

PETI Fact-finding visit to Mar Menor, Spain

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The Mar Menor is a saltwater lagoon of the Mediterranean Sea located in the Region of Murcia, in south-eastern Spain. It is the largest Spanish *albufera*, with environmental values that have led it to be granted numerous protection statuses, including designation to the Ramsar list (a list of Wetlands of International Importance).

In autumn 2019 and summer 2021, tons of dead fish appeared on its shores, due to episodes of anoxia associated with the deterioration of the ecological state of the lagoon, which is severely affected by a process of eutrophication. According to the OECD eutrophication is the process of enrichment of water by nutrient salts that causes structural changes to the ecosystem, such as increased production of algae and aquatic plants, depletion of fish species, general deterioration of water quality and other effects that reduce and preclude use.



Spain

The [Kingdom of Spain](#) is the second biggest country of the European Union, and with more than 47 million citizens, it is the fourth most populated. Its territory, with its capital in Madrid, is organised into seventeen autonomous communities, in turn made up of fifty provinces, and two autonomous cities. The Spanish Constitution determines the Parliamentary Monarchy as its political form. Spain has a very diverse climate throughout its territory. The Mediterranean character predominates in almost all of its geography, with arid or semi-arid climates in areas such as Murcia. Spain is a country particularly affected by the phenomenon of drought: during the period 1880-2000 more than half of the years have been classified as dry or very dry.



Spain is committed to the protection of the environment in its legal system, with [legislation](#) such as Law 41/2010 of 29 December 2010 on the protection of the marine environment, Law 21/2013 of 9 December 2013 on environmental assessment, and Law 7/2021 of 20 May on climate change and energy transition. Spain is a country with vast geographical areas that have some form of environmental protection. In 2019, more than 40% of its land and sea area was protected (27% land area and 13% sea area). Spain's protected areas include 16 national parks, 152 natural parks, 291 reserves (Biosphere Reserves alone occupy 12% of the national territory) and some 800 protected areas of varying degrees. The Mediterranean country is also part of many [international conventions and agreements on the environment](#), such as the Barcelona Convention, the Berne Convention, the Bonn Convention, the Convention on Biological Diversity (CBD), the OSPAR Convention and the Ramsar Convention.

The region of Murcia

The [Region of Murcia](#) is a Spanish uni-provincial autonomous community, located in the south-east of the Iberian Peninsula, bordering Andalusia, the Valencian Community, the Mediterranean Sea and Castilla-La Mancha. Its capital is the city of Murcia. As single-province region, it is the 9th largest in Spain in terms of surface area and 10th in terms of population. With 11,313 km², it is the 9th largest region in Spain in terms of surface area and represents 2.9% of the national surface area. The total population of the Region of Murcia was 1,518,486 inhabitants in 2021, of which just under a third live in the capital. As a province, it is the 7th most populated of the country's 50 provinces.

The region is one of the [largest producers of fruit, vegetables and flowers in Europe](#), with important vineyards which produce wines with Designation of Origin. It also has an important tourist sector, concentrated on a coastline with numerous unspoilt areas (many of which are under threat) and the salt lagoon of the Mar Menor, whose special ecological and natural characteristics make it a unique natural site. Its industry stands out for the petrochemical and energy sector, centred in Cartagena, and the food industry.

Climate is one of the main factors that determine the natural runoff of the Murcian territory, which is nowadays considerably altered by regulation and hydraulic development works. At present, the different controls and planning installed on the [Segura River](#), from the headwaters to the Mediterranean, have transformed the hydrology considerably. The Segura River is the most fully regulated and exploited of all major Spanish rivers. The Segura is both the symbol and the essential reality of the Murcian orchards. The Murcian economy is based on irrigation and on industry and mining in the southern strip. For this reason, the population guidelines are determined by irrigation and by the ports, industry, mining and tourism on the coast.

Mar Menor and its value

The Mar Menor is an area of great ecological, geological and scenic importance. As stated by the [Dirección General del Mar Menor](#), a regional government body, its peculiar characteristics make it a place of refuge and breeding for dozens of seabirds and other living creatures that inhabit its waters, islands and shores.

The Mar Menor is the largest saltwater lagoon in Europe, with a surface area of 170 km², a coastline of 73 km and a maximum depth of seven meters. It is a place of vital natural importance. Its surrounding areas are particularly rich in landscape values and it is an area where up to ten approved environmental protection figures converge. It is also a protected area in the Natura 2000 Network, classified as a Special Area of Conservation and Special Protection Area for Birds (SPA). Within the SPA is the Protected Landscape "Open Spaces and Islands of the Mar Menor".

In addition, the Mar Menor has been a [Wetland of International Importance \(WII\) since October 1994](#), according to the Convention on Wetlands of International Importance (Ramsar Convention), and is a

Specially Protected Area of Mediterranean Importance (SPAMI) included in the site called "Area of the Mar Menor and Eastern Mediterranean Zone of the coast of the Region of Murcia". This saltwater lagoon and its associated wetlands are also a Wildlife Protection Area, and once again it is a Special Area of Conservation, with three marine and nine terrestrial habitats of Community interest.

The Mar Menor is [home to a rich biodiversity](#) of marine and terrestrial species. Some are of enormous biological importance as they are endemic or in danger of extinction. In addition to its undoubted zoological values, there are also botanical values, as its flora forms an important ecosystem and is of vital importance for many marine species which find an ideal place here to live and close their life cycles. All this is the result of the great variety of different habitats surrounding the lagoon.

General decline and specific disastrous events

According to the [executive summary titled "Analysis of solutions for zero discharge into the Mar Menor from Campo de Cartagena"](#) published by the Ecological Transition Ministry in Spain, the events and circumstances that have led to the current state of the Mar Menor and Campo de Cartagena are as follows (in chronological order):

- Before the current crisis, the Mar Menor had been under pressure from metal mining, with massive dumping at first and drainage of residual mining structures later on, as well as urban development activity and tourist infrastructure (housing developments, artificial beaches and marinas). The development of La Manga not only inaugurated a model of excessive urban planning in the area - the number of ports per kilometre of coastline is almost five times higher than in the Balearic Islands - but also had a decisive impact on the lagoon's interior.

- In addition to the sewage discharged over the years and the increase in tourist pressure, there was a specific event that led to the first major change: [the widening and dredging of the El Estacio channel in the early seventies](#). This introduced a new type of algae and altered the salinity, irreversibly changing the nature of the seabed and the communities that inhabited it, as well as the colonisation of other species at the bottom of the lagoon.

- In the 1980s, once the Tagus-Segura water transfer system was in operation, there was an increase in water that was being imported into the system for irrigation in the Campo de Cartagena. This contributed to the transfer of pollutants from urban waters. Consequently, the contribution of nutrients to the lagoon increased the concentrations of these substances in the water column.

- In the 1990s, nitrate concentrations in the lagoon water were still low and remained below 0.06%, contrasting with higher values of phosphates. Nitrates entered the lagoon via runoff, mainly in winter, while phosphorus entered via urban discharges, mainly in summer. In the years 2010 and 2012, high nitrate levels were found along the western shore of the lagoon, mainly associated with the discharge from the Albuñón watercourse. Nitrate concentration has since increased as a consequence of the intensification of irrigation and fertilisation.

- In mid-2015, a progressive alteration occurred in the lagoon which made it reach a state of eutrophication "in equilibrium". An invasive algae covered more than 80% of the bottom of the lagoon, favouring high organic matter content in the sediment and low oxygen concentrations. The high biomass allowed the lagoon to resist the eutrophication processes, as excess nutrients were partially removed from the water column and stored in the sediment.

- According to Miguel Ángel Esteve Selma, Professor of Ecology in the Department of Ecology and Hydrology at the University of Murcia, the [present crisis and its most recent events have its origins in the irrigation of](#)

most of the Cartagena countryside following the aforementioned Tagus-Segura transfer in the early 1980s. In successive periods and with varying degrees of legality, irrigation increased until it approached 60,000 hectares, some of them illegal. Each hectare of lagoon is influenced by four hectares of intensive irrigation. Fertilisers (nitrates and phosphates) are discharged into the cultivated plots, but some of them end up in the lagoon by various routes and eutrophicate (producing an overabundance of nutrients) its waters. It is estimated that 85% of the total nutrients reaching the Mar Menor originate from industrial agriculture.

The [causes of the worsening of the lagoon's state](#) can be summarised as follows:

- A "Mediterraneanisation" of the waters of the Mar Menor. The widening and dredging of the Estacio channel in the early 70s to allow boats from the Mediterranean to enter the lagoon, radically altered the salinity indexes and temperature of the waters.
- The lagoon experienced a loss of surface area and depth due to the dragging of sediments from mining activity and deforestation through the watercourses that flow into the Mar Menor.
- Contamination caused by nutrients, mainly nitrates, from the expansion of irrigated agriculture around the lagoon that are dragged through the streams or arrive through underground contributions from the Campo de Cartagena aquifer. This causes an increase in the concentration of organic matter, especially microalgae, accelerating the processes of eutrophication.
- Discharges of agricultural run-off water (saturated with nitrates) from coastal municipalities, especially through the so-called Rambla del Albujón (a watercourse).
- Urban saturation of the coasts and alteration of natural conditions by road construction, dredging of ports, canals, artificial restoration of beaches and tourism-related infrastructure.
- Contamination by hydrocarbons from motor boats and the removal of seabed by the fastest boats, such as jet skis.
- Changes in ecosystems. The aforementioned changes in the environmental conditions of the lagoon have caused enormous transformations in the ecosystems, species and fishery resources. Formerly common species have disappeared or have been extraordinarily reduced, while invading species have spread massively, turning into plagues.
- Invasive species. Since the opening of the Estacio channel and the massive influx of water from the Mediterranean Sea, some non-Mediterranean species have invaded the area. For example, the blue crab originating from the American Atlantic coasts.
- Mass mortality of marine fauna in 2019 and 2021. The degradation of dead organic matter in this large lagoon, itself a consequence of the long eutrophication described above, caused phenomena of anoxia (lack of oxygen) in the northern basin of the Mar Menor, with thousands and thousands of fish and crustaceans dying on the shores due to a lack of oxygen in the water.

Restoration efforts and actions undertaken by the government, the judiciary and the European Commission

National Government

The [national Government will invest EUR 484 mln \(previously EUR 382 mln](#), after which a 26,7% increase was added) to save the Mar Menor until 2026. In November 2021, the Framework of Priority Actions to Recover the Mar Menor was presented. According to the Ministry for the Ecological Transition, it outlines projects and interventions aimed at recovering the biological integrity of the lagoon, helping to reorganise the socio-economic uses of its surroundings, and making them more compatible with the preservation of the natural capital of this unique enclave. The plans will be executed in different phases until 2026. They include a range of [short and medium-term measures in essential areas](#) such as the management of the public water domain, the environmental restoration of the lagoon perimeter with 'green' solutions, reduction of the pollution load of the waters that end up in the lagoon with improvements in sanitation, purification and flood risk management, and conservation of the rich marine and terrestrial biodiversity. As a result of a subsequent participatory process, new projects were incorporated representing a significant increase in the initial budget (+ EUR 102 mln).

One of the pillars of the Framework of Actions are measures to control the public water domain by tackling polluting discharges from illegal irrigation and other activities - urban, tourist, mining, etc. This includes reinforcement of surveillance and inspection by the water authority, the Confederación Hidrográfica del Segura (CHS), cutting off of supplies to farms without irrigation rights, reviewing authorisations for waste water discharges, and controlling livestock farms. The plans also include measures to restore the original drainage network of the Campo de Cartagena basin, which is important for reducing runoff and flooding and, with it, the nitrate and sediment inputs that are largely responsible for the eutrophication process suffered by the Mar Menor.

Another central area of action is the restoration and environmental improvement of the lagoon's perimeter strip with nature-based solutions - filters and green infrastructures - as a protective belt, creating a buffer zone of at least 1,500 metres around the lagoon. This also includes actions to regenerate abandoned mining sites and degraded soils in the mining basins of La Unión and Cartagena, a source of heavy metals that are dragged into the Mar Menor. A total of EUR 140 mln will be allocated to this line, EUR 51 mln of which are included in the 2022-2023 budgets.

Likewise, the MITECO's programme of actions in the Mar Menor highlights a special way to manage the risk of flooding in the riverside municipalities and the drainage and purification in the whole of the catchment basin. The programme also includes the renovation and improvement of the Rambla del Albuñón watercourse in two phases. This is the chapter with the highest budget estimate, EUR 167.40 mln until 2026.

Protection of the inner shore of the Mar Menor and the Mediterranean shore, redefinition of the public maritime land domain (DPMT), removal of installations and recovery of illegal occupations, as well as the conservation of terrestrial and marine biodiversity are other action guidelines that have been activated.

The new projects and actions represented in the latest budget increase are concentrated in the sections dedicated to the restoration and environmental improvement of the Mar Menor basin through nature-based solutions (EUR 67.9 mln), to flood management, and to actions to reduce the pollution load (EUR 14.6 mln). For example, the measures for the restoration of ecosystems on the perimeter of the Mar Menor and the creation of the green belt are substantially increased, increasing the estimated budget from EUR 32 to 52 mln. The measures for sanitation and purification are reinforced with an additional EUR 20 mln to support the local councils in the improvement of the sanitation networks and systems that prevent discharges into the Mar Menor or the aquifers.

Another part of this budget increase, around EUR 20 mln, will be allocated to actions specifically aimed at farmers in the Campo de Cartagena. There will be a public call for proposals as a system of environmental incentives complementary to the CAP to help reduce nitrate pollution at source and to also facilitate adaptation to climate change with nature-based solutions. Among the proposals eligible for funding under this scheme are: conservation agriculture practices, the reduction of runoff and erosion on plots and other practices that allow the recovery or improvement of environmental services in the Mar Menor watershed.

Regional Government

Among the [urgent steps](#) that need to be taken at the regional level are the following eight measures, which practically mirror the Government's aforementioned proposal:

- Removal of vegetal biomass from the Mar Menor in order to protect its ecological status and to avoid feeding the eutrophication cycle. In the period 2017-2021, almost 7,000 tonnes have been withdrawn.
- Creation of a register of endangered, singular and/or threatened species of the Mar Menor, and a plan to protect them.
- Denitrification through Bioreactors and Green Filters, to reduce the amount of nutrients in its waters.
- Research, execution and testing of boreholes to study the geological state and quality of groundwater in the area surrounding the Mar Menor.
- Design of a reserve and breeding program of autochthonous filter feeder species.
- Continuous environmental monitoring and follow-up of the ecological and environmental parameters of the Mar Menor, with special emphasis on the collection of physical-chemical data on the water and the evolution of different populations of flora and fauna that normally inhabit the lagoon and are considered "indicators" of the quality of its waters.
- Start-up of the development of pilot tests for oxygenation and water column stratification breakage, which are intended to provide a solution to possible local episodes of anoxia.
- Launching the Marchamalo saltworks rehabilitation project.

In the same vein as the national government, the [regional government recently announced its recovery projects budgeted for 2022, amounting to EUR 85 mln](#). Following a meeting with the European Commissioner for the Environment, Oceans and Fisheries, Virginijus Sinkevicius, the President of the Region of Murcia, Fernando López Miras, has proposed the creation of an "action plan to help the Mar Menor" as well as the creation of a monitoring and advisory committee led by the European Union to evaluate its results. This would be an advisory body that would depend "exclusively" on the European Union. Its main task would be to "monitor the actions" carried out to improve the situation of the Mar Menor and the effectiveness of these actions within the framework of the "common and shared objective of recovery" of the lagoon.

Judiciary

As regards the efforts of the Spanish judiciary, the [High Court of Justice of the Region of Murcia ordered in an Order of November 2021](#) the restoration to its natural state of an area of 4.91 hectares cultivated with trees in production, specifically citrus trees, in Zone 1 of the Law on the recovery and protection of the Mar Menor. The unlawfully irrigated land must be restored to its natural state, which is justified for reasons of

environmental protection, in the context of the regional competence to control pollution caused by nitrates of agricultural origin.

Until December 2021, the Community had initiated 171 cases involving 2,807 hectares. The procedure was completed in 10 cases and a total of 158.86 hectares was restored. The water authority (CHS) indicates that there are more than 8,500 hectares of illegally irrigated land in the Campo de Cartagena. "Not even 300 have been returned to their initial dry land situation, the degree of application of the law is minimal, derisory", according to Pacto por el Mar Menor, a platform of organisations and persons fighting for a clean Mar Menor.

European Commission

The European Green Deal sets as its ambition an EU with zero pollution, which benefits public health, the environment and climate neutrality. Under the Nitrates Directive (Council Directive 91/676/EEC), Member States should monitor their waters and identify those affected or likely to be affected by pollution caused by nitrates from agricultural sources. They are also required to designate areas of land that drain into these waters as Nitrate Vulnerable Zones, and set up appropriate action programmes to prevent and reduce the nitrates pollution. The Nitrates Directive aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices.

After a thorough follow-up to the situation, the Commission sent a Letter of Formal Notice to Spain in November 2018 and a Reasoned Opinion in June 2020, highlighting Spain's failure to comply with the Nitrates Directive requirements. In December 2021, the [Commission decided to refer Spain to the Court of Justice of the European Union](#) for poor implementation of the Nitrates Directive.

The Commission stated that "Despite some limited progress, Spain must still take additional measures to prevent eutrophication for the whole country since the measures established to date have failed to achieve the objectives of the Directive. In addition, it should review and further designate Nitrate Vulnerable Zones in seven regions, include all the necessary mandatory elements in the Action Programmes for five regions and take additional measures for the four regions where the measures set in place have proven insufficient to achieve the objectives of the Nitrates Directive (including Murcia)". The Commission further considered that efforts by the Spanish authorities had to date been unsatisfactory and insufficient and therefore referred Spain to the Court of Justice of the European Union.

The government's argumentation

The [National Government considers](#) that the problem in the salt lagoon is not the result of "a conflict of competences" between administrations, but is the result of "a neglect of competences" by the Government of Murcia, of "years of inaction and permissiveness with actions harmful to the environment" of this natural area. This was explained by Isabel Rodríguez, spokesperson of the Minister for Territorial Policy and Government. Meanwhile, the leader of the Popular Party, Pablo Casado, has insisted that Murcia has no powers to solve the crisis of this lagoon and calls on the Executive to act. For its part, the Murcian Executive has branded as "categorically false" that there is a neglect of the exercise of the competences of the community.

There are guidelines from the central government to enforce the law in the Campo de Cartagena, but these competences "are fundamentally the responsibility of the regional government and in this region there has been an inertia for many years of turning laws into a dead letter", according to Ramón Pagán, spokesperson for Pacto por el Mar Menor, who refers to actions such as regulating the use of fertilisers in accordance with European regulations, which is the responsibility of the Community, and "which nobody here controls". Or compliance with the law on the protection and recovery of the Mar Menor, defining the use that can be

made of the land for agricultural purposes. "This summer we have seen again that in estates where we had already filed complaints for non-compliance with the law, intensive agriculture is being resumed, I am referring to the 1,500-metre exclusion zone".

However, the Regional Ministry assures that under the 2022-2023 inspection plan the number of inspections has increased by 80%, and that compliance with the law "is guaranteed and permanently controlled". It assures that "If any situation outside the law is detected, an inspection and a sanctioning file is opened", "but the competence to grant irrigation rights or prohibit the use of water is the sole and exclusive competence of the Confederación Hidrográfica del Segura (CHS)". Once illegal hectares have been identified, it is the regional government's responsibility to close them. Fernando López Miras, president of Murcia, has announced that the current deadlines for closing illegal farms would be halved. A change which comes five years after the green soup episode. In addition, the Murcian government adopted a ban on the use of inorganic nitrogen fertilisers in the area and established penalties of between EUR 5,000 and 50,000 for those who fail to comply. The ban already affected a strip of about 1,500 metres, the closest to the lagoon (some 1,190 hectares in total), but is now extended to cover some 11,000 hectares.

Farmers' claims

Proexport, an association which includes the large fruit and vegetable companies in Murcia, considers that they are being unfairly attacked, because agriculture is not responsible "for the extreme warming of the water in the Mar Menor, nor for the arrival of 200,000 tourists, nor for the fact that the gullies [channels connecting the Mar Menor with the Mediterranean] are clogged, nor for the fact that the aquifer is sprouting along the entire coastline", as they denounce in a [communiqué](#). However, there is no mention of the problems with fertilisers.

Santiago Pérez Blay, farmer and trustee of the community of irrigators of the Cartagena countryside, acknowledges that nitrates arrive from agriculture, but adds to this the problem of the deficient purification of waste water, which on many occasions flows directly into the Mar Menor. In his opinion, "people have to be educated, not persecuted because there are always ways of getting around the controls. It should be shown through analysis how these nutrients reach the aquifer. Even the two-kilometre strip of land that could not be cultivated when the Tagus-Segura water transfer was approved has disappeared. Now it is cultivated, most of it illegally."

Experts' opinions

But how bad can a wetland like this get? In 2017, Salvador García-Ayllón Veintimilla, professor at the Polytechnic University of Cartagena, published a [study](#) in the scientific journal *Ocean & Coastal Management* in which he compared the Mar Menor situation to that of a famous USA saltwater lagoon, Salton Sea. "To know where the Mar Menor could be in a few years' time, the Salton Sea is a very illustrative case" referring to how the Californian sea became a putrid place, a dead sea full of dead fish.

A very comprehensive [study](#), commissioned by the Confederación Hidrográfica del Segura from the Institute Of Water And Environmental Engineering of the Universitat Politècnica of València, analyses the current situation of the Mar Menor and how to tackle the problem, and offers very detailed solutions.

According to Miguel Ángel Esteve Selma, Professor of Ecology in the Department of Ecology and Hydrology at the University of Murcia, it is urgent to [implement certain measures](#) with an integral modelling of the whole socio-ecosystem (Mar Menor and drainage basin) to improve the state of the lagoon and prevent these episodes from recurring every year. Such measures should aim to:

- Reduce the intensive agricultural surface area, at least the hectares of illegal irrigated land (around 10,000 hectares).
- Reduce nitrate and phosphate inputs per unit of cultivation.
- Re-naturalise the Campo de Cartagena interstitially, by means of hedges, revegetation of boundaries and recovery of watercourses and “ramblas”.
- Remove irrigated land from the periphery of the lagoon and convert it into wetlands to denitrify the discharges from the aquifer.
- Remove nutrients from surface water through serial systems of bioreactors and wetlands.
- Closely monitor the natural recovery of phytoplankton, filter communities and sediments to assess more active restoration options.

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