1%	N.A.	N.A.
Basque Country I.B.	0%	0%	14.3%	Segura	18.1%	46.9%	22.7%
Bay of Biscay	0%	0%	0%	Júcar	0.8%	5.4%	0%
Guadiana	0%	0%	0%	Ebro	0.1%	0%	0%
Guadalquivir	0%	0%	0%	Catalonian I.B.	20.9%	8.3%	6.0%
Andalusia (Med.)	N.A.	N.A.	N.A.	Canary Islands	0%	0%	0%

Source: MARM 2010

Salt intrusion in coastal groundwater, measured by examining the percentage of monitoring stations recording chloride concentrations above 1,000 mg/l, varies significantly throughout the basins analysed. The increased concentration of chloride is mainly due to the pressure exerted by groundwater usage. When groundwater abstraction exceeds these bodies' replacement level, the balance between groundwater and sea water is disrupted and the latter intrudes, producing salinisation and a deterioration in quality.

Salt intrusion is practically non-existent in the northern river basin districts, but it is widespread in the Mediterranean basins. The data for 2009 show an improvement in the worst affected river basin districts, such as the Júcar and Segura basins.

NOTES

- The figures for the Júcar, Segura and Ebro river basin districts differ in this edition from those in the 2008 environmental profile as the data have been updated.

SOURCES

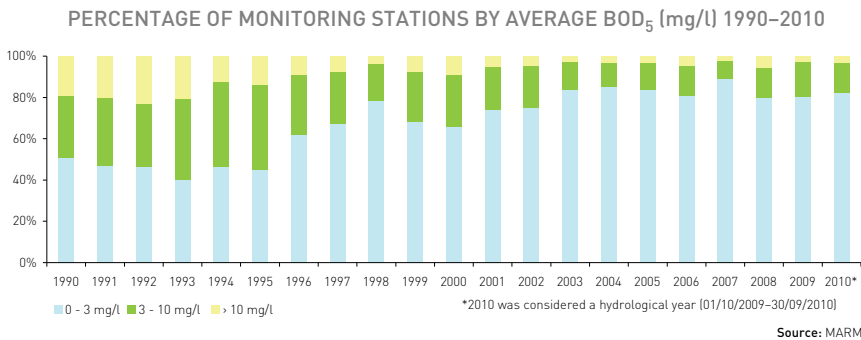
- Data provided by the Sub-Directorate-General for Integrated Public Water Resource Management. Directorate-General for Water: MARM.

FURTHER INFORMATION

- <http://www.marm.es>
- <http://www.eea.europa.eu>

Organic pollution of rivers

In 2009 and 2010 there were no significant variations in BOD₅, but there were considerable changes in ammonium concentrations

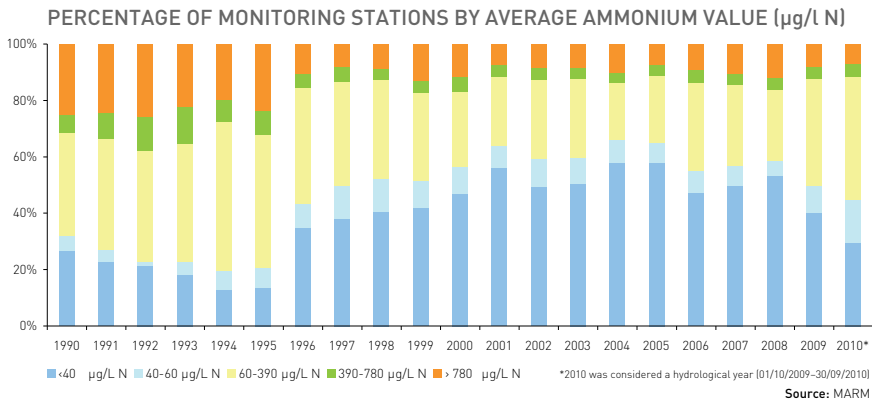


Urban wastewater discharges are directly related to organic pollution of rivers. This pollution is measured using the biological oxygen demand and ammonium concentration in rivers.

A river's capacity to break down organic matter present in its waters is determined by the amount of dissolved oxygen the water contains. This capacity is known as the Biological Oxygen Demand (BOD₅) and is measured in milligrams of O₂ per litre (mg/l). This indicator shows the percentage of monitoring stations in which the average BOD₅ value falls between three ranges: 0–3 mg/l, 3–10 mg/l and over 10 mg/l.

As the graph shows, there are no significant variations in the percentages in 2009 and 2010. The proportion of monitoring stations that recorded a low BOD₅ (0–3 mg/l) remained around 80%, that of stations with a BOD₅ value of 3–10 mg/l stood at around 15%, while that of stations with a BOD₅ of over 10 mg/l totalled close to 3%.

Discharges from sewerage networks are the main cause of ammonium in rivers. Ammonium, along with nitrates, increases the nitrogen concentration in rivers, which contributes to eutrophication. This indicator shows the percentage of monitoring stations in which the average ammonium concentration, measured in µg/l N, falls between the five ranges shown in the second graph.



The data for average ammonium concentration vary over time, though a trend has been maintained over the last two years. The percentage of monitoring stations recording low concentrations ($<40 \mu\text{g/l N}$) decreased to 40.1% in 2009 and to 29.4% in 2010. The percentage of monitoring stations recording medium concentrations increased, while the percentage of stations recording high ammonium concentrations ($>780 \mu\text{g/l N}$) decreased, falling to 8.1% in 2009 and 7.1% in 2010.

NOTES

- The National Water Quality, Sewerage and Treatment Plan 2007–2015 was approved by the Council of Ministers in June 2007.
- Biological Oxygen Demand, also referred to as Biochemical Oxygen Demand (BOD), is used as a parameter to measure the quantity of matter liable to be consumed or oxidised by biological means within a liquid sample and is used to establish the degree of pollution. This is normally measured after 5 days (BOD_5) and is stated in $\text{mg O}_2/\text{litre}$. It should not be confused with Chemical Oxygen Demand (COD), the parameter used to measure the quantity of organic matter in a liquid sample liable to be oxidised by chemical means.
- Ammonium (NH_4^+) is the monovalent cation formed from ammonia. It is one of the substances in urine, along with urea, sodium and chlorine.
- At room temperature, ammonia (NH_3) is a colourless gas produced naturally by decomposing organic matter. It is also generated industrially to make fertilisers, textiles, plastics, explosives, paper, foodstuffs, beverages, cleaning products and coolants, among other products.

SOURCES

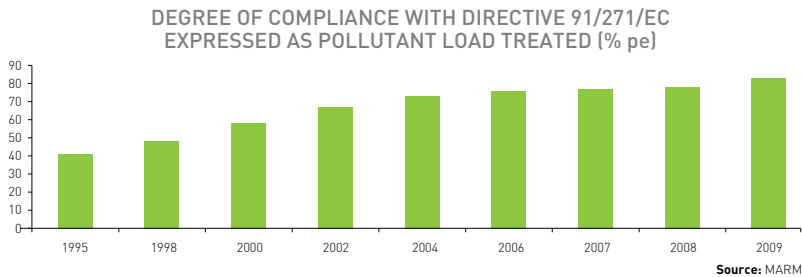
- Data provided by the Sub-Directorate-General for Integrated Public Water Resource Management. Directorate-General for Water: MARM.

FURTHER INFORMATION

- <http://www.marm.es>
- <http://www.eea.europa.eu>

Treatment of urban wastewater

In 2009, treated pollutant load compliance, expressed as a percentage of population equivalent, stood at 83%



In 2009, treated pollutant load compliance in accordance with Directive 91/271/EEC reached 83%. In more than half of Spain's autonomous communities, compliance stood at over 90%, while in three of them it reached 100%.

The National Water Quality, Sewerage and Treatment Plan (PNCA) 2007–2015 defined the sewerage and wastewater treatment measures required to achieve the targets set for 2015 by the Water Framework Directive.

The PNCA is implemented through collaboration agreements and protocols signed with regional governments that provide the basis for attainment of the environmental targets set by the WFD. In 2009, the MARM signed collaboration agreements and protocols with the Regional Governments of Galicia and the Balearic Islands, with the Autonomous Cities of Ceuta and Melilla, and with Madrid City Council.

MAIN VARIABLES USED TO ESTIMATE DEGREE OF COMPLIANCE WITH DIRECTIVE 91/271/EC (2009)

2009	Load (p-e)	No Agglomerations	Pollutant load compliance (p-e)	Pollutant load compliance %	No Agglomerations compliance	Agglomerations compliance %	Pollutant load no compliance (p-e)	Pollutant load no compliance %	No Agglomerations no compliance	Agglomerations no compliance %
TOTAL ESPAÑA	68,772,103	2,320	56,931,125	83%	1,253	54%	11,840,978	17%	1,067	46%

Notes: UA: urban agglomerations

Source: MARM.

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 discharges 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. Its aims 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

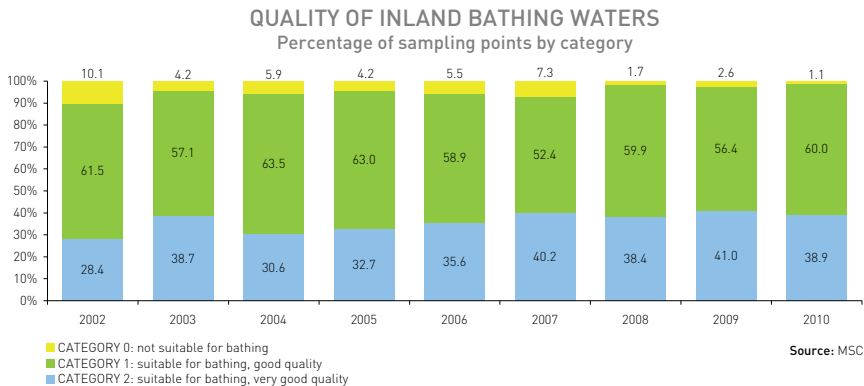
- Data provided by the Directorate-General for Water, Sub-Directorate-General for Infrastructure and Technology. MARM.

FURTHER INFORMATION

- <http://www.marm.es>
- <http://water.europa.eu/en/welcome>

Quality of inland bathing waters

Inland bathing water quality continued to increase, with just 1.1% of water being classified as not suitable for bathing



In recent years, the quality of inland bathing waters has remained stable with about 60% of waters suitable for bathing being classified as good quality. Bathing waters classified as very good quality have also remained stable at around 40%, while bathing waters classified as not suitable for bathing have decreased dramatically and are now well below the 10% recorded in 2002.

In the 2010 bathing season, the quality of inland bathing waters improved on the previous year, with the percentage of waters not suitable for bathing dropping to 1.1% and the percentage of waters classified as good quality rising to 60%. This increase was due to the decrease in waters not suitable for bathing, and to the percentage of waters classified as very good quality falling to 38.9%.

In compliance with reporting obligations set by the EU and other international bodies, the Spanish Ministry of Health, Social Policy and Equality created the National Bathing Water Information System (NAYADE). This is a health and environmental information system that collects data from inland and coastal beaches in Spain to monitor bathing water quality. Since January 2008, this data has been published on the Internet. The aims in creating the NAYADE include giving citizens access to information on bathing zones and the quality of bathing waters; facilitating co-ordination of hygiene monitoring programmes to prevent possible health risks associated with bathing waters; and complying with the reporting obligations set by the EU and other international bodies.

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 carried out by regional governments and the Autonomous Cities of Ceuta and Melilla in accordance with Royal Decree 734/88 of 1 July.
- 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 (excellent, good, sufficient and poor), 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 the current season together with the data for the last three years. The new classification is as follows: poor, sufficient, good and excellent. However, classification in accordance with the new categories cannot be carried out until the 2011 bathing season, when it will also include the data for the previous three years (2008, 2009 and 2010). Therefore, the European Commission, via the Committee for the Adaptation to Technical Progress of Directive 2006/7/EC, established a transitional period in which the previous classification will be used. This will be adapted to the current parameters and will add measurement of faecal coliforms to that of *Escherichia coli* and measurement of faecal streptococci to that of intestinal enterococci.
- The Hygiene Classification of Bathing Water at Sampling Point follows the criteria below:
- CATEGORY 2: Water suitable for bathing, very good quality. Such water simultaneously meets the following conditions:
 1. At least 95% of samples must not exceed the mandatory value for *Escherichia coli*.
 2. At least 80% of samples must not exceed the guide value for *Escherichia coli*.
 3. At least 90% of samples must not exceed the guide value for intestinal enterococci.
- CATEGORY 1: Water suitable for bathing, good quality. Such water meets condition 1) of Category 2, but not conditions 2) and/or 3) of Category 2.
- CATEGORY 0: Water not suitable for bathing. Such water does not meet condition 1) of Category 2.

SOURCES

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

FURTHER INFORMATION

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

