

# **Fact finding mission to Mar Menor, Spain**

**23th Febraury 2022**

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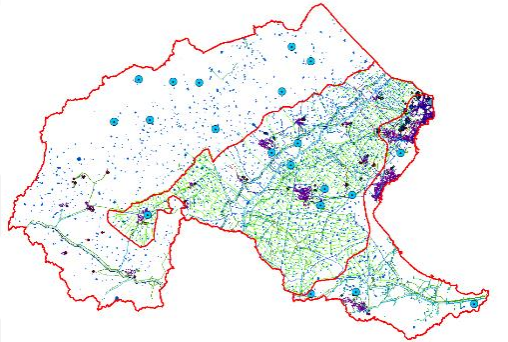
Action 4: Conclusions

## Main pressures of the Mar Menor

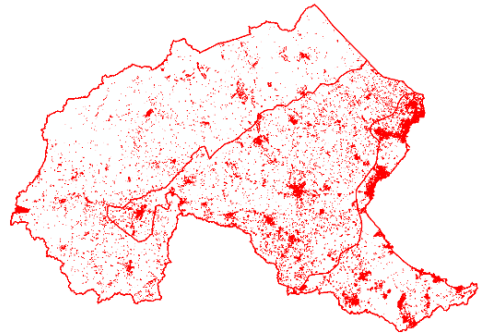
**Antonio Luengo Zapata**

*Regional Counsellor of Water, Agriculture, Livestock, Fisheries  
and the Environment*

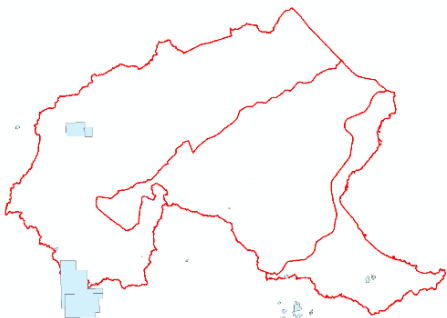
## Main pressures of the Mar Menor



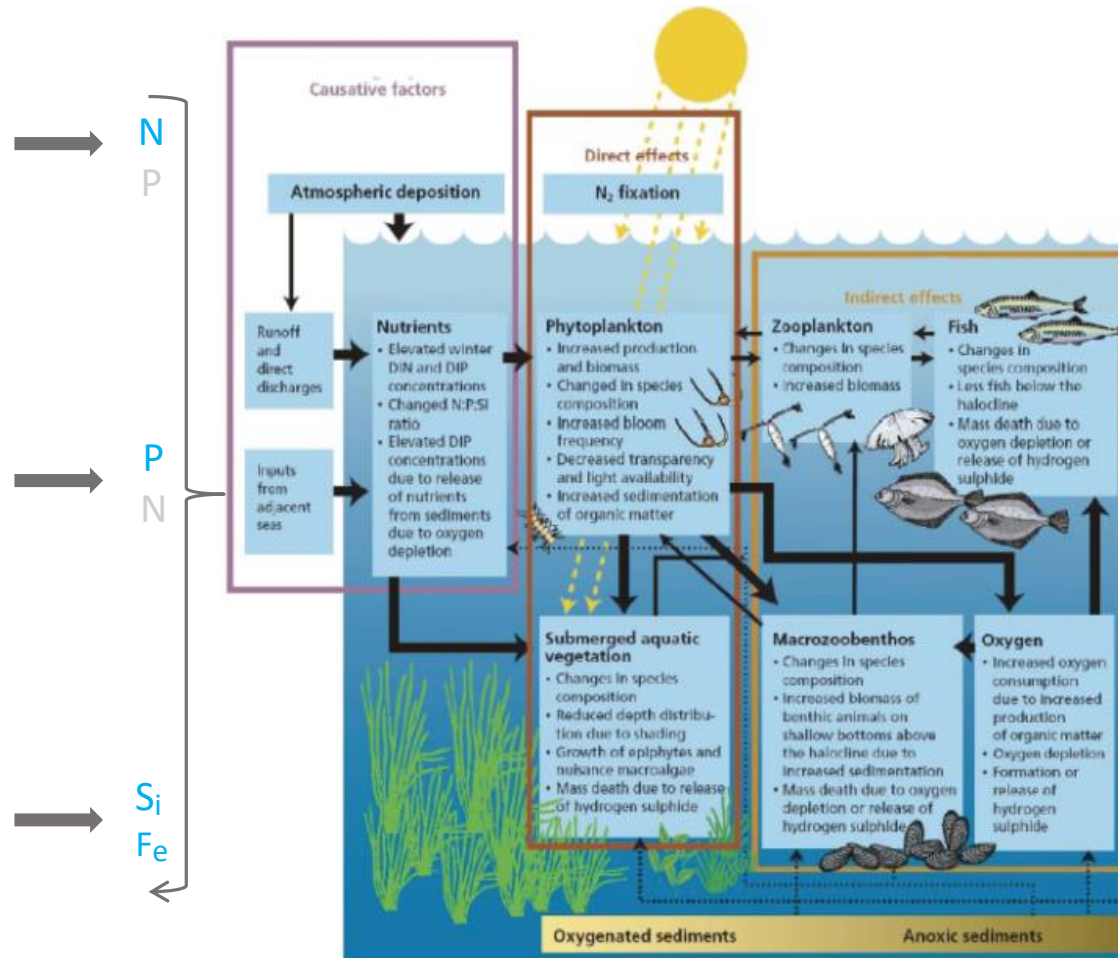
*Agricultural activities and livestock*



*Urban, industrial activities and tourist*



*Mining activities*



Law zones 1/2018

Zones	ha
1	16.476
2	42.782
3	62.297

Law zones 3/2020

Zones	ha
1	16.476
2	105.079



Campo de Cartagena:  
121.555 ha

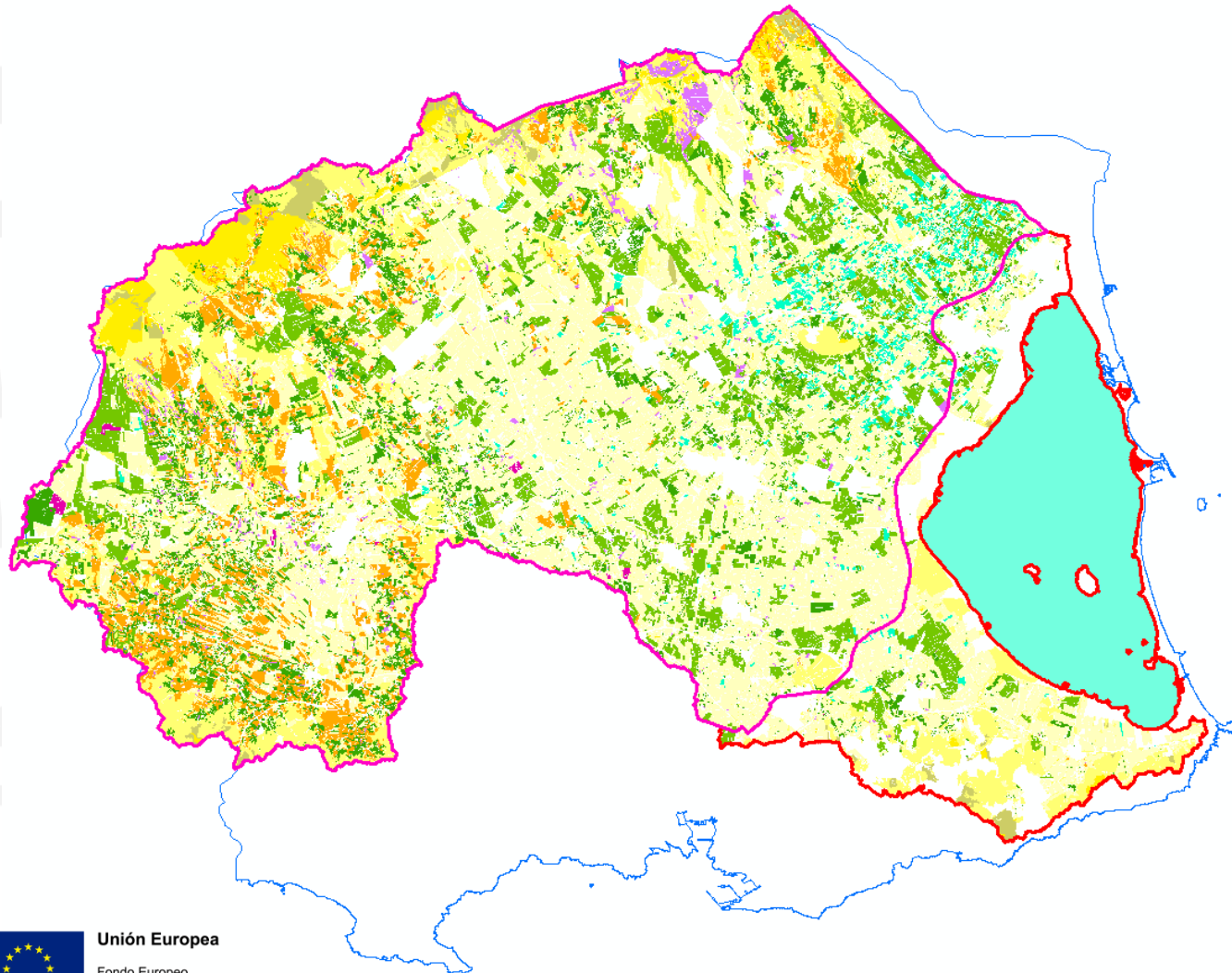


Mar Menor  
Anoxic sediments

Eutrophication crisis: 2016/ 2019/2021



## Agricultural activities



### AGRICULTURAL LAND USE

121.555 ha Law zones 3/2020

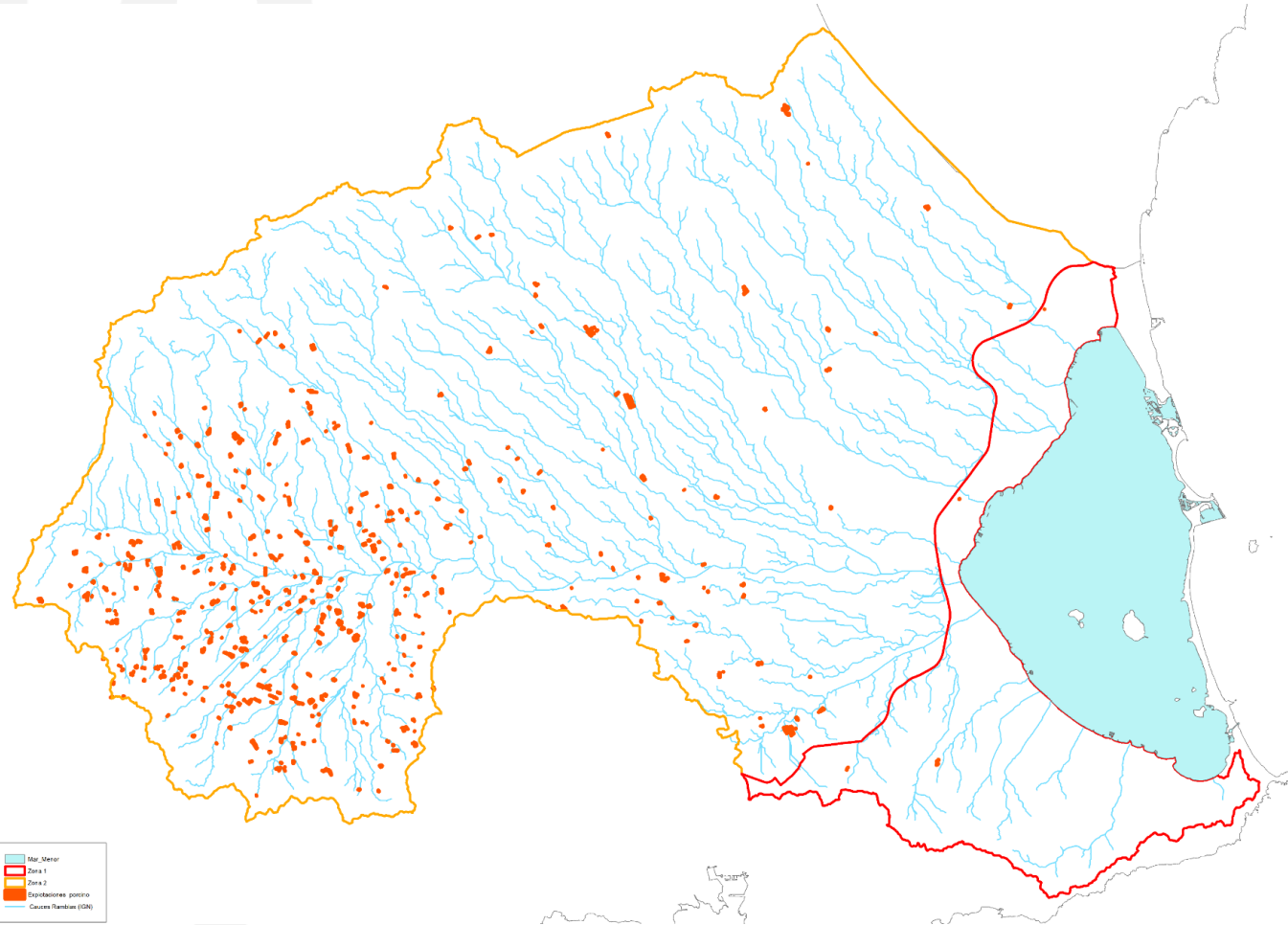
79 230 ha agricultural land use (cadastre data)

55.914 ha irrigation (cadastre data)

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desc\_uso\_s
- CITRICOS
  - CITRICOS-FRUTALES
  - CITRICOS-FRUTALES DE CASCARA
  - FORESTAL
  - FRUTALES
  - FRUTALES-FRUTALES DE CASCARA
  - FRUTOS SECOS
  - FRUTOS SECOS Y OLIVAR
  - FRUTOS SECOS Y VIÑEDO
  - HUERTA
  - INVERNADEROS Y CULTIVOS BAJO PLASTICO
  - OLIVAR
  - OLIVAR-CITRICOS
  - OLIVAR-FRUTAL
  - PASTO ARBUSTIVO
  - PASTO CON ARBOLADO
  - TIERRAS ARABLES
  - VIÑEDO



## *Livestock activities*



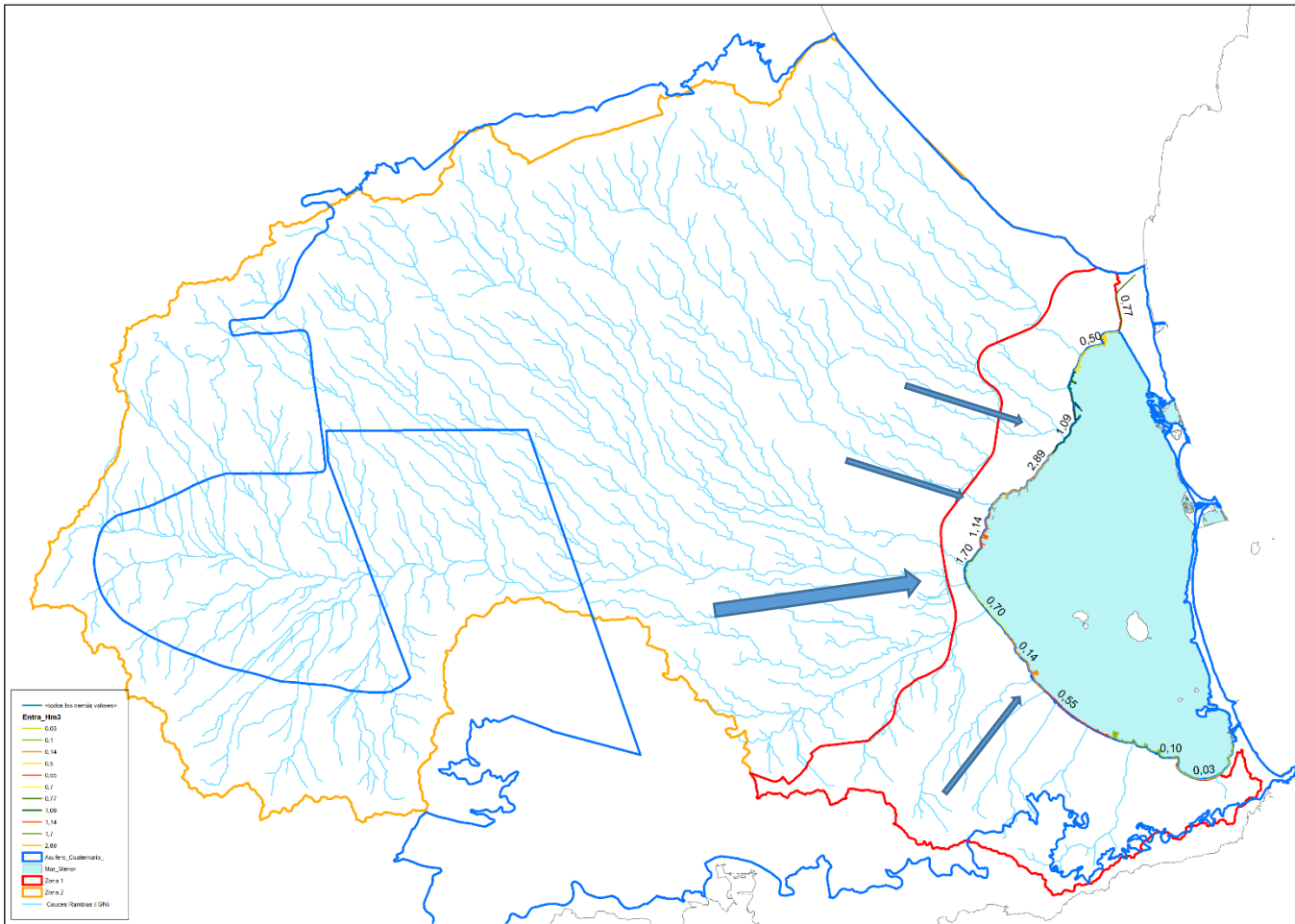
### ■ UPDATE OF THE LIVESTOCK REGISTRY

- Preparation of control panel number of livestock facilities (461 pig farms).
- Preparation of maps of exploitation densities by species.



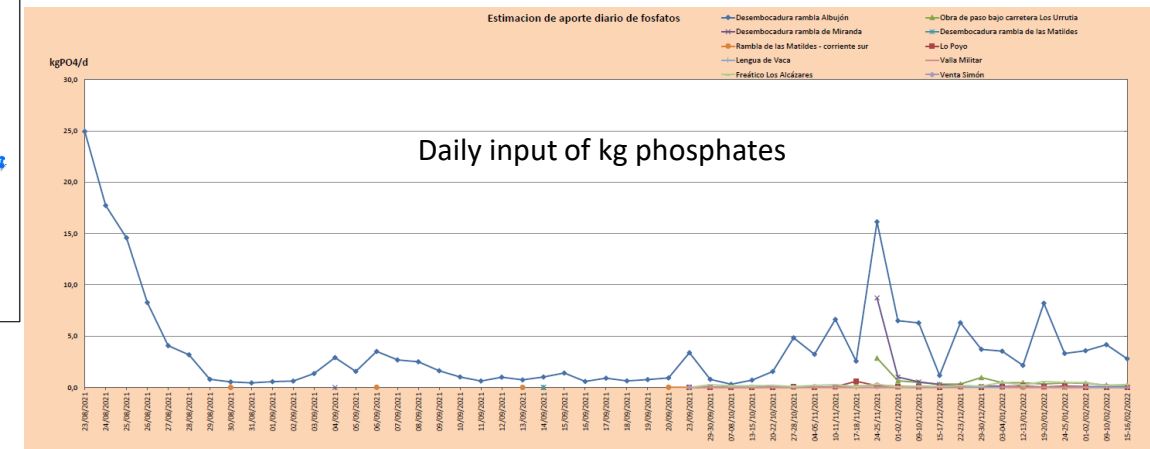
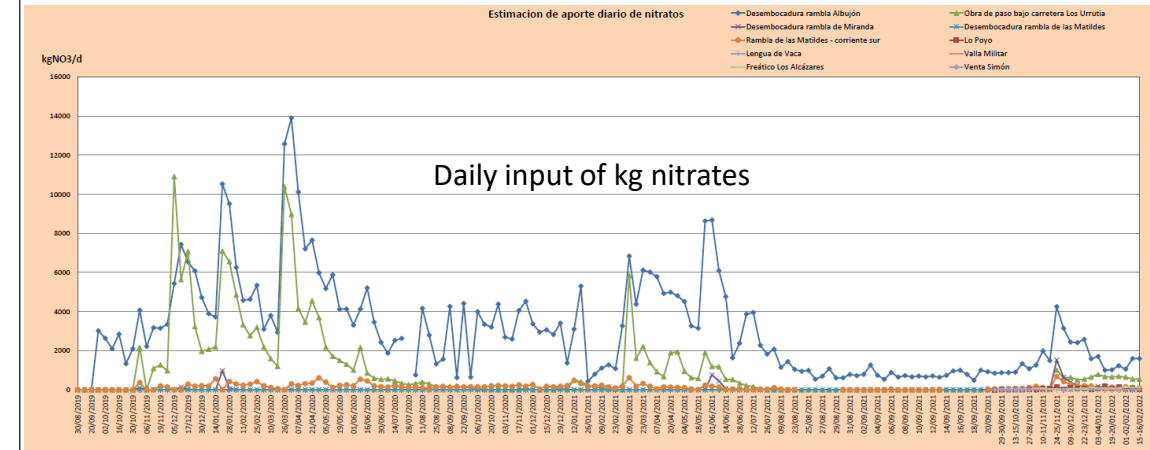


## High piezometric level of groundwater

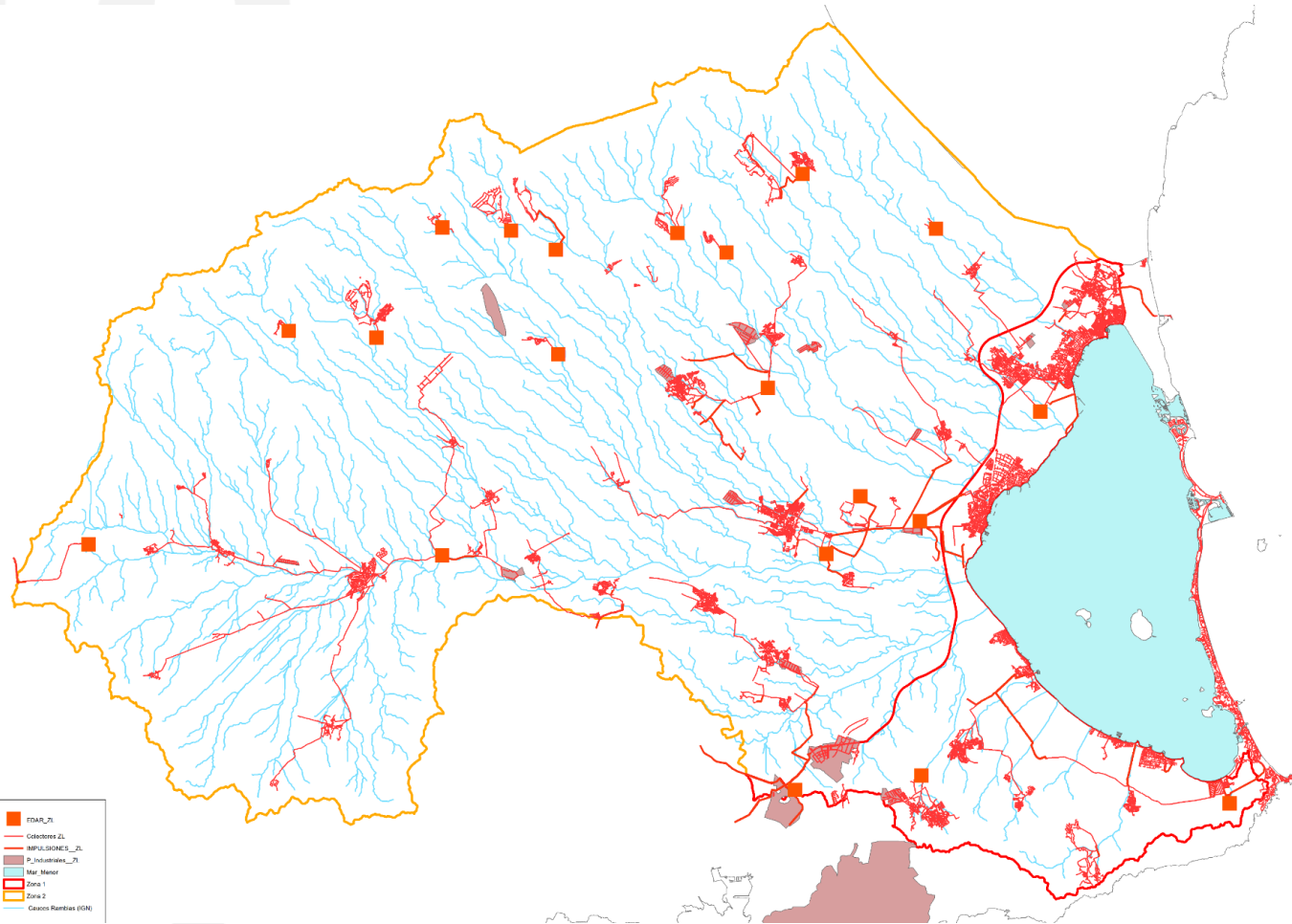


### ■ Piezometric level in the Quaternary aquifer

- Download through the Rambla del Albujón (Nitrates and phosphates)



## *Urban and industrial activities*



### ■ HIGH URBAN DENSITY

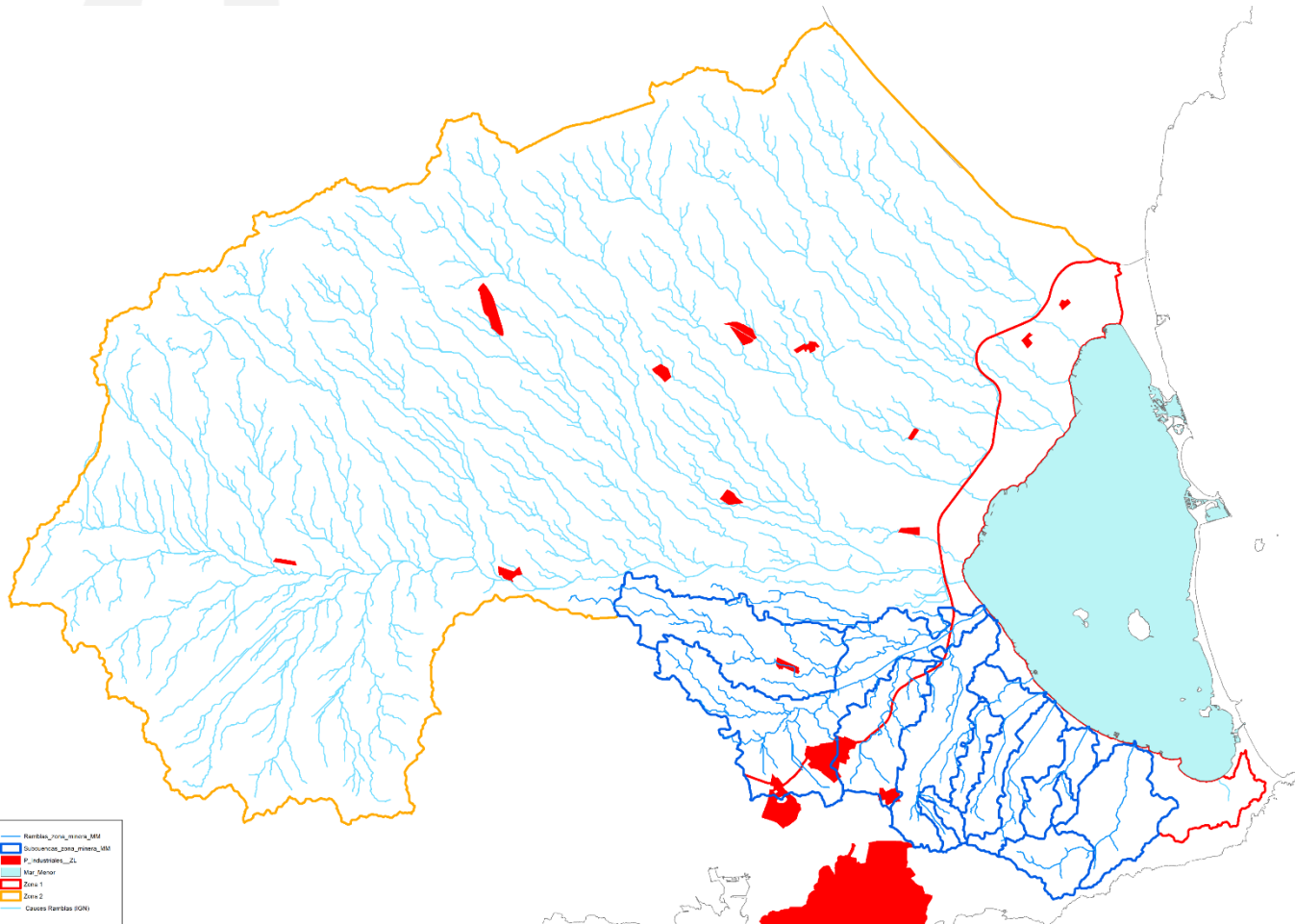
- High impervious ground Surface.
- High population density.
- Very extensive sanitation network.
- High upcoming industrial activity.

18.132 ha urban land and roads

Populación (INE): 397.402 people



## *Mining activities*



### ■ HISTORICAL MINING ACTIVITY

- Monitoring and restoration of the soil surface affected by mining.

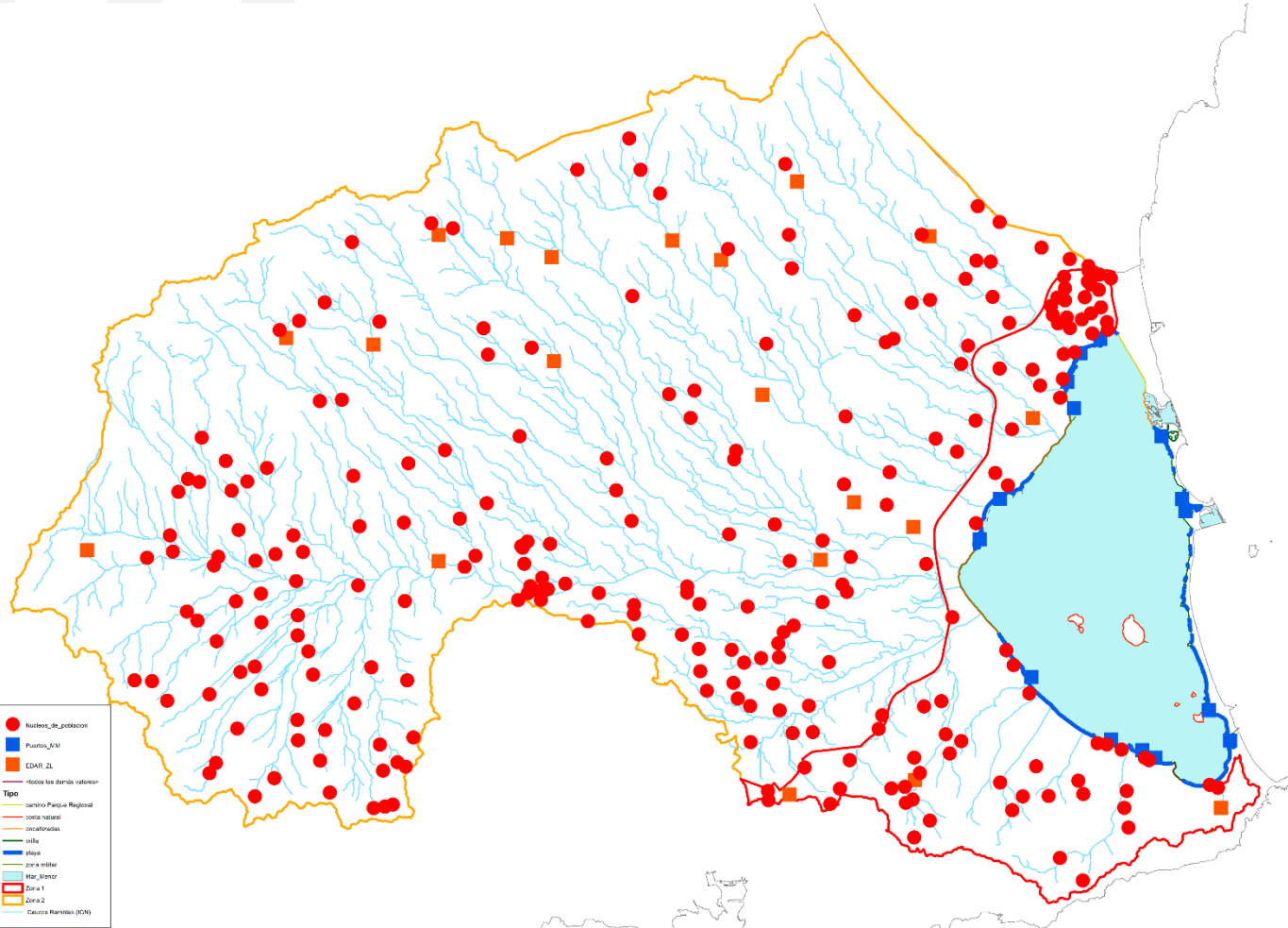




## *Tourist activities*

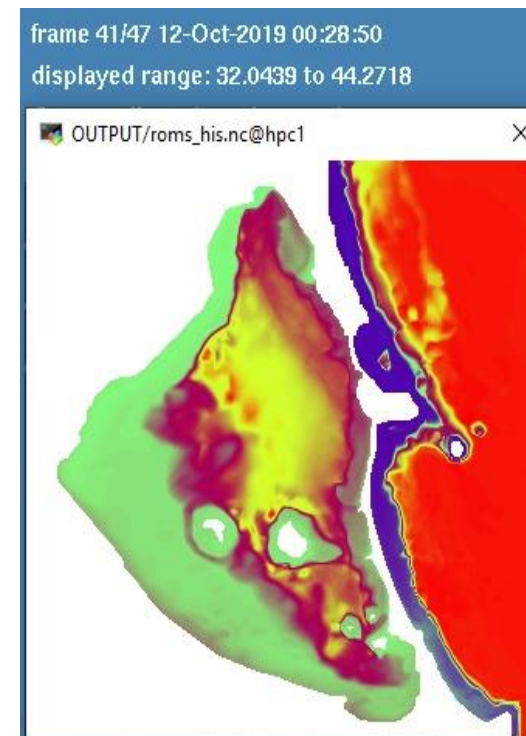
### TOURIST ACTIVITY

- Inventory of tourist places: 11 Ports and beaches.



## ***Eutrophic crisis of the Mar Menor***

- Increased **inflow of surface and subsurface waters** from the catchment.
- **Phytoplankton bloom** in summer 2016 due to eutrophication of Mar Menor waters.
- Relatively rapid **recovery of equilibria**, improving in two years the quality of conditions in the water column, benthic communities and self-regulating mechanisms of chlorophyll and nutrient concentrations.
- In September 2019 the **DANA** (Isolated High Level Depression) and the successive torrential rains aggravated the delicate conditions of the Mar Menor, favoring a very low salinity and the massive proliferation of phytoplankton, due to the huge influx of freshwater with suspended materials and nutrients, and the consequent elevation and recharge of the water table.
- In October 2019 there is a first episode of anoxia (0.3-0.8 mg/L of surface oxygen) that caused the death of fish and crustaceans. **A second episode of anoxia** occurred in the summer of 2021. In both cases, 3-4 tons of organisms were killed.
- Current critical situation of the ecological status of the Mar Menor: **dynamic and spatially heterogeneous eutrophication process**, which can be reversed if drastic action is taken on low salinity and high nutrient concentration water discharges.





## Environmental management of the Mar Menor lagoon with scientific advice and public involvement

**J. Faustino Martínez Fernández**

*Deputy Director of Natural Heritage and Climate Change. Región de Murcia*

*Natura 2000 Network Manager*

# Action 1: Strategies, Plans and Governance

## *The natural wealth of the Mar Menor lagoon*

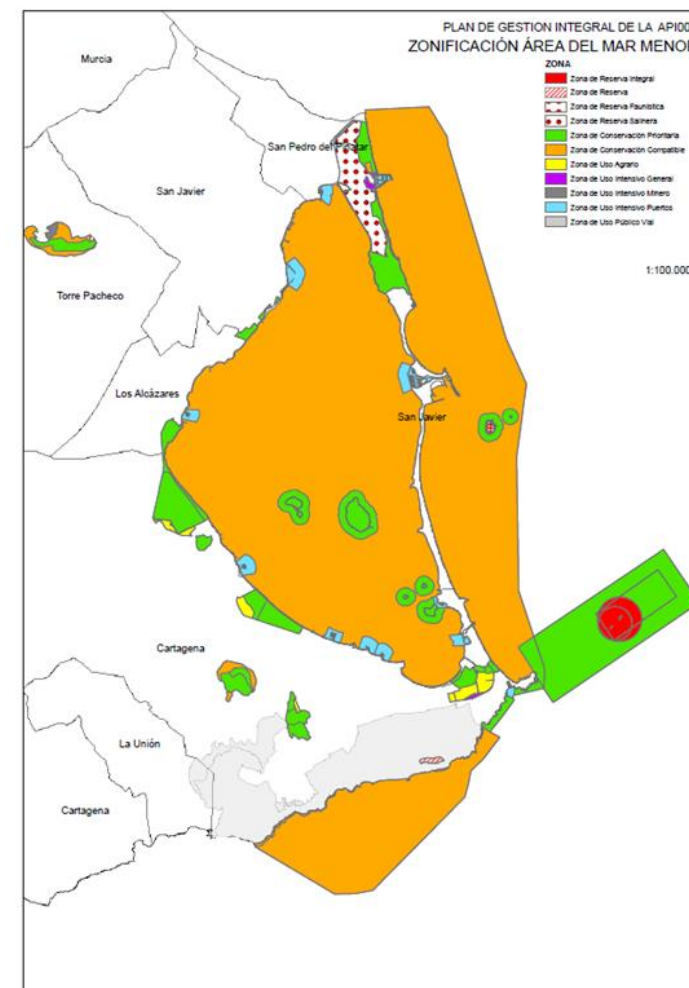
- The **largest salt lagoon in Europe** with a surface area of 135 km<sup>2</sup>, a **coastline of 73 km** and a maximum depth of 7 m.
- Separated from the Mediterranean Sea by the sandy bar of **La Manga**.
- It connects with the Mediterranean Sea through **five gorges or channels**: Charco, Torre, Ventorrillo, El Estacio and Marchamalo.
- It includes **five volcanic islands** : Barón Island, Perdiguera, Ciervo, Sujeto and Redonda.
- It includes the **peripheral wetlands** and the **nearby hills** (Carmolí, San Ginés and Sabinar).
- **21 Habitats of Community Interest**: 3 marine and 18 terrestrial; 6 priority, 10 very rare and 8 rare.
- Numerous **endangered species of flora and fauna**.



# Action 1: Strategies, Plans and Governance

## *The natural wealth of the Mar Menor lagoon*

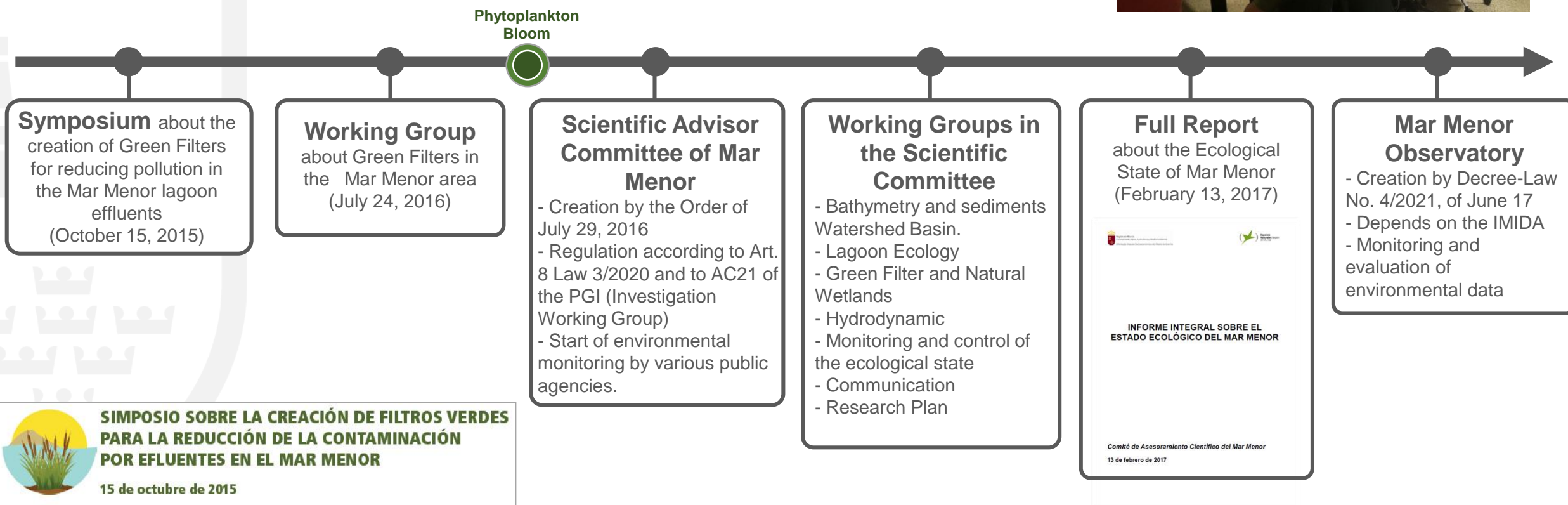
PROTECTION FIGURE	PROTECTED AREAS	
	CODE	NAME
Special Conservation Area (SCA)	ES0000175	Salt pans and sandbanks of San Pedro del Pinatar
	ES6200006	Open Spaces and Islands of the Mar Menor
	ES6200013	Cabezo Gordo
	ES6200030	Mar Menor
Special Protection Area for Birds (SPAB)	ES0000175	Salt pans and sandbanks of San Pedro del Pinatar
	ES0000260	Mar Menor
Protected Natural Area (PNA)	Regional Park	Salt pans and sandbanks of San Pedro del Pinatar
	Protected Landscape	Open Spaces and Islands of the Mar Menor
	Protected Landscape	Cabezo Gordo
International Protected Areas	Wetland of International Importance Ramsar (WII)	Mar Menor
	Special Areas of Mediterranean Importance (SPAMI)	Mar Menor Area and Eastern Mediterranean Coast of the Region of Murcia
Other Protected Areas	Wildlife Protection Area (APFS)	Mar Menor and associated wetlands



# Action 1: Strategies, Plans and Governance

## *Scientific advice*

The actions under development have continuous scientific advice based on the **best available data** from the **environmental monitoring** obtained by Universities, Research Centers and Public Administrations.



# Action 1: Strategies, Plans and Governance

## *Public involvement*

### PUBLIC INVOLVEMENT BODIES

#### **Social Participation Committee of Mar Menor**

*Order of February 28, 2017 and Art. 7, Law 3/2020 - Participation Commission (AC.24ª, PGI Mar Menor)*

#### **Regional Advisory Council for the Environment (CARMA)**

*Decree No. 42/1994, of April 8, which regulates the Regional Advisory Council for the Environment*

#### **Governing Board of the Regional Park San Pedro del Pinatar Salt pans and Sandbanks**

*Natural Resource Management Plan approved by Decree No. 44/1995, of May 26*

#### **Canal Mar Menor**

*(<http://canalmarmenor.es/>) and apps "CONNECTAmbiental Mar Menor" y "Rumbo Mar Menor"*

### PUBLIC INVOLVEMENT ACTIONS

#### *Legitimate and legal actions*

Integral Management Plan (PGI) of the Protected Areas of Mar Menor and the Submerged Coastal Strip

Integrated Management Strategy of the Mar Menor Sociocological System (EGISSEMM)

Zero Discharge Plan (PVO)

Forest Hydrological Plan of the Mar Menor watershed basin

Environmental Recovery Plan of Soils Affected by Mining (PRASAM)

II Program for the control and improvement of rainwater, drainage and WWTP networks in the Mar Menor area. Horizon 2030

Participatory Local Development Strategy for the Local Action Group for Fisheries and Aquaculture (GALPEMUR)

Strategy for Sustainable and Integrated Development "Open La Manga 365" (EDUSI)



# Action 1: Strategies, Plans and Governance

## Administrative coordination



### Interdepartmental Commission of the Mar Menor (Art. 9 Law 3/2020)

- **Coordinate** the organizations of the CARM with competences for the development of projects and actions related to the Mar Menor.
- **Follow-up** of the execution of **the measures** adopted for the recovery of the Mar Menor.
- **Be informed** of the development of **regulations** and plans that are approved in the area of the Mar Menor.

### Inter-administrative Commission of the Mar Menor (Art. 5 Law 3/2020)

- It includes a **Political-Interadministrative Forum** and a **Technical-Adm. Commission**.
- There are representatives of the **State**, the Region of Murcia and the municipalities.
- Aimed at the **coordination** and institutional **cooperation** of public policies and actions related with the Mar Menor.

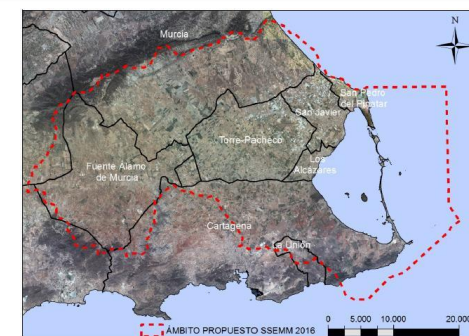
### Convention Region Of Murcia-State (October 4, 2013 – October 3, 2018)

- Signed by the **President** of Region of Murcia and the **Minister** of the Environment.
- Creation of a **Mixed Monitoring Commission**.
- Creation of an **Interadministrative Technical Commission**.



# Action 1: Strategies, Plans and Governance

## *Integrated management strategy of the Mar Menor sociocological system (EGISSEMM)*



- Start of processing in 2014 with a extensive process of **public involvement** in its preparation and in the **Strategic Environmental Assessment**.
- Approved in Decree No. 42/2021, of March 31, according to the Recommendation of the European Parliament and of the Council of May 30, 2002, about the application of **integrated management of coastal areas in Europe**.
- **Backbone** of all current and future planning and management instruments.
- **Roadmap for the political intervention** of the Government of the Region of Murcia, which contains **strategic and operational actions** to be carried out in the Mar Menor **at present and in the future**.



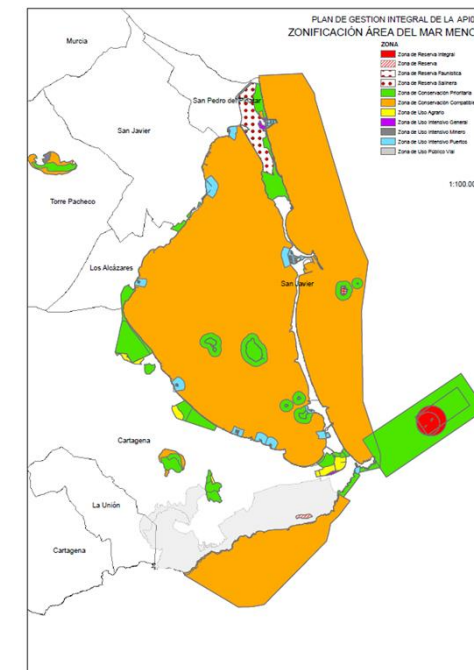
INSTRUMENTS	OVERALL AIM	AREA OF APPLICATION	VALIDITY
<b>Integrated Management Strategy of the Mar Menor Sociocological System (EGISSEMM)</b>	Develop a management model of action in the <b>public administration</b> , adapted to the special characteristics of the Mar Menor Socioecological System, in close <b>inter-administrative cooperation</b> , inspired by governance principles of <b>citizen involvement</b> .	<ul style="list-style-type: none"> <li>- Hydrographic basins flowing to Mar Menor lagoon</li> <li>- Coastal Waters (Water Framework Directive): Mar Menor, Cape of Palos, Cape of Palos –Point of Espada; El Mojón - Cape Negrete; Point of Espada – Cape Negrete.</li> <li>- Protected Areas Natura 2000 Network (marine environment): ES6200029</li> <li>- Special Areas of Mediterranean Importance (SPAMI) Mar Menor Area and Eastern Mediterranean Coast of the Region of Murcia</li> <li>- Cape de Palos and Hormigas Islands Marine Reserve</li> </ul>	Indefinite duration



# Action 1: Strategies, Plans and Governance

## *Integral management plan (PGI) of the protected areas of MM*

- **Approved** by Decree No. 259/2019, of October 10 (BORM No. 242 of October 19, 2019), **in compliance with Directives** 92/43/CEE (habitats) and 2009/147/CE (birds).
- First Nature 2000 Network management **plan without any social actor against** in the Conseil.
- **Two periods of public involvement** (in 2015 and 2016).
- Wide participation of **24503 allegations** from a 2352 complainants.
- It includes **guidelines and regulations** for conservation and environmental management, for the conservation of cultural heritage, for agricultural and farm activities, for professional fishing and marine farming, for hunting, for public use and tourist activities, for road infrastructures, for industry, for energy and mines, for military actions and for urban activities.
- It plans 63 **actions for conservation**. All the measures planned for first and second year are underway, and a large part of them have **already completed**.



INSTRUMENTS	OVERALL AIM	AREA OF APPLICATION	VALIDITY	BUDGET
Integral Management Plan (PGI) of the Protected Areas of Mar Menor and the Submerged Coastal Strip of the Region of Murcia	<b>Preserve or restore</b> the favorable conservation status of the Red Natura 2000 protected areas, and its natural habitats and species.	Protected Natural Areas, Natura 2000 Network Areas and Protected Areas by International Instruments in the Mar Menor area and the Mediterranean Coastal Strip of Región de Murcia	2019-2025	21.915.700 €

# Action 1: Strategies, Plans and Governance

## Law 3/2020, of July 27, of the recovery and protection of Mar Menor

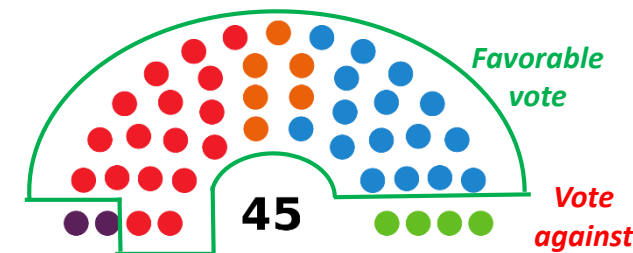
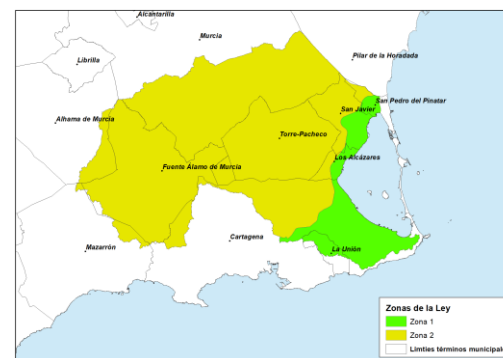
**Regional Council Agreement**  
Nov 2019

**Decree-Law**  
No. 2/2019, of December 26, on the Integral Protection of Mar Menor (BORM No. 298, of 12/27/2019)

**Law 3/2020,**  
of July 27, of the recovery and protection of Mar Menor (BORM No. 177, of 8/1/2020)

**Decree-Law 5/2021,** of August 27, amending Law 3/2020 (BORM No. 200, of 8/30/2021)

Approved almost unanimously by the Regional Assembly (39 of 45 deputies)



- **Improvement of Governance** in the Mar Menor Area.
- **Territorial and landscape** planning and management.
- **Environmental** planning and management of discharges.
- **Agricultural, farm, fishing and mining** planning.
- Management of **port infrastructures** and **navigation**.
- **Penalty and control system**.

INSTRUMENTS	OVERALL AIM	AREA OF APPLICATION	VALIDITY
<b>Law 3/2020, of July 27, of the recovery and protection of Mar Menor</b>	Protection, recovery, development and revaluation of the biological, environmental, economic, social and cultural wealth of the Mar Menor, and the comprehensive and sustainable application of the different <b>public policies</b> in the Mar Menor, attributed to the CARM.	Mar Menor and the municipalities (totally or partially) of San Pedro del Pinatar, San Javier, Los Alcázares, Torre Pacheco, Fuente Álamo de Murcia, Cartagena, La Unión, Murcia, Alhama de Murcia and Mazarrón	Indefinite

# Action 1: Strategies, Plans and Governance

## *Zero discharge plan (PV0)*

- Redacted by the Government of Spain, with the **consensus** of all administrations and civil society.
- The document identify actions to be executes by regional or state Public Administration.
- It analyses **environmental problems and applicable solutions**, aimed at solving the following problems:
  - Arrival of pollutants to the Mar Menor lagoon from the crops of Cartagena.
  - Recovery of the Mar Menor ecosystem.
  - Other problems with incidence in the situation of the Mar Menor area.
- The scientific community has prioritized actions such as 5, 6 and 9, whose objectives are aimed at **reducing the aquifer**, bringing it closer to the historical levels, before the start of the eutrophication process. Also to **prevent the massive entry of water** with nutrients from the groundwater and the watercourse of Albuñón, and **minimize the impact of torrential rains** on the Mar Menor area.



INSTRUMENTS	OVERALL AIM	AREA OF APPLICATION	VALIDITY	BUDGET
<b>Zero Discharge Plan (PV0)</b>	Remove, or reduce as much as possible, the pollution into the Mar Menor.	Mar Menor, its hydrographic basin and the underground water mass of the Cartagena field	Indefinite duration	615.470.000 € (target scenario)

# Action 1: Strategies, Plans and Governance

## *Other plans*

INSTRUMENTS	OVERALL AIM	AREA OF APPLICATION	VALIDITY	BUDGET
<b>Forest Hydrological Plan of the Mar Menor watershed basin</b>	Actions of <b>hydrological-forestry correction</b> aimed at <b>control and regulation the erosion</b> , sediment transport and runoff from the drainage basin to the Mar Menor.	Basin Slope to the Mar Menor	16 years	392.300.000€
<b>Environmental Recovery Plan of Soils Affected by Mining (PRASAM 2018-2028)</b>	Establish a framework of action and preventive policies that includes actions aimed at the <b>restoration and prevention</b> of sites affected by <b>metal mining</b> .	Mining districts of Cartagena – La Unión and Mazarrón	2018-2028	84.887.237€
<b>Program for the control and improvement of rainwater, drainage and WWTP networks in the Mar Menor area. Horizon 2030.</b> (Drainage and purification Second Plan for the Region of Murcia. Horizon 2035)	Improving the state of water masses, through measures aimed at the <b>collection, treatment and discharge of wastewater</b> , both urban and industrial (156 actions in the Mar Menor area).	Mar Menor Area	2020-2030	235.186.261€
<b>Participatory Local Development Strategy for the Local Action Group for Fisheries and Aquaculture (GALPEMUR)</b>	The <b>socioeconomic development</b> of the coastal area of the Region of Murcia, with direct and indirect actions for <b>fishing and aquaculture</b> .	Coastal municipalities of the Region of Murcia	2016-2022	3.049.412€
<b>Strategy for Sustainable and Integrated Development “Open La Manga 365” (EDUSI</b>	The <b>transformation of La Manga</b> into a sustainable tourist center, solving the summer problems of accessibility and mobility, boosting the business fabric and employment to improve the tourist offer throughout the year, as well as the provision of facilities and free spaces.	The area delimited in the urban planning of Cartagena and San Javier, from Amoladeras to Veneziola, including the Salinas de Marchamalo and the Ciervo, Rondella and Sujeto islands, but not the San Pedro Regional Park.	2014-2022	18.750.000€

## Agro-Environmental Unit

**Andrés Martínez Bastida**

*Deputy Director for Control, Prevention and Monitoring of  
Vulnerable Areas*

## Action 2: Strategies, Plans and Governance

### *Protection regulations applicable to the Mar Menor and its basin*

#### **Community**

- **Council of Europe Directive 91/676/EEC** of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources.
- **Directive 2000/60/EC** of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

#### **National**

- **Royal Decree 261/1996**, of February 16, 1996, on the protection of water against pollution caused by nitrates from agricultural sources (**REPEALED**).
- **Royal Decree 47/2022**, of January 18, on the protection of water against diffuse pollution caused by nitrates from agricultural sources.



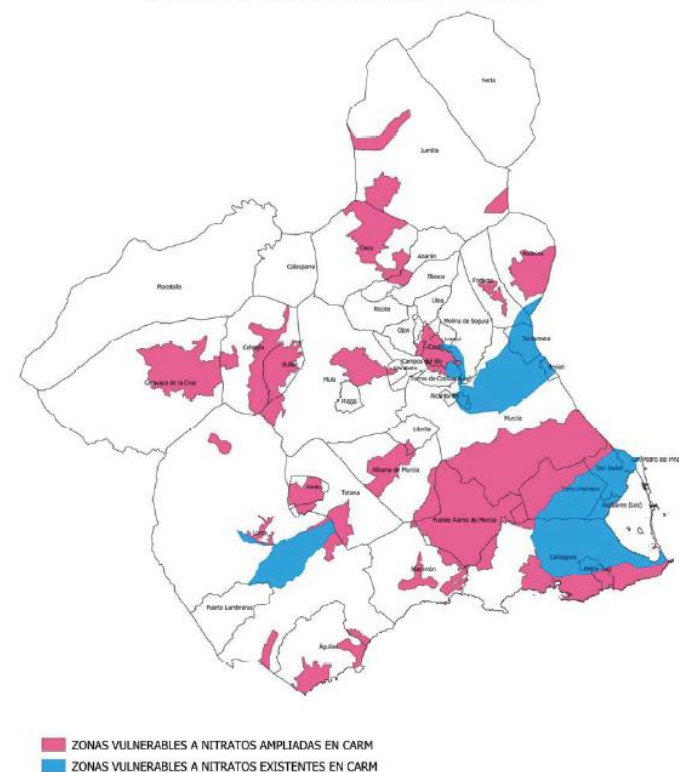
## *Protection regulations applicable to the Mar Menor and its basin*

### ***Autonomous- vulnerable zones***

In compliance with article 4 of RD 261/1996, the Autonomous Community of the Region of Murcia has designated **vulnerable zones** in 2001, 2004, 2009 and 2019.

- **Order of December 20, 2001** of the Regional Ministry of Agriculture of the Region of Murcia, which designated the area corresponding to the Quaternary and Pliocene aquifers in the area defined by the eastern irrigable area of the Tajo-Segura Transfer and the coastal sector of the Mar Menor as vulnerable to contamination by nitrates of agricultural origin.
- **Orders of December 12, 2003, March 3, 2009, June 27, 2011 and June 16, 2016**, approving successive action programs regarding nitrate pollution of agricultural origin.
- **Order of December 23, 2019**, of the Ministry of Water, Agriculture, Livestock, Fisheries and Environment, by which the designation of new vulnerable areas to nitrate pollution from agricultural origin in the Region of Murcia, expansion of existing ones and the determination of the coastal water body of the Mar Menor as a body of water affected, or at risk of being affected, by nitrate pollution from agricultural origin is agreed.

ANEXO I  
AMPLIACIÓN DE ZONAS VULNERABLES A NITRATOS EN  
COMUNIDAD AUTÓNOMA REGIÓN DE MURCIA





## Action 2: Strategies, Plans and Governance

### *Protection regulations applicable to the Mar Menor and its basin*

#### *Autonomous-code of good agricultural practices*

- In compliance with Article 5 of RD 261/1996, in the CCAA of the Region of Murcia is in force the **Code of Good Agricultural Practices of the Region of Murcia**, which appears in Law 1/2018, of February 7, of urgent measures to ensure environmental sustainability in the environment of the Mar Menor in its ANNEX V.
- **Order of March 31, 1998** of the Ministry of Environment, Agriculture and Water, approving the Code of Good Agricultural Practices of the Region of Murcia.
- **Order of December 3, 2003**, of the Regional Ministry of Agriculture, Water and the Environment, approving the Code of Good Agricultural Practices of the Region of Murcia.
- **Law 1/2018, of February 7**, on urgent measures to guarantee environmental sustainability in the Mar Menor environment in its ANNEX V.

## Action 2: Strategies, Plans and Governance

### *Protection regulations applicable to the Mar Menor and its basin*

#### ***Autonomic-action program***

- In compliance with article 6 of RD 261/1996, the CCAA of the Region of Murcia currently has in force an **action program** defined by Order of June 16, 2016, of the Regional Ministry of Water, Agriculture and Environment, which modifies the Orders of November 19, 2008, March 3, 2009 and June 27, 2011, of the Regional Ministry of Agriculture and Water, establishing the action programs on the areas vulnerable to nitrate pollution from agricultural origin in the Region of Murcia.
- Order of March 3, 2009, of the Regional Ministry of Agriculture and Water, which establishes the Action Program on the Vulnerable Zone corresponding to the aquifers of the Vegas Alta and Media of the Segura River Basin.
- Order of 27 June 2011, of the Regional Ministry of Agriculture and Water, which amends the order of the Regional Ministry of Agriculture of 19 November 2008, which establishes the action program on the vulnerable zone corresponding to the aquifers of the Vegas Alta and Media of the Segura River Basin.
- Order of June 16, 2016, of the Regional Ministry of Water, Agriculture and Environment, amending the Orders of November 19, 2008, March 3, 2009 and June 27, 2011, of the Regional Ministry of Agriculture and Water, establishing the action programs on the areas vulnerable to nitrate pollution from agricultural origin in the Region of Murcia.

# Action 2: Strategies, Plans and Governance

## Law 3/2020, of July 27, of the recovery and protection of Mar Menor

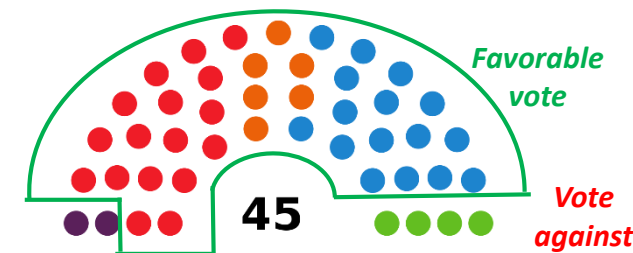
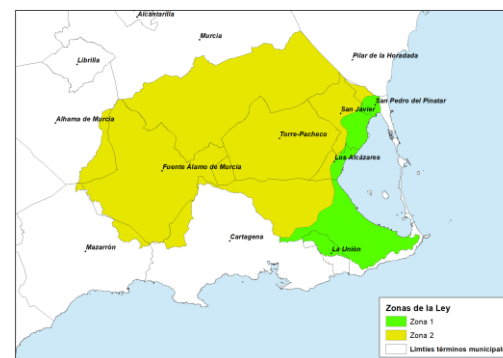
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## Action 2: Strategies, Plans and Governance

### *Measures applicable to farms located in Zones 1 and 2*

#### *Crop systems.*

Transformation of the agricultural activity of the Mar Menor basin according to technical criteria (soil typology, water availability and quality, slope of the land, piezometric levels), with the aim of implementing **sustainable agriculture**.

- a) Rainfed crops.
- b) Adoption of confined surface cultivation systems with recirculation of nutrients.
- c) Sustainable and precision agriculture.

Registration in the Register of Agricultural Holdings of the Autonomous Community of the RM

**Provision of information on the actual volume of water supplied and monitoring of its application to irrigation.**

- Sensor monitoring system for water content and/or matrix potential in the soil (water availability for the crop).
- Systems for sensor monitoring, control and follow-up of mineral fertilization through irrigation and for **nitrogen and phosphorus** measurement.





# Action 2: Strategies, Plans and Governance

The **Code of Good Agricultural Practices** of the Region of Murcia will be **mandatory**.

Conservation **vegetation structures** for water retention and regulation, runoff control, nitrate absorption and protection against soil erosion.

Mandatory **action program** on areas vulnerable to nitrate pollution from agricultural sources in the Region of Murcia.

All cultivation operations, including land preparation and planting or sowing, **shall follow the contour lines according to the orography of the land**, and tillage and cultivation on slopes is prohibited.

It is mandatory to calculate the **nitrogen balance**.

Maximum extraction coefficient of the crops established in the current action program will be the **most restrictive** of the range.

The **use of urea** and all fertilizers containing nitrogen in ureic form is prohibited.





# Action 2: Strategies, Plans and Governance

## Comparative crop extractions

CULTIVO	MIN. EXTRAC	MAX. EXTRAC	DIFERENCIA	%	DIF KG N/Ha
Limon	4,8	6	1,2	20,00	42
Naranjo	4,8	7	2,2	31,43	77
Mandarino	4,8	7,5	2,7	36,00	86,4
Almendo S	35	45	10	22,22	2,4
Almendo R	35	45	10	22,22	13,8
Lechuga	2,5	4	1,5	37,50	97,5
Melón	3,5	5	1,5	30,00	63
Brócoli	12	15	3	20,00	57
Pimiento I	3	4,5	1,5	33,33	180
Alcachofa	8	12	4	33,33	72

### MURCIA

CULTIVO	EXTRACCION	PRODUCCION	TONELADAS	KG N
Limon	4,8	35000	35	168
Naranjo	4,8	35000	35	168
Mandarino	4,8	32000	32	153,6
Almendo S	35	240	0,24	8,4
Almendo R	35	1380	1,38	48,3
Lechuga	2,5	65000	65	162,5
Melón	3,5	42000	42	147
Brócoli	12	19000	19	228
Pimiento I	3	120000	120	360
Alcachofa	8	18000	18	144

### VALENCIA

CULTIVO	KG N	PRODUCCION	TONELADAS	EXTRACCION	DIFERENCIA VALENCIA-MURCIA	%
Limon	180	35000	35,00	5,14	0,34	6,67
Naranjo	180	35000	35,00	5,14	0,34	6,67
Mandarino	180	35000	35,00	5,14	0,34	6,67
Almendo S	50	240	0,24	208,33	173,33	83,20
Almendo R	80	1380	1,38	57,97	22,97	39,63
Lechuga	120	35000	35,00	3,43	0,93	27,08
Melón	160	35000	35,00	4,57	1,07	23,44
Brócoli	220	35000	35,00	6,29	-5,71	-90,91
Pimiento I	280	120000	120,00	2,33	-0,67	-28,57
Alcachofa	250	18000	18,00	13,89	5,89	42,40

### CLM

CULTIVO	EXTRACCION	PRODUCCION	TONELADAS	EXTRACCION	NANCIA CLM-M	%
Almendo S	50	240	0,24	208,33	173,33	83,20
Almendo R	60	1380	1,38	43,48	8,48	19,50
Lechuga	120	65000	65	1,85	-0,65	-35,42
Melón	115	42000	42	2,74	-0,76	-27,83

### ANDALUCIA

CULTIVO	KG N	PRODUCCION	TONELADAS	KG N	A ANDALUCIA	%
Limon	6	35000	35,00	210,00	42,00	20,00
Naranjo	6	35000	35,00	210,00	42,00	20,00
Mandarino	6	35000	35,00	210,00	56,40	26,86
Melón	5	35000	35,00	175,00	166,60	95,20
Pimiento I	5	120000	120,00	600,00	551,70	91,95
Alcachofa	10	18000	18,00	180,00	17,50	9,72

## Action 2: Strategies, Plans and Governance

### ***Limitation of agricultural activity on land close to the maritime-terrestrial public domain (agricultural activity at less than 1,500 m from the lower limit of the Mar Menor shore).***

- a) The use of chemical fertilizers, non-composted manure or green manure.
- b) Fertilization in excess of 170 kg/N/ha/year.
- c) The irrigation cultivation of those plots that do not have consolidated water use rights, in which it is proven that their agricultural practices involve an excess of applied nitrogen or that the crop arrangements favor runoffs with sediments that reach the Mar Menor in times of heavy rainfall.
- d) The installation of new greenhouses and the expansion of existing greenhouses.

### ***Additional Measures Applicable to Agricultural Holdings located in Zone 1***

Only agricultural activity is allowed:

- Rainfed crops.
- Irrigated organic farming.
- Confined surface cultivation systems with nutrient recirculation.
- Sustainable precision agriculture

Additional irrigation limitations.

**Mandatory** moisture sensors, tensiometers or any other device.

It is **forbidden** to apply nitrogen-based mineral fertilizers, unless they contain nitrification inhibitors.

Encouraging crop rotations with nitrogen capturing species with deep root systems and favoring green manure.

Additional limitations related to fertilization.





## Action 2: Strategies, Plans and Governance

### ***Limitation of agricultural activity on land close to the maritime-terrestrial public domain (agricultural activity at less than 1,500 m from the lower limit of the Mar Menor shore).***

LIMITING THE USE OF ORGANIC MATERIALS FOR FERTILIZATION.

Direct application of sewage sludge is prohibited.

LIMITATIONS FOR SLURRY AND OTHER MANURES WITH FERTILIZER VALUE.

- a) Only slurry and other manures with fertilizer value whose movement has been previously validated in the electronic registry of livestock manure movements (REMODEGA) may be applied.
- b) They shall be used exclusively under technical prescription.
- c) Mandatory representative analytical reports measuring at least the following parameters: humidity; electrical conductivity; pH; organic matter; total, organic, nitric and ammoniacal nitrogen; total phosphorus; total potassium and C/N.

***Order of July 29, 2021, of the Regional Ministry of Water, Agriculture, Livestock, Fisheries and Environment, approving the date of implementation and operation of the Electronic Registry of Livestock Waste Movements (REMODEGA).***

## Action 2: Strategies, Plans and Governance

**Inorganic nutrient inputs are prohibited in Zone 1.**

**Reduction from 6 months to 3 months** in the time required for the processing of crop restitution and sanctioning proceedings.

***Decree-Law 5/2021, of 27 August, amending Law 3/2020, of 27 July, on the Recovery and Protection of the Mar Menor.  
Entry into force: August 31, 2021.***

## Action 2: Strategies, Plans and Governance

### *Proceedings region murcia- sanctioning proceedings against the kingdom of spain for non-compliance with the nitrates directive.* Proceeding no. 2018/2250

#### FIRST REASON

Failure to comply with Article 5(6) of the Directive, **relating to measuring points**, revealing a significant removal of monitoring stations.

Non-compliance concerning Andalucía, Aragón, Cantabria, Castilla-La Mancha, Castilla y León, Cataluña, Comunidad Foral de Navarra, Comunidad de Madrid, Comunidad Valenciana, Extremadura, Galicia, Islas Baleares, Islas Canarias, La Rioja, País Vasco, Principado de Asturias, **Región de Murcia**, and in saline waters and Islas Canarias..

#### SECOND REASON

Failure to comply **with Article 3, paragraph 4**, of the Directive, regarding the modification of NVZs as a result of changes or factors not foreseen in the previous designation. This affected all autonomous communities except Ceuta.

#### THIRD REASON

Non-compliance with **Article 5, paragraph 4**, read in conjunction with Annexes II and III, which establishes a period of time for the implementation of the action programs. 14 Autonomous Communities have designated ZVN and have established an action program, including Murcia, so this non-compliance does not apply.

#### FOURTH REASON

Non-compliance with **article 5, paragraph 5 regarding the adoption of additional measures or reinforced actions** if, as a result of the experience gained in implementing the action programs. This affected Aragón, Castilla-La Mancha, Castilla y León, Comunidad Foral de Navarra **and Región of Murcia**.

### *Result of the non-compliances*

- The Autonomous Communities of Castilla y León, Extremadura, Galicia, Balearic Islands, Canary Islands, Madrid and Valencia continue to fail to comply with **Article 3, paragraph 4**, of the Directive by not designating sufficient SPAs.
- The Autonomous Communities of Aragón, Castilla-La Mancha, Castilla y León, Castilla y León, Madrid and Extremadura continue to fail to comply with **Article 5, paragraph 4**, by not including a series of mandatory measures in the action programs.
- The Autonomous Communities of Aragón, Castilla-La Mancha, Castilla y León, Castilla y León and **Murcia** remain in breach of Article 5(5) **for not taking additional or reinforced measures** if, as a result of the experience gained in implementing the action programs.

## Action 2: Strategies, Plans and Governance

### *Control instruments and measures put in place 2020-2021*

ACTION PROGRAM FOR VULNERABLE ZONES IN THE REGION OF MURCIA AND SPECIFIC ACTION PROGRAM FOR NITRATE VULNERABLE ZONES IN CAMPO DE CARTAGENA.



In Strategic Environmental Impact Assessment.

AGRI-ENVIRONMENTAL OPERATOR



Responsible for advising the holder of the agricultural exploitation.  
Entry into force 2022

COLLABORATING ENTITIES OF THE AGRICULTURAL ADMINISTRATION (ECARM)



All farms **obliged** to contract. They will be accredited by the **ISO-17020** standard.  
Entry into force 2022



MAR MENOR SUSTAINABLE AGRICULTURE LABEL



**Voluntary.** Guarantee of compliance in production processes. Entry into force 2022

## Action 2: Strategies, Plans and Governance

### *Control and monitoring of the measures for agricultural and livestock management and planning contained in Law 3/2020, of 27 July, for the recovery and protection of the Mar Menor.*

#### SANCTIONING REGIME AND CROP RESTITUTION PROCEDURE

**EXPEDIENTS RESTITUTION OF CROPS.** Necessity of having water rights. Firm resolution of CHS.

**Consequences:** NO aid to any type of aid to irrigation + ANOTATION ex officio in the REA.

**FILES RESTITUTION OF LEGALITY.** Restoration of legality.

**Consequences:** Non-compliance is a very serious administrative infringement, which carries a fine of 50,001 to 500,000 euros, as well as the accessory sanction of loss of subsidies from the CARM for a period of two years.

**SANCTIONING FILES.** Registry of Sanctioning Proceedings in matters of Integral Protection of the Mar Menor.

## Action 2: Strategies, Plans and Governance

- **Order of September 10, 2020** of the Regional Ministry of Water, Agriculture, Livestock, Fisheries and Environment of approval of the Plan of Inspection of Agricultural Holdings for 2020 and 2021.
- **Order of September 6, 2021**, of the Regional Ministry of Water, Agriculture, Livestock, Fisheries and Environment, approving the Plan of Inspection of Agricultural Holdings for the three-year period 2022-2024, for the control of the measures provided for in Chapter V and Article 57 of Law 3/2020, of July 27, for the recovery and protection of the Mar Menor.



# Action 2: Strategies, Plans and Governance

## *Sanctioning regime and crop restitution procedure*

SUPERFICIE (Ha)	AÑO 2017	AÑO 2018	AÑO 2019	AÑO 2020		AÑO 2021	AÑO 2022	TOTAL SUPERFICIE
CONTROL TRAGSA	1140	1575	2442,47					5157,47
INSPECCIÓN CARM								10954,97
Inspecciones Ordinarias				1936,48		3082,76		
Inspecciones RECHS				939,43		1030,38		
Total inspecciones ordinarias			0	2875,91	26,25%	4113,14		
Inspecciones Inscripción REA				110,2				
Inspecciones extraordinarias			220	413		3403,71	39,01	
Total inspecciones extraordinarias			220	523,2	4,78%	3403,71		
Total superficie por anualidad	1140	1575	220	3399,11		7516,85		
Nº ACTUACIONES INSPECCIÓN	AÑO 2017	AÑO 2018	AÑO 2019	AÑO 2020		AÑO 2021	AÑO 2022	TOTAL ACTUACIONES INSPECCIÓN
INSPECCIÓN CARM								708
Inspecciones Ordinarias				48		82		
Inspecciones RECHS				50		50		
Inspecciones Inscripción REA				35		0		
Total ordinarias				133		132		
Inspecciones extraordinarias			6	258		143	2	
Inspecciones RLEA				2		32		
Total extraordinarias				260		175		
Total inspecciones por anualidad			6	393		307		

# Action 2: Strategies, Plans and Governance

## *Sanctioning regime and crop restitution procedure*

Nº ACTUACIONES INSPECCIÓN	PREVISION AÑO 2020	EJECUCIÓN AÑO 2020	RESULTADO	PREVISION AÑO 2021	DESDE 1 AGOSTO 2021	% TOTAL ANUAL	EJECUCION AÑO 2021	RESULTADO	TOTAL SUPERFICIE ( Has.)
Inspecciones TRAGSA incumplimientos	120	48		120	37		82		
Inspecciones RECHS	0	50		0	50		50		
Inspecciones Inscripción REA	0	35		0	0		0	0	
Total inspecciones ordinarias	120	133	111%	120	87	65,91%	132	110,00%	
Inspecciones extraordinarias	20	258		20			143	86%	
Inspecciones RLEA	0	2		0			32	100%	
Total inspecciones extraordinarias	20	260	1300%	20			175	875%	
Total inspecciones	140	393	281%	140			307	219%	
Superficie total		3.399,11					7516,85	221,14%	10.915,96

## Head of fishing Service

**M. Emilio Dolores Pedrero**

*General Directorate of Livestock, Fisheries and Aquaculture*

## Action 2: Strategies, Plans and Governance

### *Marine Strategy Framework*

**Directive 2008/56/EC**  
of the European Parliament and of the  
Council of 17 June 2008



**Law 41/2010**  
29 December, Marine  
Environmental Protection



### *Programmes of measures of the second cycle in Mar Menor*

#### **ITI MAR MENOR**

Improvement of drainage network, Construction of storm tanks, Green filters, recovering the fishing culture heritage, fisheries governance for managements plans...

#### **TETRA**

Decree No. 32/2016, 4th May, which regulates the system for locating and monitoring fishing vessel in waters of the Region of Murcia

#### **Environmental adaptation program**

of profesional fishing fleet in accordance with Law 3/2020, 27 the July, on the recovery and protection of the MM

#### **Management plan**

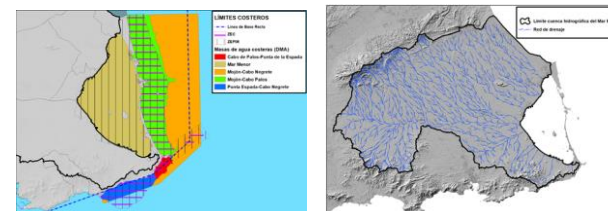
for the fisheries exploiting stocks in the Mar Menor Lagoon



# Action 2: Strategies, Plans and Governance

## *Integrated management strategy of the sociocological system of the environment of the MM (IMSSEMM)*

- Approved by Decree No 42/2021 of 31th March in accordance with the Recommendation of the European Parliament and of the Council of 30 May 2002 on the implementation of integrated coastal zone management in Europe.
- Roadmap for the political action of the Government of the Region of Murcia on the present and future actions to be developed in the Mar Menor.
- Backbone of all current and future planning and management instruments.
- Includes actions of a strategic nature and actions of an operational nature.

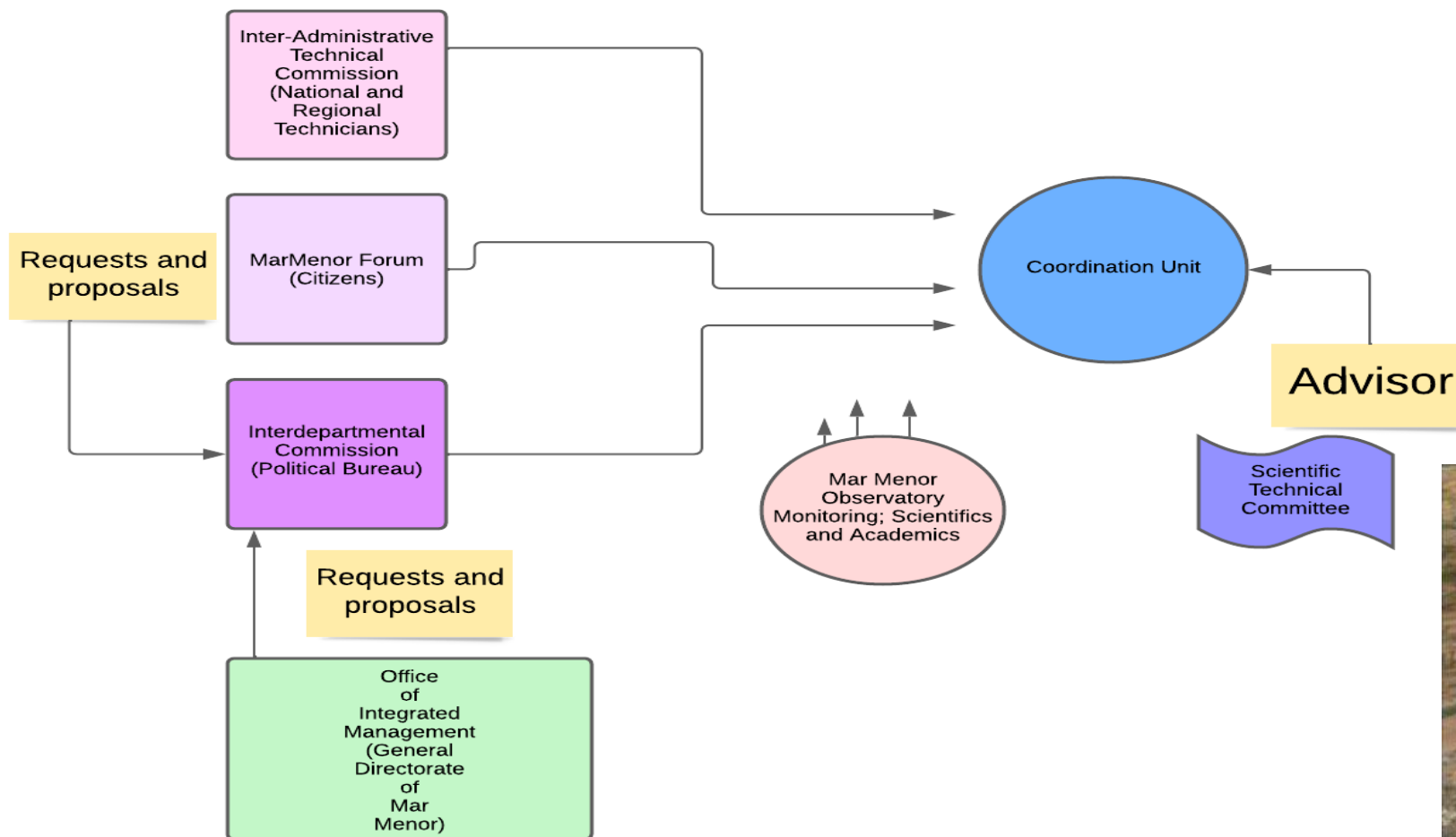


### *Instrument for the integral management of the Mar Menor and its watershed*

Instrument	Global Objective	Geographical scope	Temporary validity
IMSSEMM	Achieve a management model in the field of action adapted to the special characteristics of the IMSSEMM in close inter-administrative cooperation inspired by principles of good governance and committed to citizen participation	<ul style="list-style-type: none"> <li>-Hydrographic basins slopes to the Mar Menor</li> <li>-Coastal waters (water framework directive): Mar Menor; Mojón- Palos Cape; Palos Cape-Punta de la Espada; Mojón Negrete Cape, Punta de la Espada-Negrete Cape</li> <li>-Natura 2000 Network Protected Area (marine environment) ES62000029</li> <li>-ZEPIM "Area of the Mar Menor and Eastern Mediterranean Zone of the coast of the Region of Murcia</li> <li>-Marine Reserve of Cabo de Palos-Islas Hormigas.</li> </ul>	indefinida

# Action 2: Strategies, Plans and Governance

## Organization chart

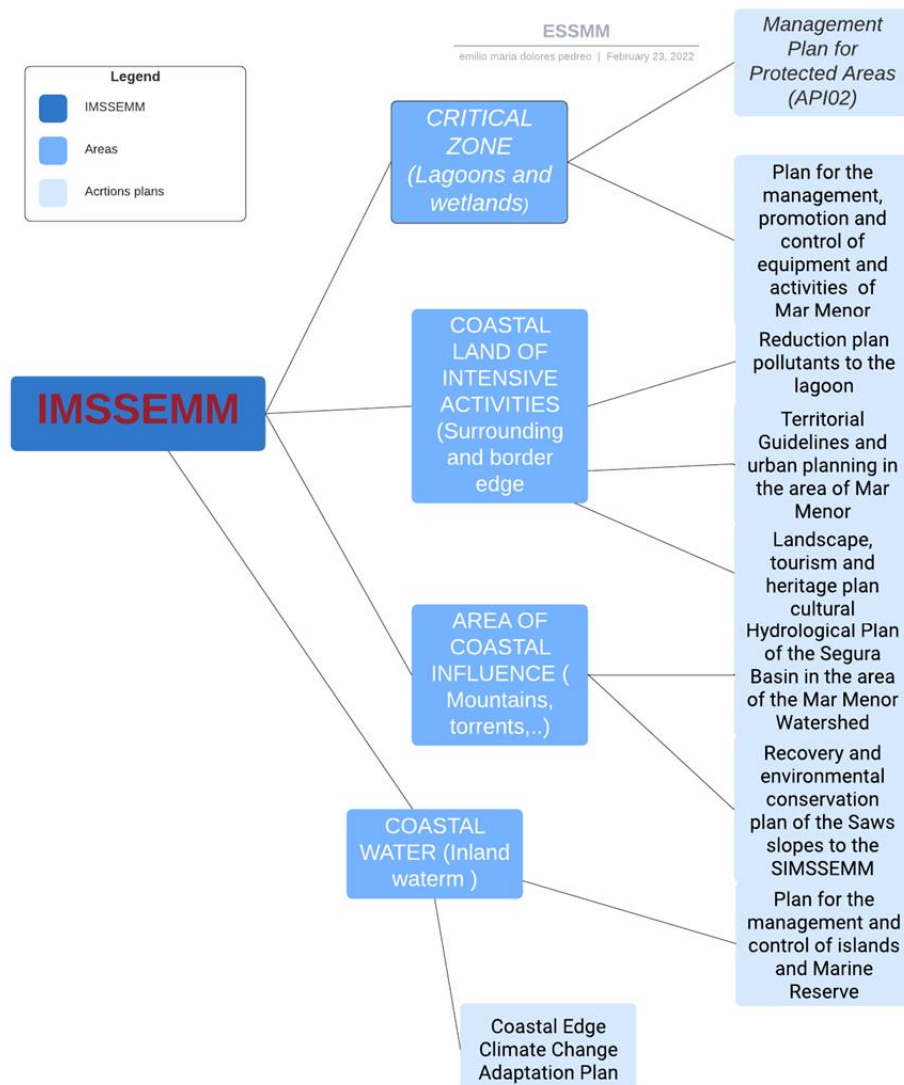


IMSSEMM



# Action 2: Strategies, Plans and Governance

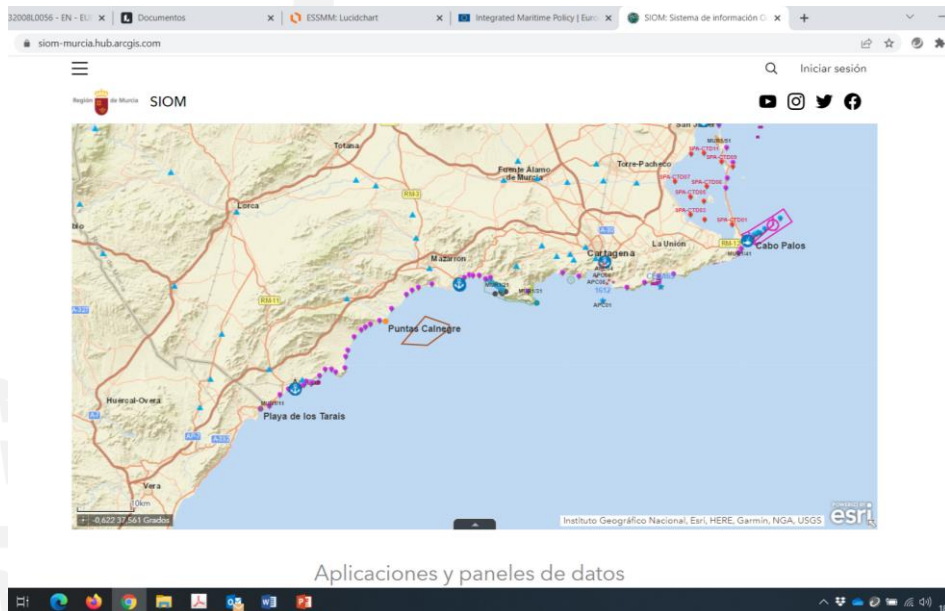
## *Actions Plans IMSSEMM*



## *Integrated Maritime Policy (IMP)*

### Marine data and knowledge

SIOM (information oceanographic system)



<https://siom-murcia.hub.arcgis.com/>

### Integrated maritime surveillance

- Environmental Monitoring and Inspection of Marine Reserves.
- CTD data collection.
- Control of efiras.
- Maritime support to the surveillance work of Environmental Agents.
- Maritime support for the control of marine and coastal biodiversity.
- Inspection of inland fishing activity and aquaculture facilities.
- Analysis and preparation of environmental reports on the impact of activities on the marine environment.
- Analysis of Environmental Monitoring Plans for activities in the marine environment.
- Study, control and supervision of the application of actions in the field of Marine Strategies.
- Planning, evaluation, control, monitoring.

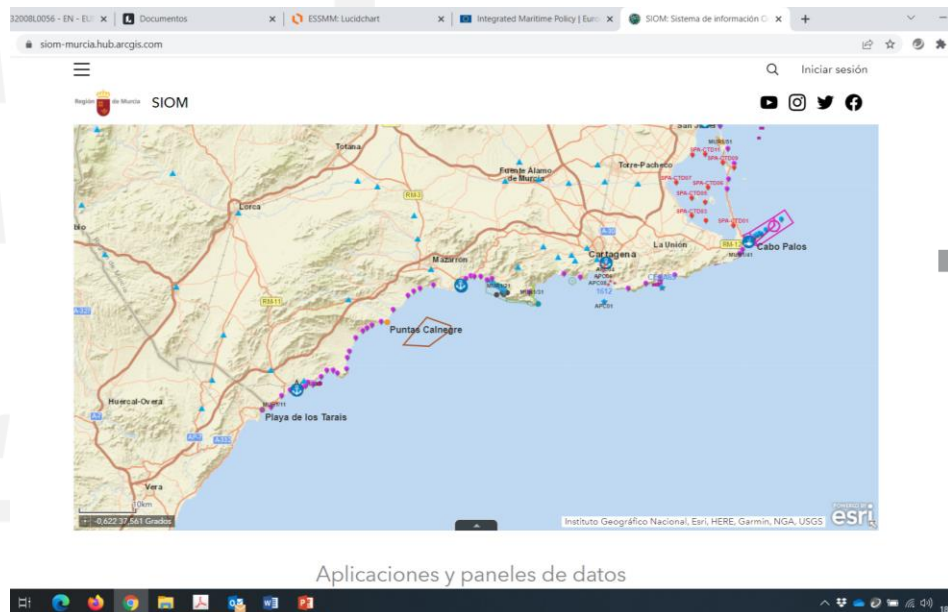


# Action 2: Strategies, Plans and Governance

## *Integrated Maritime Policy (IMP)*

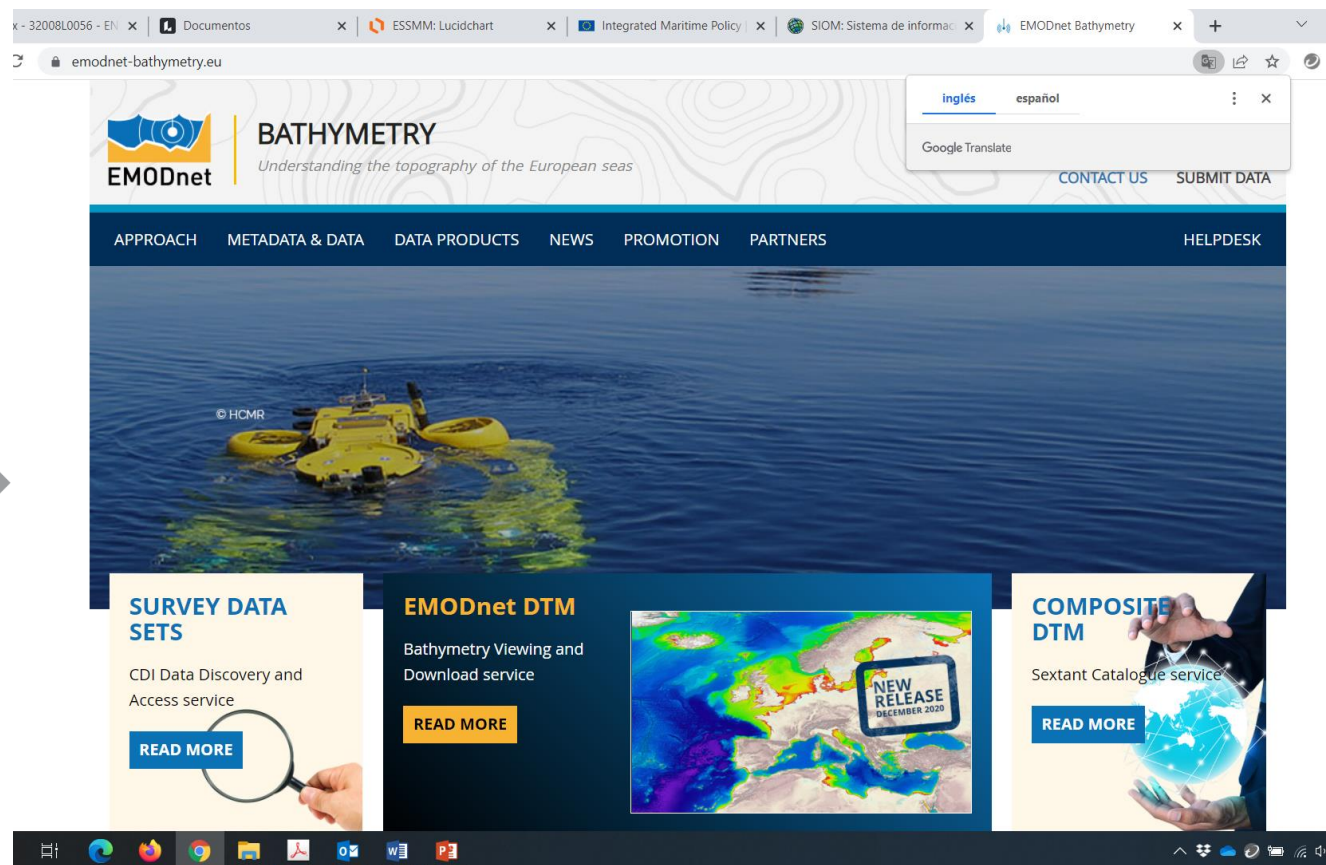
### Marine data and knowledge

SIOM (information oceanographic system)



Aplicaciones y paneles de datos

<https://siom-murcia.hub.arcgis.com/>



## Integrated Territorial Investment (ITI) Mar Menor

### It finances actions like:

- Edusi la Manga
- Mar Menor Integral Management Plan (API02): anchorages.
- Water quality
- Environmental studies
- Research projects
- Local Development
- Marine Reserves State actions



### The goal is threefold:



Recover the good environmental status of the Mar Menor

Establish a framework for governance and cooperation between all actors, public and private

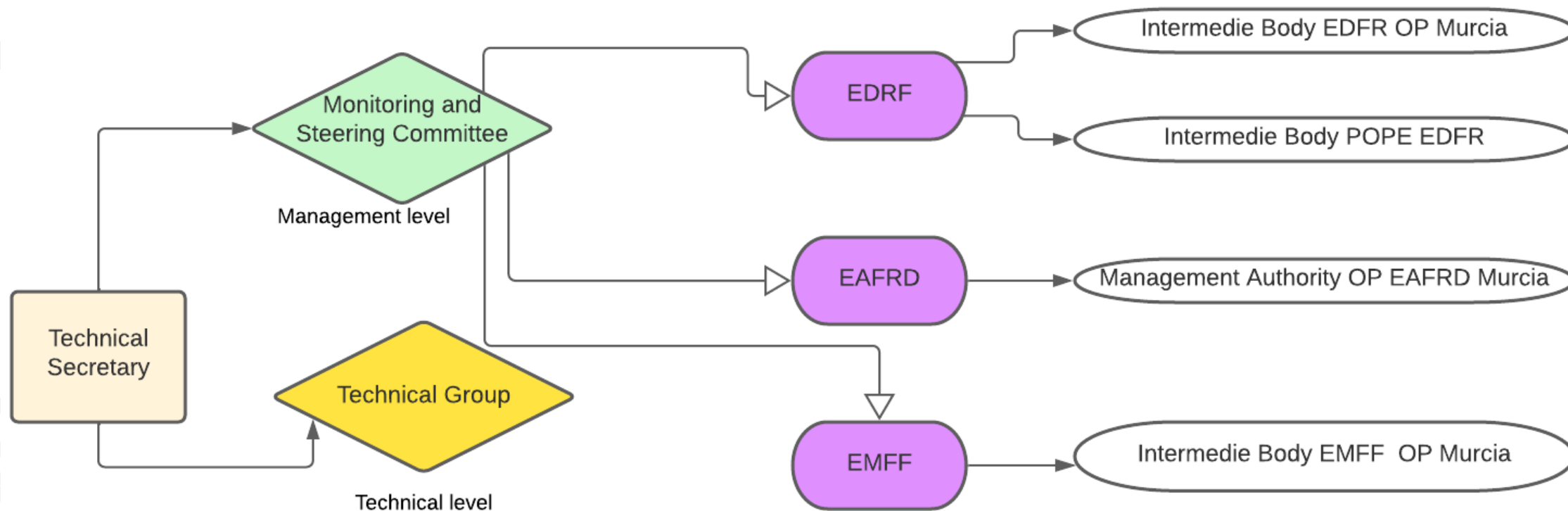


Promote a model of sustainable development around the Mar Menor

PROGRAMA OPERATIVO	GASTO PREVISTO 2014-2021 (€)	GASTO COMPROMETIDO A 31/12/2021 (€)	GASTO EJECUTADO A 31/12/2021 (€)
PO FEDER CARM 2014-2020	37.412.500,00 €	26.181.676,33 €	15.830.638,38 €
POPE (FEDER) 2014-2020	60.000.000,00 €	18.750.000 €	1.954.208,36 €
PDR CARM (FEADER) 2014-2020	111.111,11 €	763.709,14 €	763.709,14 €
PO FEMP España 2014-2020	2.000.000,00 €	6.071.429,22 €	5.363.593,22 €
<b>TOTAL</b>	<b>99.523.611,11 €</b>	<b>51.766.814,69 €</b>	<b>23.912.149,10 €</b>

## Action 2: Strategies, Plans and Governance

### *Integrated Territorial Investment (ITI) Mar Menor*



## Geographic Information Systems and Remote Sensing Team-SIGyT

**Manuel Erena Arrabal**



*Institute for Agricultural and Environmental Research and Development*



- Promotion of research activities (Data Interoperability)
- Participation of the scientific and technical community (Transparency)
- Social participation and transparency (Open Data)
- Increased monitoring intensity: 2016->2022 (Open Science)
- Data science and Big Data for environmental monitoring (ICT)
- Development of IoT platform (Smart Environment)
- Creation of the Mar Menor Observatory (OMM)

## Promotion of research activities (ERDF 2014-20)

The regional government is committed to research and scientific knowledge as the best ally for the recovery of the Mar Menor. The expenditure executed (2018-2021) to date is 6.6 M€ in, among others, the bank of protected species, the bank of native filter feeders, monitoring and analysis of the ecological status, hydrodynamic predictive modeling, the biogeochemical study of funds or studies on environmental parameters and pollutants of the Mar Menor. An expenditure of 2.4 M€ is planned for the period 2022-2023 for research, monitoring and projects related to the scientific contribution (UMU/UPCT/CARM).

Follow-up and monitoring programs in place	Staus	Planned/executed investment
<b>Tracking and monitoring of the ecological status of the Mar Menor.</b> 	<p>Underway from August 2018 until September 30 through own means.</p> <p>Approved direct grant in favor of the University of Murcia (UMU) for monitoring and predictive analysis of the evolution of the ecological status of the lagoon ecosystem of the Mar Menor and impact prevention (Decree No. 112 /2020 of October 15, amending Decree No. 78/2020).</p> <p>Prepared periodic reports on the ecological status of the Mar Menor and conducted periodic analysis and field data collection campaigns from 2018 to the present.</p>	<p>Invested and executed to date 619,184.22 € (2018-2020)</p> <p>Planned investment of 450,000 € through direct subsidy to execute the works next year 2021.</p>
<b>Sensorization of "Rambla del Albujón"</b>	<p>Underway since October 2019. Continuous water level sensors installed in the Albujón wadi. Pending expansion of monitoring station through the installation of nitrate and turbidity sensors.</p>	<p>Invested to date 49,217.52 €.</p> <p>Planned sensorization of all the wadis that flow into the Mar Menor.</p>
<b>High Resolution Hydrodynamic Model</b> 	<p>Underway through the Polytechnic University of Cartagena, through direct subsidy (Decree 14/2020 of April 2).</p> <p>12 barometric pressure sensors installed</p> <p>Pending installation of 2 meteorological stations and ADCP system and 12 oceanographic buoys.</p> <p>Information available : study of water exchange between the Mar Menor and the Mediterranean (April 2020).</p>	<p>Invested to date 457,026.10 € through direct subsidy (200,000 €) and installation of sensors (257,026.10 €).</p> <p>Investment planned for next year 2021.</p> <p>244,904 € for the installation of measuring equipment (continuous flow autoanalyzer, current meter, acoustic profiler CTD probe, nitrate sensor.</p> <p>48,000 € for the installation of underwater nodes for environmental monitoring.</p> <p>300,000 through direct subsidy to UPCT for the High Resolution Hydrodynamic Model.</p>
<b>Monitoring of the state of the ichthyofauna in shallow areas of Mar Menor</b>	<p>Underway since September 2017.</p> <p>Planned collaboration with UMU to continue the work by direct grant.</p> <p>Last report produced: assessment of the state of the shallow zone fish community after the DANA (April 2020).</p>	<p>Invested to date 285.940,96 €.</p> <p>Planned investment period 2021-2022: 114.000 €.</p>

## Promotion of research activities (ERDF 2014-20)

Research Studies CARM/ERDF (ITI)	Inversión	Period /Year
<i>Geochemical and biological study of the seabed of the Mar Menor Lagoon and drafting of a hydrological-forestry restoration project by hydro-techniques in the Sierra Minera de Cartagena and La Unión (South Mar Menor Basin) to mitigate the contribution of sediments (heavy metals) to the Mar Menor Lagoon</i>	481.622,92 €	2017
<i>Study of actions in the southern basins of the Mar Menor on the contribution of water, sediments and nitrogen to the Mar Menor lagoon</i>	64.762,67 €	2017
<i>R+D+i projects for the optimization of the use of fertilizers on crops in the Mar Menor discharge basin.</i>	296.775,31 €	2016-2018
<i>R+D+i projects Design and implementation of a spatial data infrastructure on agriculture and water in the Region of Murcia-IDEaRM</i>	996.527,30 €	2016-2018
<i>Biogeochemical study of the Mar Menor seabed</i>	434.431,52 €	2017-2018
<i>Experimental sediment and sand aspiration tests for the recovery of the seabed of the Mar Menor</i>	143.350,36 €	2018
<i>Study of the state of the art of the investigations, studies, publications and research lines initiated by the different administrations, universities and other scientific organizations on the mining exploitations of the Sierra Minera de Cartagena-La Unión and their effects on the Mar Menor</i>	17.901,95 €	2019
<i>Study of the mining waste located in the hydrographic basin of the Rambla del Beal and its effects on the Mar Menor: proposal of corrective measures</i>	18.007,65 €	2019
<i>Evaluation of the state of the fish community in shallow areas after the meteorological phenomenon "DANA"</i>	16.979,93 €	2019-2020
<i>Ichthyofauna sample processing actions since 2016 and sample collection after the 2019 episode in the Mar Menor</i>	16.417,89 €	2020
<i>Development of research and demonstration activities to minimize nitrate leaching as a consequence of agricultural activity.</i>	1.264.044,61 €	2019-2023
<i>Boosting circular economy in agriculture and water management through the advanced use of new technologies.</i>	926.624,31 €	2019-2023
<b>Total (12 PROJECTS)</b>	<b>4.677.446,42 €</b>	<b>2017-2023</b>



### *Promotion of research activities (2014-20 / 2021-27)*

*Proyectos de investigación e innovación en el Mar Menor, a cargo de entidades públicas y privadas, financiados con diferentes programas del Marco Financiero Plurianual de la UE 2014-20 y 2021-27*

#### Life

*Implementation of efficient irrigation management for a sustainable agriculture.*

Reference: IRRIMAN-> <https://irrimanlife.eu/>



*New approach to promote natural solutions for the adaptation to climate change of dryland agricultural systems in the Mediterranean area.*

Reference: AMDRYC4 -> <https://lifeamdryc4.eu>

#### Horizonte 2020

*Promoting sustainable coastal-rural initiatives (MM and Campo de Cartagena).*

Reference: COASTAL  
<http://agrotransfer.csic.es/coastal>



*Monitor and analyze the lagoon environment to predict socio-environmental evolution in highly anthropized coastal lagoons.*

Reference: SMARTLAGOON  
<https://www.smartlagoon.eu>



#### SUDOE 2014-20

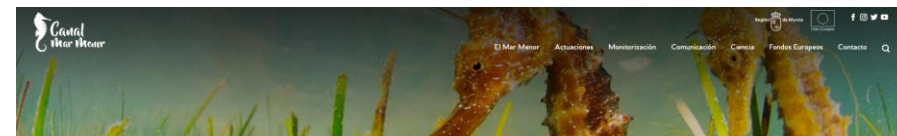
*Early Warning Service for Water-related Climate Risks to increase resilience in the Sudoe region.*

Reference: CLIMALERT  
<https://www.climalert.net/>



## *Participation of the scientific and technical community*

MEETINGS AND WORK GROUPS	Number of meetings
<i>Bathymetry and sediments</i>	12
<i>Watershed basin</i>	11
<i>Lagoon ecology</i>	23
<i>Green filters</i>	6
<i>Hydrodynamic monitoring</i>	2
<i>Political forum</i>	20
<i>Interdepartmental commission</i>	56
<i>Interadministrative technical commission</i>	18
<i>Social participation committee</i>	11
<b>TOTAL MEETINGS</b>	<b>159</b>



<https://canalmarmenor.carm.es>

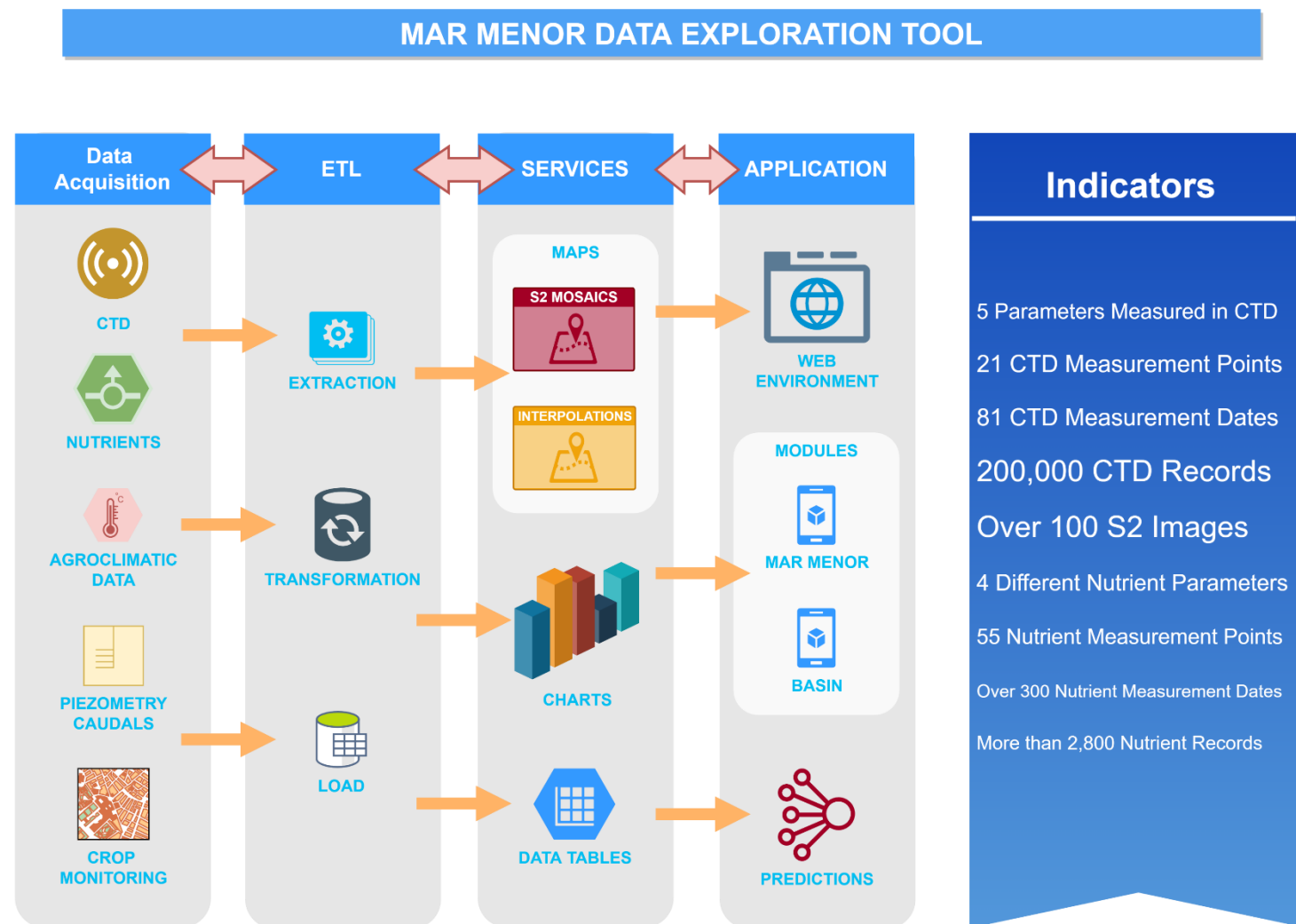
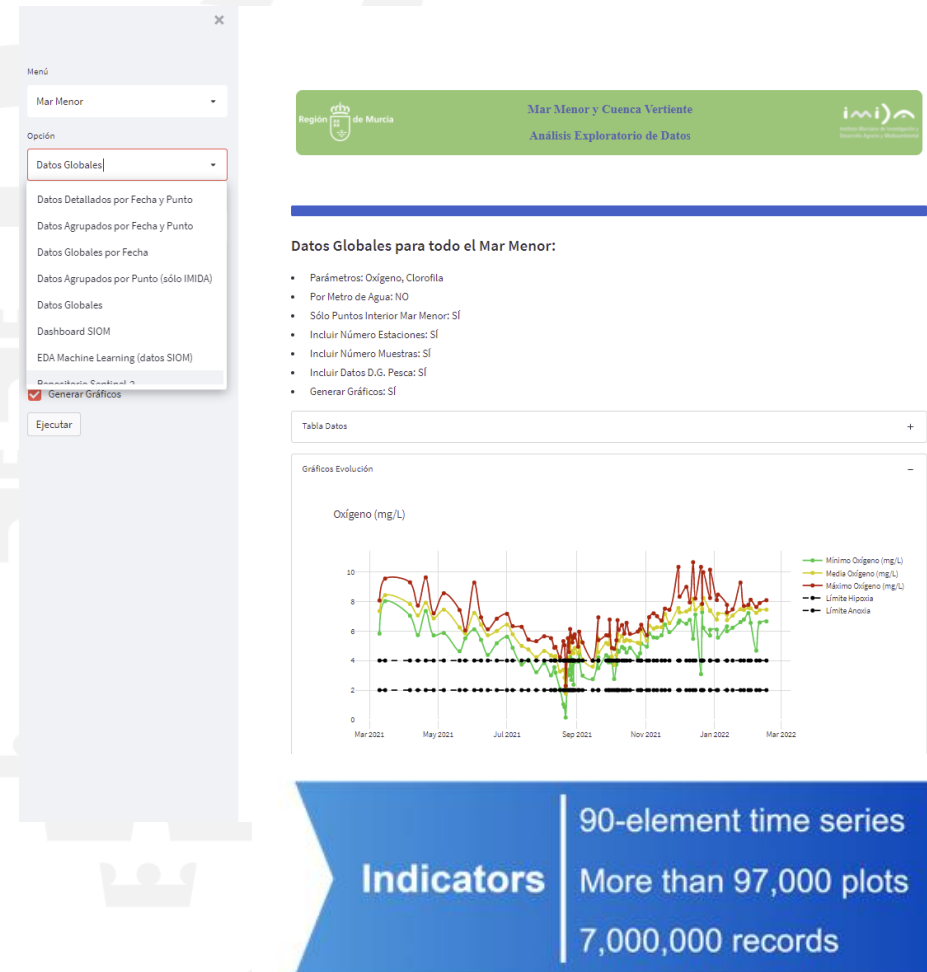


<https://datosabiertos.regiondemurcia.es>

*Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information*

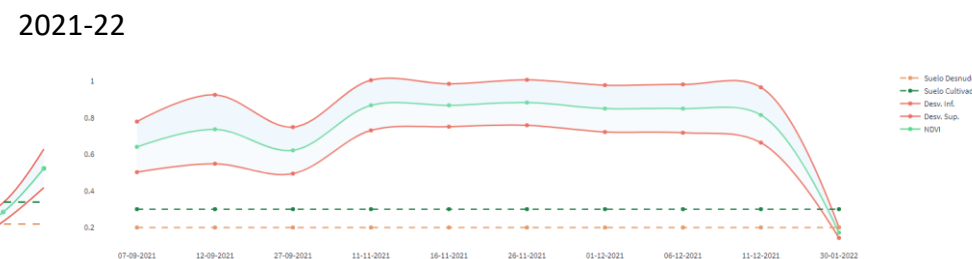
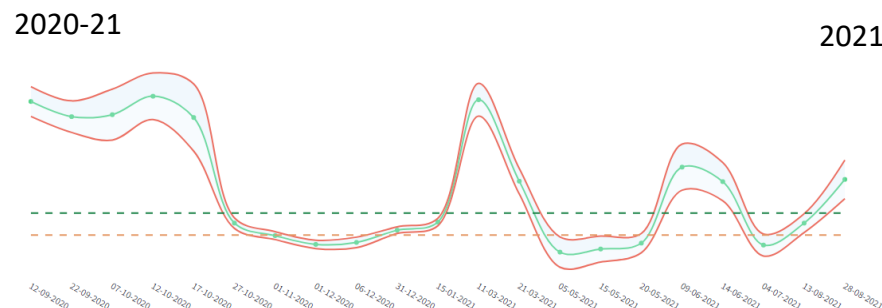
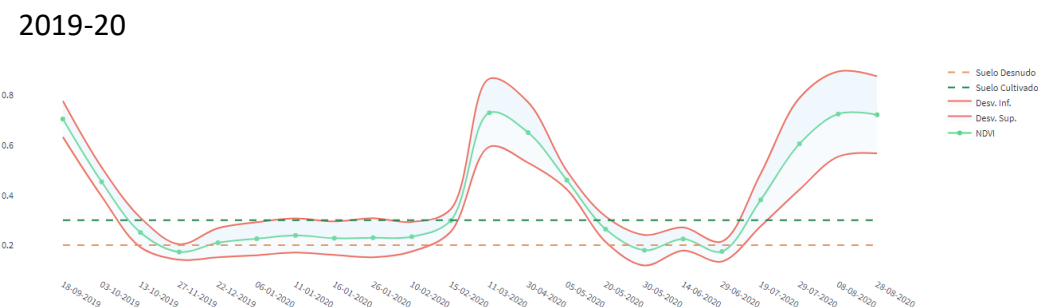
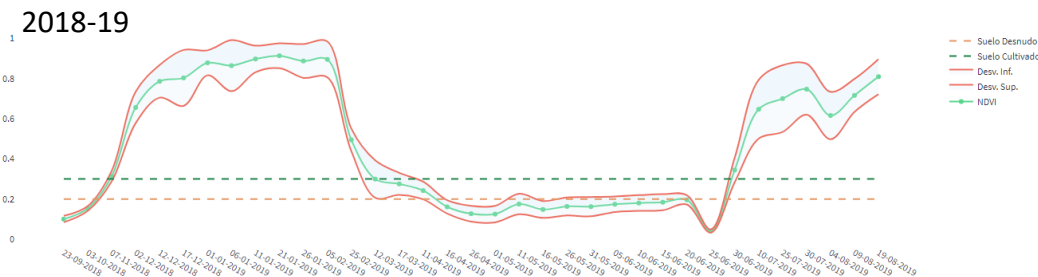
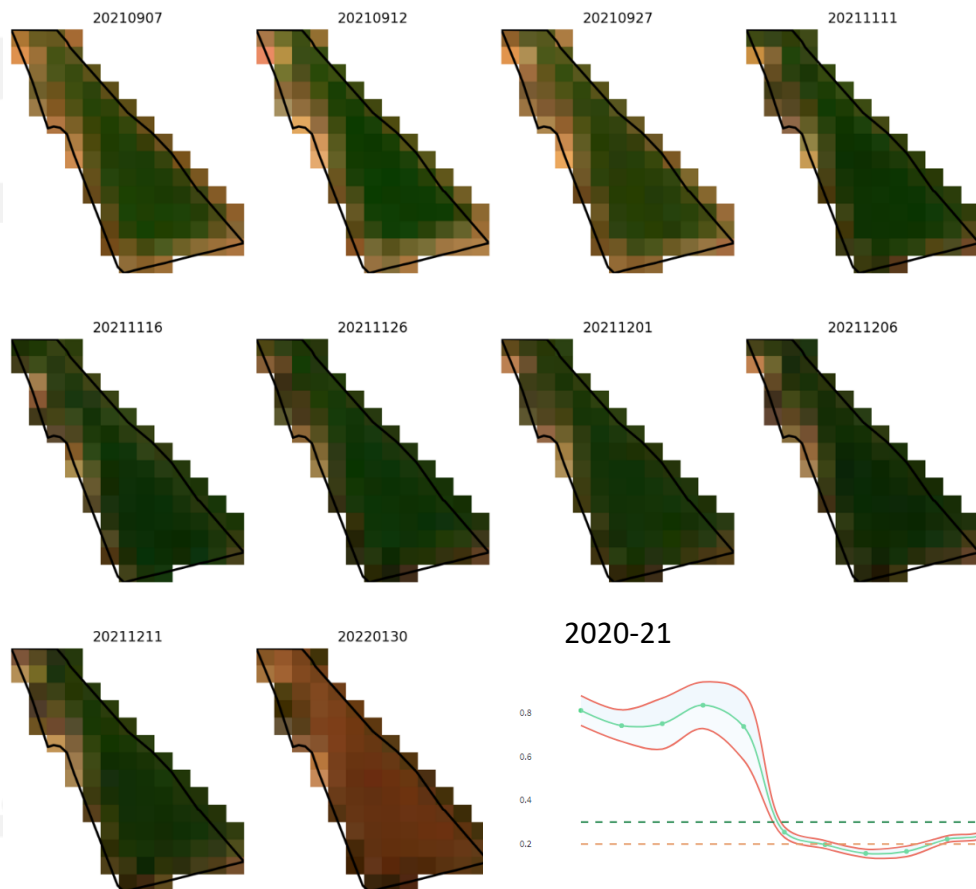


## Increased monitoring intensity: 2016->2022 (Data Exploration Tool)



## Increased monitoring intensity: 2016->2022 (Crop monitoring)

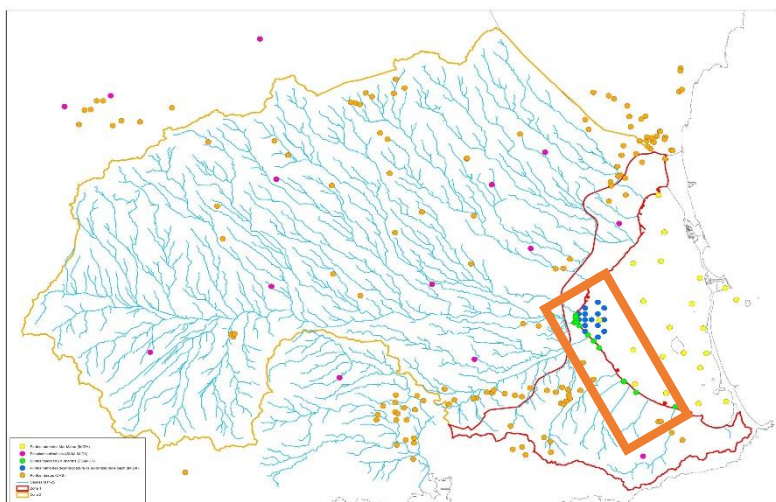
Mun. 16 Pol. 501 Par. 126 Rec. 1 - Año 2022 - Ortoimagen - Máscara



## Increased monitoring intensity: 2016->2022 (Albuji3n)

Data period: 1/7/2021 – 4/1/2022

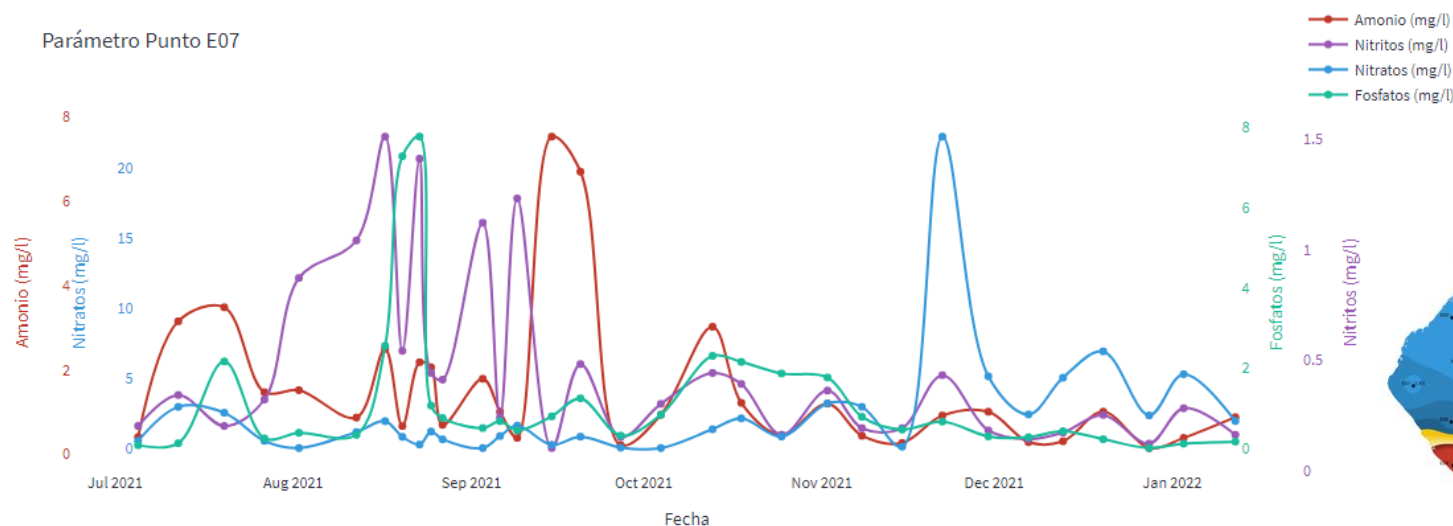
No. of points: 15



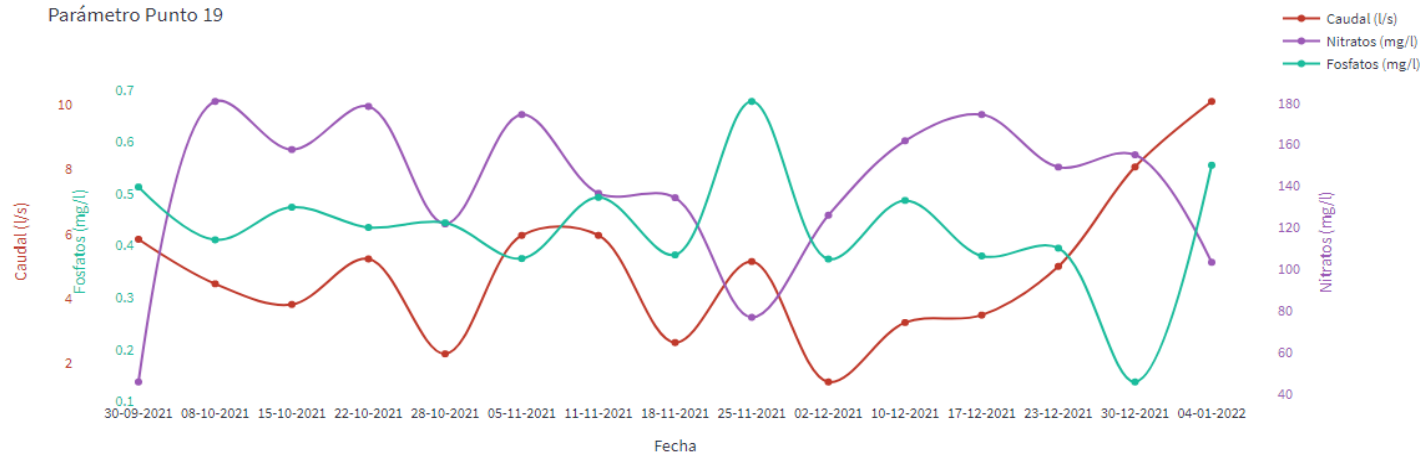
(Mar Menor) Data period: 30/9/2021 – 4/1/2022

No. of points: 14+21

Parámetro Punto E07

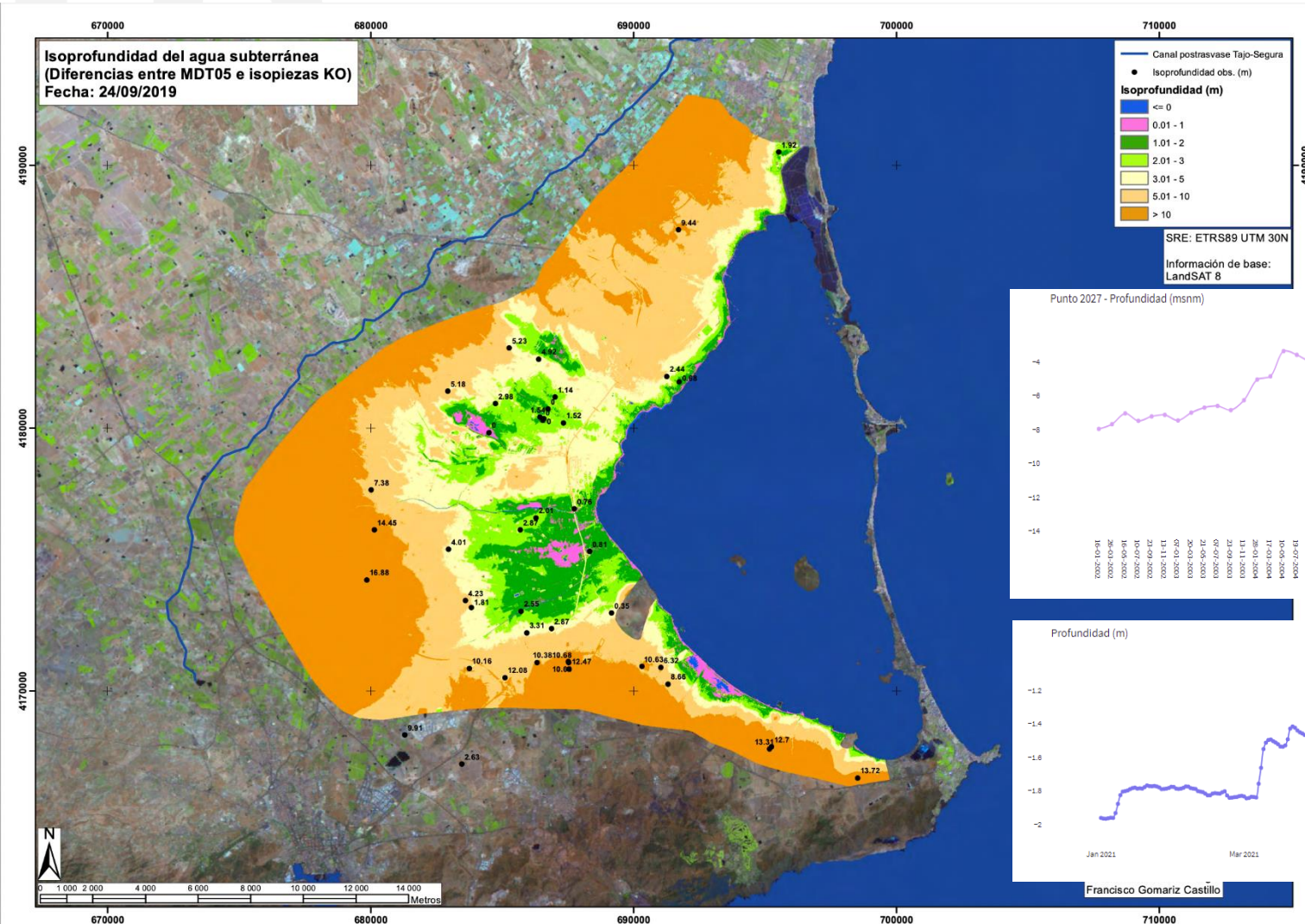


Parámetro Punto 19





## Increased monitoring intensity: Piezometric level monitoring



GOBIERNO DE ESPAÑA

MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE

CONFEDERACIÓN HIDROGRÁFICA DEL SEGURA

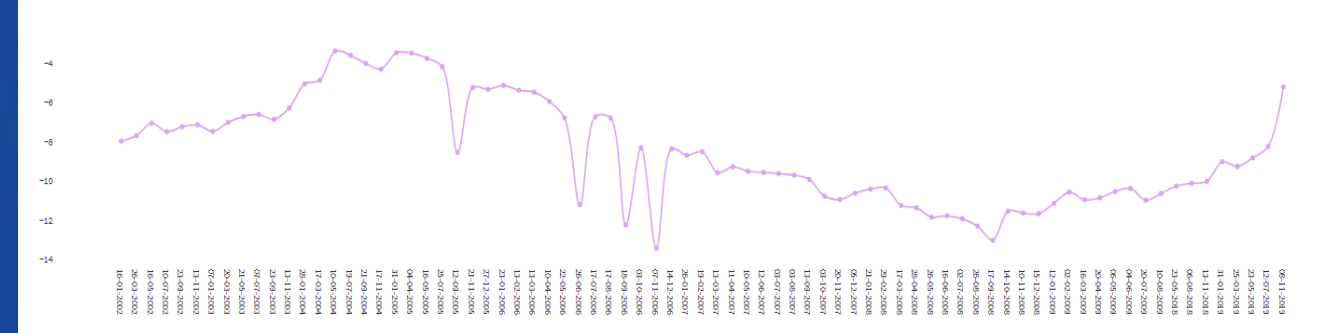


MINISTERIO DE CIENCIA E INNOVACIÓN

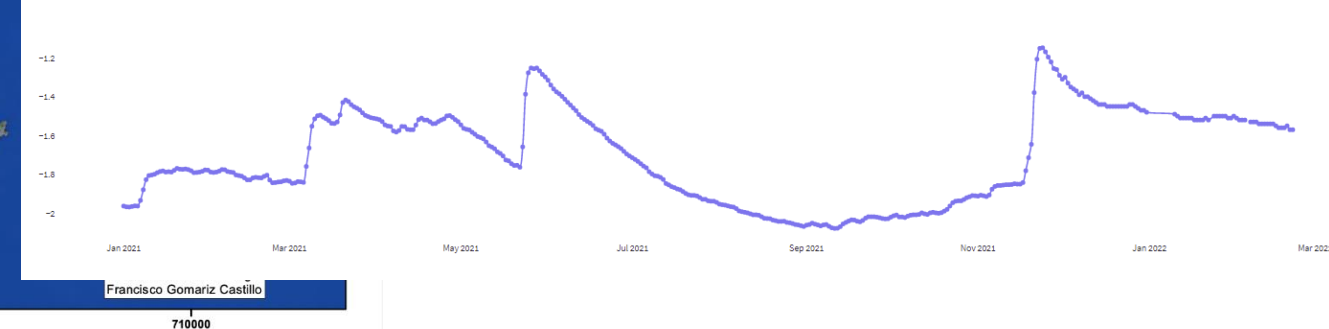


Instituto Geológico y Minero de España

Punto 2027 - Profundidad (msnm)



Profundidad (m)

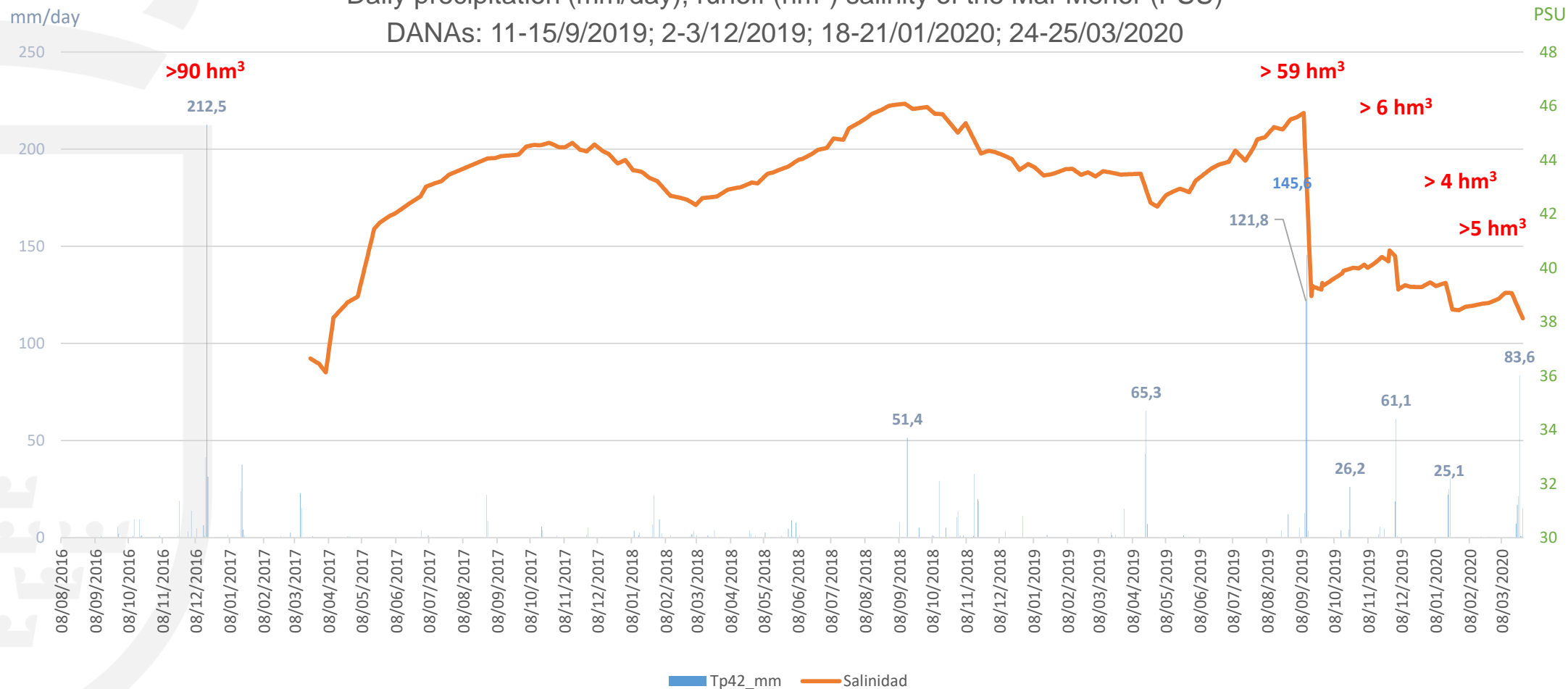


Francisco Gomariz Castillo

## Data science and Big Data for environmental monitoring

Daily precipitation (mm/day), runoff (hm<sup>3</sup>) salinity of the Mar Menor (PSU)

DANAs: 11-15/9/2019; 2-3/12/2019; 18-21/01/2020; 24-25/03/2020

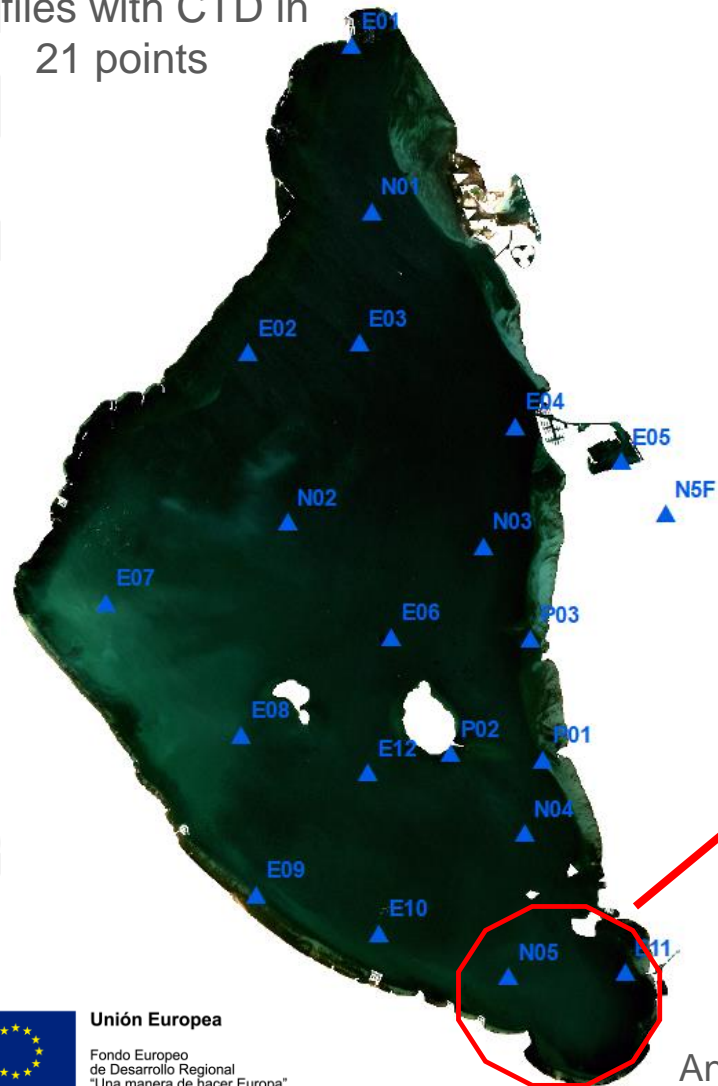


Effect of freshwater inflows by direct runoff after the last four episodes in the salinity of the Mar Menor: September 2019, when some entered (59 hm<sup>3</sup>), December 2019 (5.6 hm<sup>3</sup>); January 2020 (4 hm<sup>3</sup>); and the (5 hm<sup>3</sup>) of March.



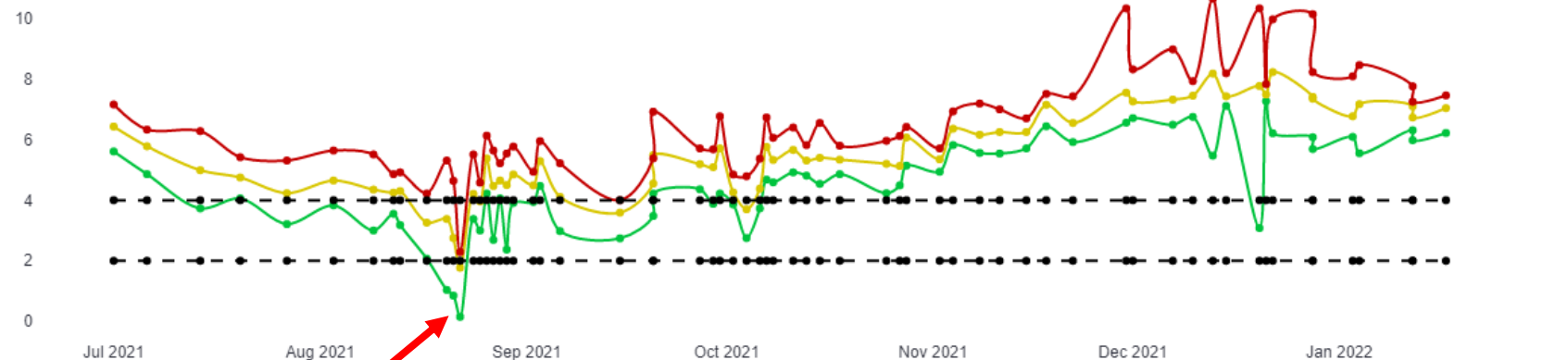
## Data science and Big Data for environmental monitoring

Profiles with CTD in 21 points

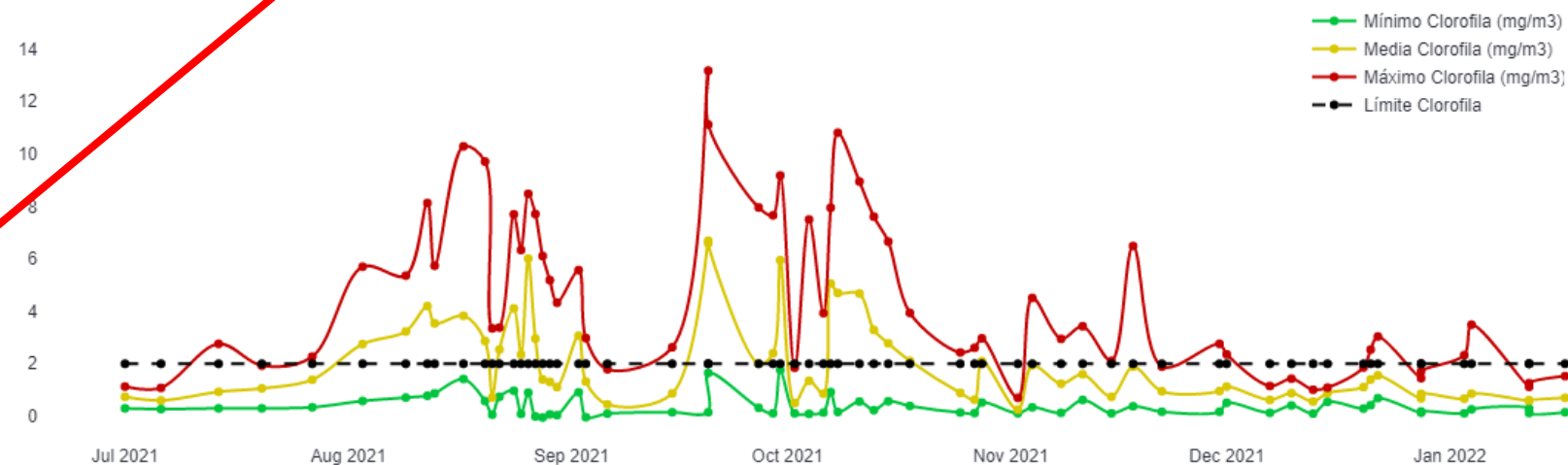


Oxígeno (mg/L)

Average content of oxygen and chlorophyll in water (2021)



Clorofila (mg/m3)



Anoxia episode (2021)

## Precision farming

Project for the implementation of precision agriculture technologies and aquifer control in the Community of Irrigators of Campo de Cartagena

### PRESUPUESTO

1.133.415,33 € · anualidad 2021  
92.338,18 € · anualidad 2022

### PLAZO EJECUCIÓN

6 meses · fase de obra  
36 meses · fase de servicio

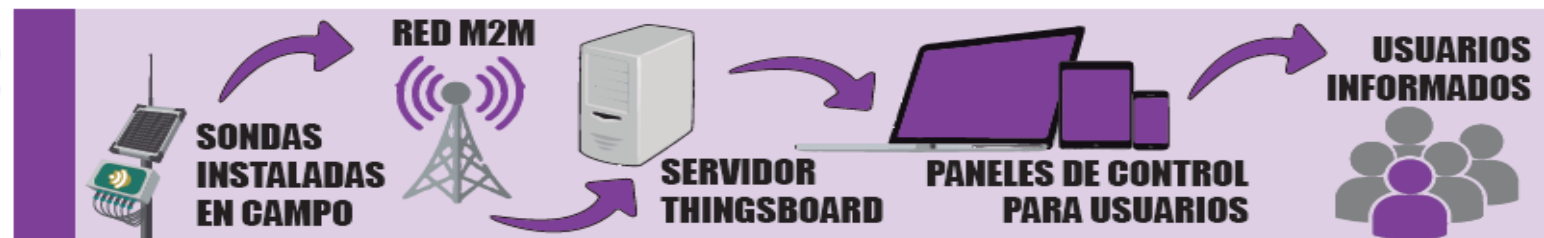
### OBJETIVO

Incorporar en los sistemas informáticos de la Comunidad de (CRCC) un sistema de gestión que favorecerá un uso más eficiente de la energía a todos los comuneros, permitiendo así mejorar la productividad de esta zona y disminuir las presiones sobre la laguna, a través del gradiente de agua de regadío sobre las capas superficiales mediante la implantación de nuevas tecnologías y su afeción directa o indirecta.

Para ello se pretende la ejecución de una red de 1.000 sondas de campo del Mar Menor tal y como se recoge en el Decreto Ley nº2/21 Integral del Mar Menor y dentro de la Comunidad de Regantes.

- 1.000 · Sondas % humedad, CE y Tª de suelo
- 25 · Pluviómetros
- 50 · Caudalímetros
- 500 · Sensores ambientales
- 25 · Piezómetros, nivel y CE agua
- 5 · Piranómetros
- 55 · Sensores humectación de hoja
- 5 · Estaciones Meteorológicas
- 5 · Sensores de NO<sub>2</sub>

### DATOS



### INFO AGRONÓMICA

#### INFORMACIÓN AGRONÓMICA

Las sondas se instalarán a distintas profundidades dependiendo del cultivo y permitirán monitorizar el estado del acuífero.

En HORTÍCOLAS, LEÑOSOS e INVERNADERO.



### LOCALIZACIÓN SONDAS

#### HORTÍCOLAS

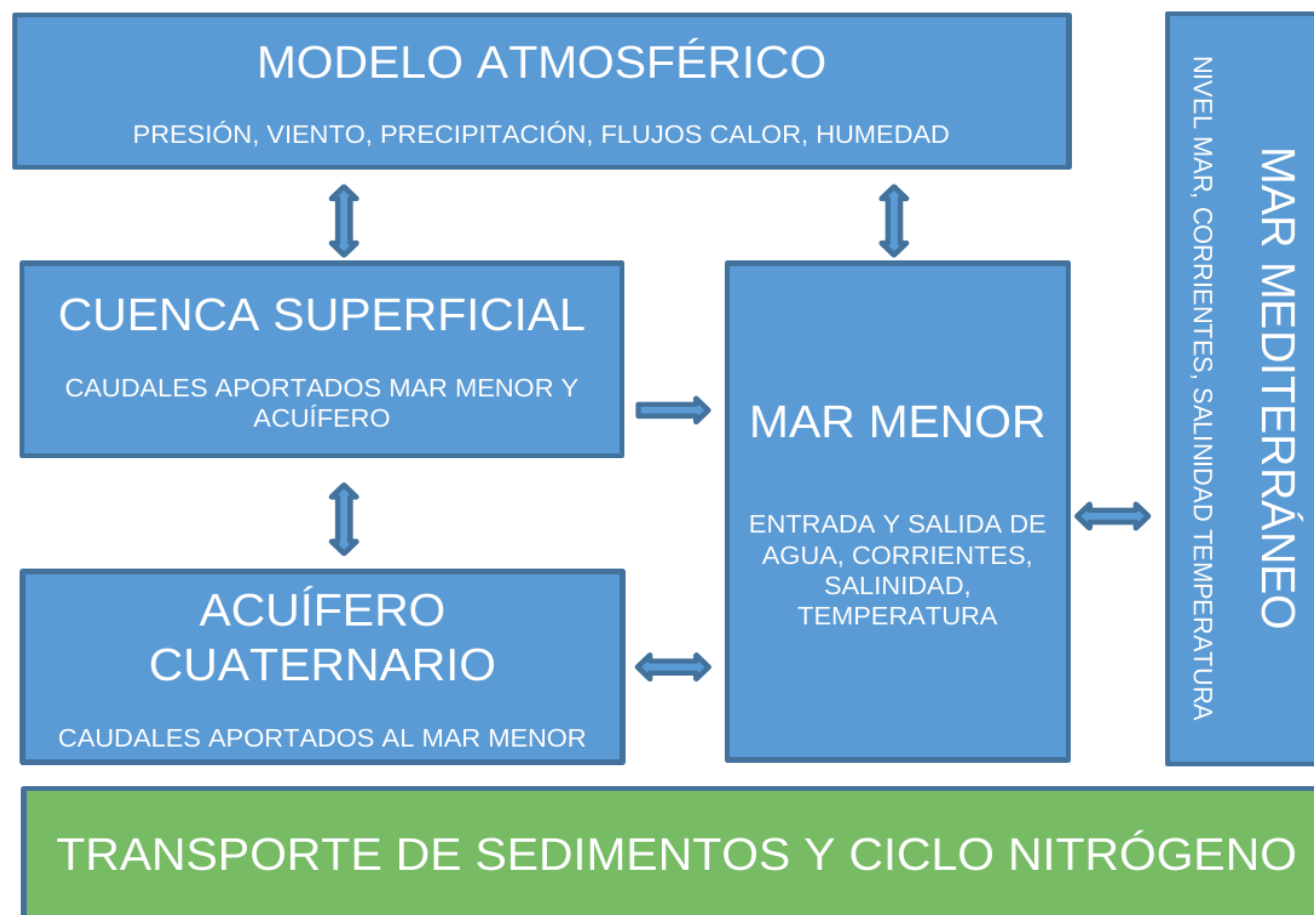
#### INVERNADERO

#### LEÑOSOS

Unión Europea

Fondo Europeo de Desarrollo Regional  
"Una manera de hacer Europa"

# *Monitoring and modeling of the physical elements involved in the water, sedimentary and nutrient balance of the Mar Menor System (Decreto-Ley 4/2021)*



## Conclusions

**Antonio Luengo Zapata**

*Regional Counsellor of Water, Agriculture, Livestock, Fisheries  
and the Environment*

### *Inspections*

Development of inspection plans aimed at verifying the application of measures at origin for the purpose of compliance with Law 3/2020.

706 inspections (up to 31/12/2021), covering an area of 10,915 ha.

Opening of 215 files.

27 personnel.

The 2022-2024 Inspection Plan includes a 90% increase in the number of inspections to be carried out in Campo de Cartagena.





### *Crop Restitution*

The CHS is competent to grant irrigation rights or to cut off water to illegally irrigated crops. In addition, they should undertake restitution on the basis of the Water Law. Faced with inaction, the regional government (empowered by the Law of the Mar Menor), executes the restitution to return the crops sanctioned by the CHS to their original state.

The Community has initiated 100% of the 228 dossiers received (2,954 hectares). So far, 183 hectares of illegal irrigated land reported by the CHS belonging to 13 sanctioning files have been restored.

During 2022, the processing of the files received will continue in order to make progress in the restitution of illegal irrigation.



### ***Biomass Removal***

Since 2017, the Community has been removing plant biomass from the shores of the Mar Menor to help the coastal municipalities improve the environmental state of the beaches and shallow areas.

In the period 2017-2021, 8,355.5 Tn of biomass have been removed at a cost of 4.1M€.

2M€ is planned for the period 2022-2023 for these tasks.



### ***Lysimetric Network***

The installation of a lysimetric network using probes aims to ensure a more efficient use of water and fertilisers, thus improving the environmental sustainability of irrigation in this area and reducing pressure on the lagoon. This makes it possible to reconcile this activity with the protection of vulnerable areas.

To date, 980 of the 1,000 probes planned have been installed in 490 control points throughout the Campo de Cartagena. More than 1.2 million euros have been invested.

By 2022, the CARM plans to allocate €1.1 million to continue promoting the implementation of sustainable and precision agriculture technologies.



### *Environmental Tanks*

The environmental tanks make it possible to store a large volume of water during rainfall episodes and reduce the pollutant load discharged into the environment at these specific times. Once the rainy season is over, this water is sent to the WWTP (preventing it from being discharged directly into the Mar Menor) and once it has been decontaminated it can be used at a later date.

To date, 7 environmental tanks have been built around the Mar Menor with an investment of 10.6 M€. 1 tank in Los Urrutias (Cartagena), 1 tank in Los Alcázares), 3 tanks in Santiago de la Ribera (San Javier) and 2 tanks in Lo Pagán (San Pedro del Pinatar).

During the 2022 financial year, it is planned to put out to tender and begin construction of the storm tank at Playa Honda, in Cartagena (6 million euros). In addition, as part of the rainwater control, sanitation and treatment programme for the Region of Murcia (horizon 2030) with an investment of 235.2 M€ in the period 2022-2030.



### *Rainwater pipes*

The maintenance of rainwater networks is essential to ensure that there is no seepage into the Mar Menor.

Two rainwater works have been carried out in the municipality of San Javier. Barrio de Los Pescadores, with an investment of 660,000 € and in the PERI del Polideportivo for an amount of 188,000 €. Currently under construction is the rainwater collector in Joaquín Blume street (Los Alcázares) for 1.7 million euros.

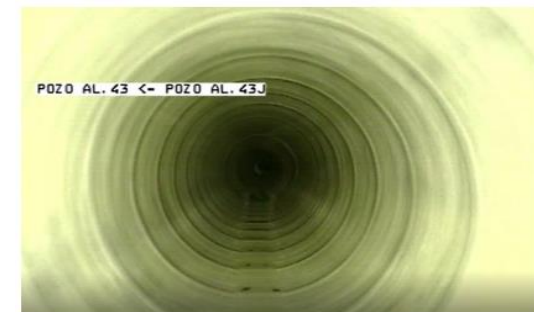
There are plans to carry out 10 actions in rainwater networks with an investment of 11.5 million euros.

**SAN PEDRO DEL PINATAR:** North rainwater collector, improvement of rainwater in El Mojón, rainwater in Avd. del Puerto and pumping from the Lo Pagán storm tank to C/ Santa Sofía.

**SAN JAVIER:** Rainwater collectors to the south and north and lamination reservoir.

**LOS ALCAZARES:** Increase of rainwater collector in Calle Meseguer, from al Árbol to Rambla, Calle Isla Tabarca rainwater collector, EUSEBIO rainwater collectors, Punta Calera, etc.

**CARTAGENA:** Rainwater pumping in El Molino de Los Urrutias 500.000





### ***Sheathed***

Rehabilitation and improvement of the existing sewerage network of the riverside municipalities. This is a trenchless system that avoids inconvenience to citizens thanks to the application of cutting-edge technology.

More than 25 km of the network have been specifically revised and more than 9 km have already been rehabilitated, with an investment of more than 1.5 million euros.

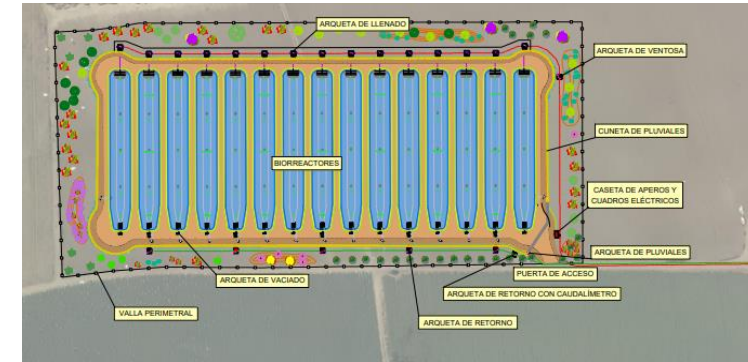
The objective is to overhaul 1,000 km of networks in the Mar Menor catchment area. In addition, in 2022, the rehabilitation of 2.4 km of collectors in San Javier is planned with a planned investment of €0.22 million.

## Bioreactors and green filters

Proposal from the scientific community for the denitrification of nitrate-rich runoff water flowing into the Mar Menor from the Albuñón and Miranda wadis and drainage channels.

Start in the second quarter of the construction of 16 citrus wood chip ponds for the retention of nitrates in the Albuñón wadi (5 million €). This is one of the 4 projects planned for the Albuñón and Miranda wadis.

The projects to be implemented in the coming years have a planned investment of 22 million euros.



### *WWTs*

The Region of Murcia has complied with the objectives and deadlines set by Directive 91/271/EEC and aims to significantly increase its degree of stringency, extending its scope to small urban agglomerations.

From 2019 to 2021, 71 actions have been carried out for the rehabilitation and improvement of the Mar Menor Wastewater Treatment Plants, investing 13.6 million euros. The Torre-Pacheco storm tank is currently under construction (3.6 million euros) and the La Unión WWTP storm tank is about to be started with an investment of more than 400,000 euros.

The II Plan de Saneamiento y Depuración de la Región de Murcia (horizon 2035) foresees the construction of 46 actions with an investment of 84.7 million euros in the period 2022-2035. In 2022 it is planned to invest €5 million, with the San Javier and Cabezo Beaza WWTPs in Cartagena being the most important projects.



### Withdrawal of vessels

Competence of the State Coastal Demarcation and Capitanía Marítima. The regional government decided to act in the face of inaction to remove illegally located vessels.

Since 2017, a total of 54 abandoned, stranded, sunken or semi-sunken vessels have been removed, involving an investment of over €110,000.

An expenditure of €65,000 is planned for the year 2022.



### *R+D+i*

The regional government is committed to research and scientific knowledge as the best ally for the recovery of the Mar Menor.

To date, €6.6 million has been spent on, among others, the bank of protected species, the bank of autochthonous filter feeders, monitoring and analysis of the ecological status, hydrodynamic predictive modelling, the biogeochemical study of the seabed and studies on environmental parameters and pollutants in the Mar Menor.

2.4 million is planned for the period 2022-2023 for research, monitoring and projects related to the scientific contribution.





1. Guarantee regulatory framework with environmental protection of the coastal lagoon, and technical and material capacity for its development.
2. Monitoring of the discharge basin, aquifers, and mar menor, probably today the lagoon with the greatest technical and scientific monitoring.
3. Sectorial and social commitment to good practices and use of the best available techniques for the development of the productive activities
4. Broad public participation, with the establishment of participation committees and the web “mar menor channel” where all the information about the coastal lagoon is published.
5. Actions in development indicated

## Videos of the most important actions

- Storm tanks
- Bioreactors
- Recovery of traditional fishing areas
- Environmental monitoring