

Wetland conservation and governance



Sustainable development in protected areas

contribution to a resource-efficient, green and competitive low-carbon economy

The Mar Menor Case.

Networking with Albania, UK and France

Carmen María Martínez Saura

ALFRED TOEPFER SCHOLARSHIP 2017



Acknowledgements

I would like to thank the support of the *Alfred Toepfer Foundation* and the EUROPARC Federation for giving me the opportunity to carry on this incredible experience; and the Team of EUROPARC Federation as well as EUROPARC ESPAÑA, due to the warm welcome, help and assistance given in the EUROPARC Conference and during all this year. Luis Monteiro, thank you for your patience and recommendations. The *Alfred Toepfer Natural Heritage Scholarship* has been an excellent opportunity for networking, for visiting Protected Coastal Wetlands with similar uses and pressures and for importing best practices for planning and managing through local people involvement. It has allowed me to learn how different wetlands could be protected, conserved or restored and tools for the sustainable development of Mediterranean Coastal Wetlands.

The visits to the parks and the study would not have been possible without the help of many people. I really appreciate the assistance, the given information and the hospitality of the protected areas staff, the Administration, many NGOs and other organisations for their support regarding my study. I specially recognise the people from INCA and PPNEA in Albania, Alison Debney from ZSL, in England, United Kingdom and Mathieu Thevenet, Domitille le Huede and Fabrice Bernard from the Conservatoire du Littoral in France, due to the incredible effort helping me to organise –some of them almost organising the visits on their own.

Of course, I acknowledge each of you that have spent a little of your time providing data or information.

Sorry if I forgot any name or person. I have met hundreds of people with tons of interesting information to share and with the determination to face the pressures of the wetlands and biodiversity.

I have also in mind my colleagues from ANSE, that have supported this project, and all of those that have shared their knowledge and passion for the conservation of the Nature and the Biodiversity. A huge thank you to WWF/España and their team, for your supporting and joining us in the conservation of the Mar Menor lagoon and helping us to highlight their pressures.

Thank you to Pedro López and Diana Hernández for coming along with me to some visits; Patricia Díaz, Ana Egea and Antonio García for your proofreading.

Thank you, Pedro, for joining me up in some travels and in my life, for long discussions and talks about the conservation of biodiversity, for teach me how to look nature in a different way and, of course, for your patience and encouragement.

And, of course, I cannot forget my family and friends, who help me reach to this point.

Table of content

Acknowledgements	1
Table of content	2
1. Summary.....	3
2. Introduction and background	4
2.1. Author	5
2.2. Home institution	5
2.3. Wetlands	7
2.4. Mar Menor Lagoon	8
2.4.1. Geomorphology, hydrology and climate	9
2.4.2. Political description	10
2.4.3. Biological description	11
2.4.4. Protection and management	13
2.4.5. Main uses and economic sectors in the area	15
2.4.6. Changes and Threats	16
2.5. Objective	18
3. Methodology	20
3.1. The study area: the reason of those Protected Areas	21
3.1.1. Divjaka-Karavasta National Park in Albania	22
3.1.2. The Blackwater, Crouch, Roach and Colne Estuaries in Essex, United Kingdom	24
3.1.3. Mediterranean coastal wetlands in the south of France	27
3.2. Travel plan.....	30
4. Results: detailed information of the areas visited	32
4.1. Divjaka-Karavasta National Park in Albania	32
4.1.1. Some challenges	37
4.2. The Blackwater, Crouch, Roach and Colne Estuaries in Essex, United Kingdom	41
4.3. Mediterranean coastal wetlands in the south of France	47
4.3.1. The study cases.....	50
5. Lessons learned and some conclusions	64
5.1. First overview and comparison.....	64
5.2. Some measures that could be applied in the Mar Menor Lagoon	65
5.2.1. From Albania	65
5.2.2. From the United Kingdom.....	65
5.2.3. From France	65
5.3. Conclusions	65
6. References and Bibliography	68
7. List of figures.....	71

1. Summary

Wetlands are among the most productive ecosystems in the world and they provide ecosystems services and values; despite their importance, they have been historically considered as worthless and suffer different pressures due to habitat destruction, drainages, land conversion, pollution and over-exploitation of resources, among others.

Mar Menor lagoon is a coastal wetland that it is legally protected by different regional, European and international categories, but is poorly managed. The lagoon suffers high pressures due to urbanisation, and other intensive uses, such as farming.

This document shows some examples of management of different European coastal wetlands and some initiatives that could be implemented in the Mar Menor lagoon.

2. Introduction and background

Wetlands are valuable and productive ecosystems with high pressures due to the transformation and land use. The pressures are usually higher in those placed in coastal areas, which are fragile spaces with a wide range of human uses. As wetlands as coastal areas are threatened in different ways by the alterations caused by the Climate and Global Change. The loss of the biodiversity, the decline in ecosystem services or the sea level rise compromise the livelihoods and security of the world population. The preservation of these ecosystems is a kind of insurance to prevent the environmental risks as water scarcity or the rising of the sea level. As example, during the twentieth century, the level of the sea has risen around 17 centimetres in average, reaching between 20 and 30 centimetres in the Mediterranean coast.

The only way to preserve these spaces is to assure the coexistence of different uses with the paradigm of the sustainable management. The main tools are management plans and governance. A management plan should determine the objectives, the threats and methods to reach the aims, over a certain period of time. This document needs to be dynamic, being reviewed in order to adapt to the different necessities and changes, and based on the lessons learned. The governance takes into account the process of decision-making and the exercise of authority and responsibility for the main decisions that could affect the site, its functioning and its population. The governance should define who and how the decisions are taken and who is in charge of any of the issues and how the population and stakeholders are involved. In that approach, the necessity of involving the population, the economic sectors and the stakeholders in general is highlighted.

The Mar Menor lagoon is the biggest coastal lagoon in the Iberian Mediterranean coast and it has different protection types due to its environmental interests. It is a complex protected space which is legally protected but poorly managed. Throughout this document, some examples of management of different European coastal wetlands are shown, and deferment measures and management approaches are exemplified.

Box 1: Some definitions

Governance of protected areas: The interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say (Graham et al., 2003).

Protected Area: A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (Dudley, 2008).

2.1. Author

I was born in Cartagena (Murcia, Spain) in 1984. I am an enthusiastic person who has been involved in environmental protection, education and participation for more than 15 years.

I studied an Environmental Sciences Bachelor and a Master in Wild Fauna Management at the University of Murcia but I started collaborating with ANSE, an environmental NGO, as a volunteer even before. Nowadays, I work as an Environmental Technician for ANSE and as a Lecturer in the Methods Area of Experimental Sciences at the Faculty of Education at the University of Murcia.

I have worked on different projects for ANSE to protect nature, including rivers, wetlands, semiarid habitats, environmental education, and involving volunteers and training farmers in sustainable agriculture. In the last 5 years, I have focused on improving the sustainability of primary sectors through biodiversity conservation, citizen participation and co-management promotion. Nowadays, we are engaged in the Mar Menor lagoon protection through the improvement of knowledge, the development of restoration actions, taking part in the establishment of a management plan and the involvement of the inhabitants and workers in its conservation.

I devote most of my free time to Nature such as visiting, walking or monitoring flora and fauna, and I spend my holidays in Nature Tours. In the future, I would like to continue studying Nature and Environmental Management and developing projects to ensure its conservation.

2.2. Home institution

ANSE – Association of Ecologists of the Southeast of Spain – is an NGO founded in 1973 that promotes environmental protection in the Iberian Southeast (www.asociacionanse.org). The organisation aims at the defence of the environment and the conservation of nature and ecological processes through biodiversity, ecosystem and landscape preservation, ensuring sustainable use of renewable natural resources, and promoting actions for reducing environmental impacts and the waste of resources.

This Association has worked in different ways in terms of monitoring, conserving and improving ecosystems and landscapes in this semiarid area, such as some actions to improve the knowledge about some species of fauna, the restoration of the flora of coastal mountain ranges or the restoration of the riparian forest. ANSE promotes local participation through Land Stewardship, volunteerism and collaboration with social and economic organisations and professionals of primary sectors –mainly farmers and fishermen. Nowadays, this organisation plays an important role including giving people a voice to press the Government for the conservation of natural areas and collaborating

with companies and professionals in the balance of the economic activity with Nature Preservation, through the implementation of good practices and co-responsibility politics.

ANSE has been calling for the effective protection of the Mar Menor lagoon for more than 30 years and, currently, it is still developing projects in the region. However, in the last few years, the status of the lagoon ecosystem has become worse and the population is becoming aware of the problem.

ANSE has developed some activities to improve the knowledge of the Mar Menor lagoon and its surroundings, mapping the distribution of the aquatic and coastal flora and its changes. In this way, the coastal flora cartography of La Manga showed the presence of endangered species, including the endemic *Asparagus of Mar Menor (Asparagus macrorrhizus)*, with an estimated population of 400 individuals or lower right now, and the changes in the ratio of natural and artificial land surface in the area in the last 70 years. The cartography of the aquatic flora of the lagoon carried out in three different times between 2014 and 2018 revealed the occupation of Slender Seagrass (*Cymodocea nodosa*) and the changes during and after the eutrophication process of the lagoon. Likewise, fauna such as fish, terrapins or birds has been monitored and a campaign of bird-ringing has been developed in the islands of the lagoon and its surroundings.

Some projects aim at improving the conservation status of the wetland and coastal ecosystem, and of species, as well as at the fight against climate change and its effects. Areas of sand dunes have been restored with nature-based solutions, for example, using indigenous species of plants –including endemism and endangered species.

Collaborations with Local and Regional Authorities and economic sectors have been set for establishing some proposal and policies in order to enhance the management of the area. The partnership with fishermen let us enhance the available data about the resources and the fisheries as well as improve the co-management of the activity and update the legislation; collaborations with the farmers are helping them to create green fences for reducing pollutants such as nitrates.

In addition, ANSE has developed an intense criticism and protest by legal and media means. Complaints help to stop some illegal constructions such as buildings and a large port. Likewise, a report was issued informing that more than a third of the agricultural area of the Mar Menor watershed is illegally developed.

Most of these actions that ANSE has carried out in the Mar Menor lagoon have been developed in cooperation of WWF/Spain. WWF/Spain is part of the network of WWF, one of the biggest independent organisations aiming at defending Nature and environment worldwide. Founded in 1963, their mission consists in conserving the Nature, their habitats, ecosystems and species, and fighting the threats on the life and living beings on the Earth.

2.3. Wetlands

Wetlands are among the most productive ecosystems in the world; they are the cradles of biological and habitat diversity, as well as important storehouses of plant genetic material.

They provide ecosystems services and values such as water quality improvement, carbon sequestration, regulation of water and biogeochemical cycling, flood storage, shoreline erosion protection, wildlife habitat, food production or opportunities for recreation, education and research. They have special importance in semiarid areas, where the availability of water is particularly scarce. In these spaces, wetlands are considered as biodiversity islands.

However, wetlands have been historically considered as worthless. In the Iberian southeast, the ecosystems have been traditionally drained for avoiding some diseases like paludism or malaria.

Wetlands play an important role when facing climate change effects, in an adaptive way, helping capture greenhouse gases, and through mitigation, helping cope with sea level rise. Some experiences carried out in tropical Africa show that the adequate management of wetlands is based on the protection of biodiversity and forest areas in order to avoid degradation and to enhance natural functioning, which allows decreasing 14 tons of greenhouse gases per hectare each year.

The high primary productivity of wetlands made them especially adequate for agricultural and fishery production. This productivity causes that wetlands are a resource for food production and very sensitive to degradation and land occupation. This is especially worrying in coastal wetlands. These ecosystems are also one of the most endangered and populated ones, suffering drainages, land conversion, pollution and over-exploitation of their resources. There, traditional and intensive uses run through, resulting in conflicts of interest and increasing stress in the ecosystem.

Ecosystems functions of the wetlands can only be maintained if the ecological processes are allowed to continue functioning. Protecting wetlands will protect our safety and welfare. The management of resources and uses is essential for sustainable development and biodiversity conservation but it could only be pushed forward with the participation of local people and workers.

Box 2: Wetlands

Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They are defined as transitional lands between terrestrial and aquatic ecosystems where the water table is usually at or near the surface of the land, covered by shallow waters. Ramsar Convention on Wetlands define them as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with static or flowing water, fresh, brackish or salt, including marine water areas whose depth at low tide does not exceed six metres. Wetlands include both the basin and transitional areas surrounding the basin and upland vegetation.

2.4. Mar Menor Lagoon

Mar Menor is the biggest coastal lagoon in the Iberian Mediterranean coast. It is a hypersaline coastal wetland placed in the southeast of the Iberian Peninsula which is protected under different protection categories due to its ecological and scenic values.

Together with some other wetlands such as El Hondo, Santa Pola salt pan or Las Moreras lagoon is part of a complex of wetlands placed in the Iberian southeast. Nowadays, most of the wetlands in the area have disappeared or reduced its size because they have been drained or occupied by buildings, infrastructures or farming.

The lagoon is placed at the end of a plain and it is the connection of the waters that flow from that plain with the Mediterranean Sea, from which it is separated by a sandbar. Although this lagoon was oligotrophic in its origins, diverse changes in the economy of the area have transformed it into eutrophic.

The economic importance is due to tourism, intensive agriculture and traditional fisheries, and the area is highly occupied by buildings and infrastructures.

This is a fragile coastal wetland which has suffered deep changes. Despite the lagoon being under Regional and Natura 2000 Protection, Ramsar and Barcelona Conventions, and being included in IBA's lists, the high pressure due to the disordered mixture of human uses is leading it to the edge of collapse.

Nowadays, the Mar Menor has major problems with spatial planning and the intensive use of the area, mainly tourism and intensive agriculture. As an example, the permanent spilt of agrochemicals is considered as one of the main causes of the quick eutrophication process that took place in 2016. It is still affecting the development of other economic activities and the life quality of local people, visitors and tourists.



Figure 1: The Mar Menor lagoon is a coastal wetland placed in the Iberian Southeast.

2.4.1. Geomorphology, hydrology and climate

The Mar Menor lagoon is a coastal salty lagoon in the southeast of the Iberian Peninsula. It occupies almost 15,000 hectares, what makes it the largest lagoon in the Spanish Mediterranean coast. Despite its name –Mar Menor or “Smaller Sea”– it is a coastal wetland or lagoon.

The seabed is diverse, with sand, muddy and rocky substrates related to the volcanic outcrop. The lagoon has a maximum depth of 6.5 metres and there are five islands of volcanic origin: Mayor or Barón island, Perdiguera island, Sujeto island, Redonda or Rondella island and Ciervo island. The latter was artificially connected to La Manga and despite its later separation, this affected flora and fauna populations.

The lagoon acts as a connection between the waters that flow from the plain and the Mediterranean Sea. It is placed at the end of an extensive quaternary plain, Campo de Cartagena, and receives all the freshwater inputs by some ephemeral watercourses called *wadis* or ‘*ramblas*’ that drain into the lagoon, and subterranean water. These *wadis* are generally inactive, but they can carry great quantities of water and sediment during flood episodes.

The lagoon is separated from the Mediterranean Sea by a sand bar of 24 kilometres length and connected to it through small channels or ‘*golas*’. Two of these channels were dredged in the 1970s with the aim of allowing navigation, what has increased the water flow between the Mediterranean Sea and the lagoon. One of the small shallow channels placed in the north is occupied by traditional fishing weirs.

From an ecological perspective, the lagoon has a greater salinity than the Mediterranean –around 42-47 g/l– due to the disequilibrium between the precipitation and evaporation, although it has lowered since the 70s due to the subsequent dredging and the increasing of water flow with the Mediterranean Sea. The continental supplies depend on occasional torrential rains or irrigation drainages, both through *wadis* and underground run-offs. A new study about the importance of the surface and groundwater flows has been published in 2018.



Figure 2: The Mar Menor lagoon.

The run-off from the *wadis* sweeps along great quantities of sediments to the lagoon, including heavy metals from the Sierra Minera and some nutrients that have caused the transformation of the lagoon, originally oligotrophic, into a eutrophic one.

The semiarid Mediterranean climate is characterised by scarce but heavy and torrential rains with irregular patterns of rainfall, usually in autumn and spring; and warm temperatures around 18°C. The temperature is more extreme in the lagoon than in the Mediterranean Sea, reaching 38°C in summer and hardly dropping down the 5°C in winter.

2.4.2. Political description

The Mar Menor lagoon is located in the east coast of Region of Murcia and the urban area is managed by four municipalities: San Pedro del Pinatar, San Javier, Los Alcázares and Cartagena. Apart from the urban areas of the three first municipalities, and some little towns that belong to the Cartagena Council, the main urban area around the lagoon is La Manga del Mar Menor. This area –highly occupied for second residences destined to touristic uses– belongs to two different Councils: the northern part is managed by San Javier and the southern by Cartagena.

The main economic uses are intensive irrigated farming, traditional fishing and tourism based on sun and beach and nautical activities. There are also military activities and salt extraction.

Currently, there is a high land occupation and it continues to grow. While the first line of the coast and the whole land of La Manga has been occupied with secondary residences and some hotels and touristic infrastructures like ports, agriculture has been widespread in the next belt and nowadays it invades the whole plain. There are some small towns which have grown because of touristic development and some military settlements, although some of them have been abandoned. There are three salt marshes on the area but only one is being exploited at the moment.

The Autonomous Administration is responsible for the management of some other areas such as environmental and port managements, and irrigation and run-off waters are managed by the Ministry of Environment through the Water Confederation.

2.4.3. Biological description

The Mar Menor lagoon and its surroundings are home to high value flora and fauna.

Aquatic Ecosystem and Species

Biota is characterised by euryhaline and eurytherm species also present in the Mediterranean Sea but they usually reach high densities in the lagoon.

- **Seagrass meadows.** In the past, the Mar Menor bottom was colonised by Slender seagrass (*Cymodocea nodosa*), but recent changes have allowed the widespread of some other species as the invasive algae *Caulerpa*. Nowadays, both species share the seabed. *C. nodosa* is a small seagrass that occupies shallow salt waters in temperate areas of the North Hemisphere.
- **Fan mussel (*Pinna nobilis*).** This species was not found traditionally in the Mar Menor lagoon, but it arrived from the Mediterranean Sea and started to spread after opening the channels and increasing the water flow from the Mediterranean Sea. This species is a Mediterranean endemism considered as Species of Special Interest, and its world population decreased alarmingly in 2017-2018. The causes are not clearly described, but it seems to be a consequence of the increase in the sea temperature and of a virus as well. Some living individuals have been found in the lagoon, which could be an opportunity for the species.
- **Fish populations.** Although the studies about fish populations in the Mar Menor lagoon are scarce, these show that shallow inshore areas of coastal lagoons function as nursery grounds for early life stages of marine fish. The lagoon is a productive system that contains an abundance of macrofauna species. Fishing catches shows that the lagoon is used by some species as a refuge and feeding area in part of their cycle, and supports some fish populations of commercial importance.
- **Sygnathidae.** Seahorses and pipefish are one of the groups of interest in the lagoon. They are present in vegetated shallow areas, but despite some monitoring initiatives, their populations are not well known. It seems that the common population trend for the majority of these species in the Mar Menor lagoon is decreasing.
- **Iberian toothcarp (*Aphanius iberus*)** is an endemic small fish in the Mediterranean coast of Spain. It originally inhabited a wide range of lowland waters but nowadays its distribution is reduced to brackish and hypersaline waters in salt marshes and coastal lagoons where it can avoid competence with the poeciliid fish *Gambusia holbrooki*, habitat destruction due to wetland desiccation, and water pollution.



Figure 3: Iberian toothcarp, an endemic small fish in the Mediterranean coast of Spain.

- **European eel (*Anguilla anguilla*)** is a catadromous species. It has a complex life cycle which involves travelling 10,000 km from spawning grounds in the Sargasso Sea across the Atlantic Ocean to the rivers and lakes of Europe. There, the eels grow and develop for up to 30 years before travelling back to the Sargasso Sea to spawn the next generation. European eel populations have seen a decline in recruitment into European rivers up to 90% since the 1980s and it is now registered on the IUCN Red List as Critically Endangered. The Mar Menor lagoon supports an important population which suffers high fishing captures.

Terrestrial Ecosystems and species

- **Sand beaches.** The Mar Menor lagoon is separated from the Mediterranean Sea by La Manga, a 22 kilometres long and 100–900 metres wide sandbar. In these and other beaches, some species of endangered flora can be found.
- **Salt wetlands.** In the western part of the lagoon, some salt wetlands functions as alluvial plains around *wadis*. These are important for endangered plants and they are a feeding and breeding place for species like Colared Prantincole (*Galeora pranticola*) or like Lesser Short-toed Lark (*Alaudala rufescens*).
- **Salt pans.** In the North, South and West of the lagoon active and abandoned salt pans can be found. These are important for some species such as the Iberian toothcarp and waterbirds. Just those located in the North are active, being exploited by a private company, and they are included in a protected area.





Figure 4: Up: some of the most valuable land ecosystems in the surroundings of the Mar Menor lagoon – Left: sandbeaches; Right: salt plains wetlands. Down: some singular species. Left: Mar Menor Asparagus, a local endemism; Right: slenderbilled gull (*Larus genei*)

- **Mar Menor Asparagus (*Asparagus macrorrhizus*)**. Recently described, this species is an endemism of La Manga, limited to the surrounding area of the Mar Menor lagoon, and classified as “Critically Endangered (CR)”. Despite being protected, the number of plants has decreased in the last years due to the urbanisation of its natural habitat.
- **Dune Juniper (*Juniperus turbinata*)**. This species is limited to the coast of the Western Mediterranean. In the Region of Murcia, Dune juniper occupied the sand coast and it was one of the main species of the coastal forest. Nowadays, just four specimens have survived deforestation and land occupation, although some areas have been replanted with the species, and around 500 specimens exist in the Region. The other coastal Juniper (large-fruited juniper, *Juniperus macrocarpa*) disappeared in the area and nowadays it is considered as extinct.
- **Sea birds and water birds**. The Mar Menor lagoon has enormous importance for the wintering and the breeding of some species such as black-fronted tern (*Chlidonias albobristatus*) or little tern (*Sterna albifrons*). During the winter, species such as great cormorant (*Phalacrocorax carbo*, the lagoon can support more than 3,000 individuals), flamingo (*Phoenicopterus ruber*), black-necked grebe (*Podiceps nigricollis*) or common shelducks (*Tadorna tadorna*) appear.

2.4.4. Protection and management

The Mar Menor lagoon and its surroundings are protected under different regional, European and international protection categories due to its biological values. Besides, some points are considered as Geological Important Sites (GIS) due to their morphological process and formations, such as volcanic mounts, islands and sand deposits, and fossil dunes, but it does not have any legal status of real protection.

Regional Protection

The area includes two different Natural Protected Spaces. And a few kilometres away from them lay another one, Calblanque Regional Park, Monte de las Cenizas and Peña del Águila.

- Salinas y Arenales de San Pedro del Pinatar Regional Park is a wetland that covers more than 850 hectares which include salt flats, dunes and beaches placed between the Mar Menor lagoon and the Mediterranean Sea. The salt flats are the only one still working in the Region and are valuable places for seabird resting, nesting and breeding. The last dune juniper that lasts in the Region is at the sand dunes in this park, although nowadays some new populations have been set in the area. Traditional uses of salt extraction and fishing are developed in *Las Encañizadas*. Its main threats are tourism and a new port (1995) that has changed the littoral dynamics.
- Espacios Abiertos e Islas del Mar Menor Protected Landscape includes some wetlands that still remain in the surrounding area of the Mar Menor lagoon, like some abandoned salt pans and mouth of some *wadis*: Marchamalo, Las Amoladeras, La Hita or Lo Poyo; and the islands inside the lagoon.

European Protection: Natura 2000

The whole lagoon is declared Nature 2000 due to its values.

- Sites of Community Importance (SCIES6200030 Mar Menor) due to the value of some of its 23 habitats, of which nine are considered as Priorities.
- The Special Protection Area for Birds (SPA ES0000260 Mar Menor, Birds Directive79/409/CEE) includes the lagoon and some adjacent wetlands. The importance of the area for nesting, resting, wintering and migration for most of the aquatic birds in the Region of Murcia is unquestionable. The area was designed because it fulfils the number criteria for some species such as Black-winged Stilt (*Himantopus himantopus*), Little egret (*Egretta garzetta*) and Lesser Short-toed Lark (*Calandrella rufescens*).

Its surroundings include some others as the following

SCIs

- ES0000175 Salinas y Arenales de San Pedro del Pinatar
- ES6200006 Espacios Abiertos e Islas del Mar Menor
- ES6200013 Cabezo Gordo

SPAs

- ES0000175 Salinas y Arenales de San Pedro del Pinatar

International protection

The Mar Menor is declared as Ramsar and ZEPIM site and is consider as IBA.

- The Mar Menor and the eastern Mediterranean area of the Murcian coast were established as Special Protected Area of Mediterranean Interest (SPAMI) by the Barcelona Convention in 2001 due to the presence of some protected and rare species such as the Spanish toothcarp (*Aphanius iberus*).

- Ramsar International Wetland Mar Menor since 1994 due to its importance for water birds and the presence of Priority Habitats or Endangered Fauna are included in Annex I and II of the Habitats Directive.
- The Mar Menor lagoon is also considered as an Important Bird Area (IBAs) by BirdLife International due to the relevance of its area for birds previously mentioned. In the last assessment carried out in 2017, the organisation declared that the area received very high pressures and the status was very unfavourable.

Despite this fact, no regulations have been developed and the management is clearly insufficient. The behaviour of the Regional Government is a clear example of not approving the Natural Resources Management Plan. The European Commission launched an infringement procedure against Spain in 2015 concerning the lack of designation of Special Conservation Areas and the lack of establishment of the necessary conservation measures.

2.4.5. Main uses and economic sectors in the area

Due to the high productivity, the area has a high occupation rate and different uses. The main ones are:

- **Urban use and tourism.** The Mar Menor lagoon is surrounded by small and medium-sized towns. A significant portion of the buildings is dedicated to touristic and second residence use. Tourism is seasonal, based on a second residence, and includes restaurants and bars, shops, ports and scuba diving small companies – the activity is developed in the Mediterranean Sea, but not in the Mar Menor lagoon.
- **Intensive irrigate agriculture.** After the arrival of water of the Tagus-Segura water transfer, the intensive irrigate agriculture appeared and was spread in the area. The main crops are irrigated horticultural and citrus fruits. This activity is carried out mainly by big national and international companies and the products are exported to different European countries.
- **Fishery.** The small-scale fishery is developed in a traditional way, but it implies high incomes. The main species captured are sea bream (*Sparus aurata*), prawn (*Penaeus kerathurus*), and eel (*Anguilla anguilla*). Most of the fishing activity was developed in *Las Encañizadas*, placed in the northern area of La Manga. This traditional fishing gear consists of a serial of structures or fences made of reeds that form labyrinths and capture fish, mainly sea bream. They are set on the shallow channels that communicate the two seas. They only work some months of the year, corresponding with the breeding migration of these species.
- **Infrastructure facilities.** With 11 ports in 73 kilometres of coast, the highest density of ports in the entire Mediterranean coast exists in the Mar Menor lagoon. Apart from that, there is a small international airport, one highway and a high quantity of big and small roads. Some natural spaces are fragmented by roads.

- **Salt pan.** Just one of the three salt pans in the area is still active. The activity is profitable and the area is breeding ground for some species like water birds and fish like the Spanish toothcarp.
- **Military uses** are also represented by an air force military base next to the airport.



Figure 5: Left: salt pan: Right: small-scale fishermen.

2.4.6. Changes and Threats

The variety of human uses could have provided some economical growth but it has caused substantial changes in the structure and functioning of the lagoon that shows unsustainable exploitation.

In the 1970s, two important events took place in the lagoon: the increased of the interchange of waters between the lagoon and the Mediterranean Sea due to the dredge of the channels and the progressive increase of nutrients due to the intensification of agriculture after the arrival of water from the Tagus River through the Tagus-Segura Water Transfer. Both resulted in drastic changes to the hydrography and water quality.

The dredge and widening of the channels caused changes in the lagoon water, and the Mar Menor became more similar to the Mediterranean. The salinity decreased and the temperatures became more moderate. The entrance and expansion of species which development have been limited up to now due to high salinities and temperatures increase. Some species like the seaweed (*Caulerpa prolifera*) have become common in the lagoon and it may be competing with the native species.

The second one implied the setting and spreading of intensive farming with a high use of pesticides and fertilisers. As a consequence of the increased inputs, the lagoon has experienced rising nutrient levels that have led to planktonic and macrofauna such as jellyfish in the lagoon. Almost 20 years ago, the basin that drained the lagoon was classified as a sensitive zone with regard to the pollution by nitrates and the eutrophication. However, this has not resulted in measures that limit the discharge of nutrients. Throughout the year 2016, after 3 decades of intensive agricultural activity, an intensive and strong eutrophication process took place. This resulted in the death of seagrass and a great increase in the available organic matter. At that moment, and before a great social discontent, certain urgent measures but partially effective were

implemented. Water transparency has been partially recovered and physical-chemical parameters have improved, what allowed the vegetation start to recover in the shallower areas.

In the 1960s, sun and beach tourism started its development in the Mediterranean coast and, on the 70s, urban development began and still continues nowadays. The urban growth in the Region is among the most intensive in the Iberian Peninsula and Europe. The Soil Law, adopted in the Region in 2001, declared building land those that are not strictly protected. Three years later, Management Guidelines of Littoral declared new building land in the coast. Despite the enormous available land, some lands of the public domain – marine, *wadis*... – were invaded by houses and buildings, what constitutes an important risk against natural disasters.

Fish populations have been affected in different moments. Changes occurred in salinity and vegetation; the enlargement of the channels caused a modification in the structure of food chains within the lagoon and caused an alteration in fish assemblages; the stocks of some species like the *mugilidae* decreased, since they prefer feeding on non-vegetated bottoms, to those bottoms now covered by algae. The eutrophication process could have made increase the stock of some species, even though in precise moments. While the catches of some species are abundant in exceptional months, the other species have decreased, affecting traditional fishing activities.

These facts result in a complex situation. The main current problems and threats to the Mar Menor lagoon and the surrounding area are:

- The number of uses of land lacking a plan. The urban area has grown quickly and disorderly. The management of urban wastes and waste waters is inadequate, although it was improved in the last decade, mainly in the case of waste waters management. In the last decade, the irrigated farming land has increased rapidly. Some irrigation waters originate from illegal sources, mainly non-declared wells. A study published in 2018 estimated that there are 12,000 hectares of illegal irrigated farming in the area. Apart from the threat to the natural area, there is a conflict of interests between different stakeholders and social sectors.
- The existing groundwater overexploitation and marine intrusion. Some of the illegal wells have small desalination plants associated and the brine produced is poured near *wadis* and channels, increasing the salinisation of the agricultural lands.
- There is a remarkable lack of real management as well as a lack of surveillance and control of activities. Although the most prominent case has been the expansion of the farming and the urban area, both illegal fishery and uncontrolled use of Natural Spaces are both common, too.
- The strong eutrophication process that took place in 2016. From this moment on, the National and Regional Administration started to develop a kind of control over some activities but this is insufficient.

- The eutrophication leads to important changes in the ecosystem, the species composition and the ecological imbalance. For instance, seagrass has disappeared in places with a depth superior to one metre and a half because the sunlight cannot reach deeper due to the eutrophication process. It seems that nowadays some areas have begun a process of recovery.
- The impact on Natural protected areas. Some of the ecosystems have changed due to the rise of nitrates in the land or other changes in the area. For example, salt marshes and plains that present a high number of endemic and threatened species have been substituted by nitrophilous species, less valuable. These areas require rehabilitation measures.
- At a social level, the occupation and economy are highly seasonal, and the majority of jobs are lowly qualified and/or specialised.

2.5. Objective

The aim of the proposal, developed thanks to the support of Alfred Toepfer Natural Heritage Scholarship, was to compare and exchange information about the coastal wetlands and their management in order to create certain guidelines and recommendations that help to develop the conservation and sustainable uses of these ecosystems. For instance, making contact with different professionals linked to these ecosystems in order to exchange the best practices.

- To collect, to compare and to exchange information about:
 - coastal wetland values, uses and pressures;
 - strategies for managing coastal wetlands;
 - the compatibility between the different human uses in coastal wetlands and between human uses and coastal wetlands conservation.
- To set some bases that could help to create guidelines and recommendations for:
 - enhancing ecosystem conservation;
 - promoting nature-based solutions;
 - fostering a sustainable use of resources;
 - encouraging local participation and involvement and the co-management of resources and activities.
- To create a network that helps different professionals to move forward through wetland conservation:
 - to facilitate the exchange of information and managers' good practices;
 - to supply the involvement of civil society through associations and NGOs;
 - to show different examples of wetland management developed in similar ecosystems but placed in different countries.
- To improve my knowledge and understanding about
 - different coastal wetlands and their management;

- the complexity of the wetland socio-ecosystem and the integration of economic uses;
- studying cases for wetland management and solving conflicts of uses, such as the role of the stakeholder's implication.
- To ponder over:
 - establishing priorities for natural heritage conservation in Mediterranean coastal wetlands;
 - selecting those successful examples that can be applied.
 - similarities between different wetlands to create common guidelines for wetland conservation through an ecosystem approach to apply them in the Mar Menor lagoon.
 - ideas for improving the involvement and co-responsibility of traditional economic sectors and the governance.
- To have new international experiences as a young conservationist.
- To set the stage for an NGO involved in wetland conservation network.

3. Methodology

Several Protected Coastal Wetlands from three different countries have been visited to carry out the project since each country develops the environmental management in a different way. Each of the Protected Species has a different conservation development in terms of status and strategies. I selected these areas due to their similarity with the Mar Menor ecosystem (natural or social), its management and its necessities.

The study has been developed following a common methodology in all the countries, but some of the steps had to be adapted.

Firstly, bibliography information has been collected, using both scientific and technical sources, including scientific bibliography and different websites from different organisations –official, from the Administration, or those from different websites.

Before arriving at the specific country, the Administration Body or Partner organisation involved were contacted in the management of the Protected Area in order to establish some dates and gather specific information, including other stakeholders to contact with.

After arriving at the country, field work and meetings took place. The steps set to be followed are described below. Due to the preferences of host or partner(s) institution(s) or agenda, some of them have been developed in a different order and others have been combined.

- (1) Previous meeting: first contact and meeting with the Administration Body or Partner organisation involved in the management of the Protected Area (PA). The objective of this first meeting is to exchange information about values and major threats of the area and management practices, the main uses and the stakeholders involved.
- (2) Fieldwork aims at examining the ecosystems and the conservation status of the space.
- (3) Meeting particular stakeholders such as fishermen, farmers and technicians involved in the management of the Protected Area monitoring, as well as environmental organisations, or other authorities in order to delve into the information and to know their perspective.
- (4) The last step is to pool the information gathered and suggest some guidelines for wetland management and stakeholders, as well as to solve conflicts of use in an informal chat. If possible, the conversation would take place with the Administration Body or Partner organisation.

In order to collect information, stakeholders will fill in a questionnaire previously prepared, as well as any other questions arising in the chat and the visits will be annotated. Information about the state of the environment will be taken from observation during field visits. The main points to delve into in each of the visits would be:

- values, status and management model of the coastal wetland;
- main uses and pressures of the ecosystems;
- land occupation due to different activities;
- management or control of farming waste;
- situation and management of traditional fisheries, especially of eels; fishermen involvement in management;
- nature-based solutions management – green fences for facing nitrates, coastal restoration to cope with the effects of climate change, etc.;
- conservation proposals and acceptance among the population;
- natural and social similarities and differences with the Mar Menor lagoon.

3.1. The study area: the reason of those Protected Areas

The areas subject to study are relevant protected Coastal Wetlands placed in three different countries. They have been chosen because of their similarity to the Mar Menor lagoon in some of its physical, biological and socioeconomic characteristics. They have been used as examples of three different conservation and management methodologies with the aim of comparing and exchanging good practices.

The areas and countries visited are the Mediterranean wetlands located in the south of France; the Blackwater, Crouch, Roach and Colne estuaries in the county of Essex, England, United Kingdom; and Divjaka-Karavasta National Park in Albania.



Figure 6: The three visited areas.

3.1.1. Divjaka-Karavasta National Park in Albania

Divjaka-Karavasta National Park has been protected since 1994 and includes a high diversity of ecosystems and species. It is the largest wetland in Albania and it is separated from the Adriatic Sea by a large strip of sand. The lagoon has a small island where birds breed. Different cultural values and socioeconomic uses are added to the potential of this place. Even though the physical and natural features, as well as some of the traditional uses of the Divjaka-Karavasta lagoon are very similar to the Mar Menor, the level of development that has suffered is very different. This lagoon has a much lower level of pressure than the Mar Menor although some urbanistic developments that have been programmed will completely change the situation of the park.

Although the local population is not involved in the conservation of the area, some organisations (environmental associations) fight for the conservation of the park, by developing biodiversity monitoring and conducting demonstration projects through environmental education. Moreover, they fight against administrative decisions such as the building of a macro resort in a protected area.

Specific aims of the visit

- To appreciate the involvement of NGOs in the conservation and management of national areas.
- To know fishermen's involvement and collaboration.
- To learn the relationship among Environmental Bodies, NGOs and Economic Sectors.



Figure 7: The visit includes meetings with different organisations, such as NGOs and the Environmental Administration, and participating in environmental activities.

Specific steps followed during the visit

- (1) To carry out fieldwork, visit different wetlands, and aim at knowing the ecosystem and landscapes. The Natural Reserve Kune-Vain-Tale in Albania, a coastal wetland, and the inland Lakes Skadar and Orchid in Montenegro were visited.
- (2) To meet partner organisations involved in the management of Divjaka-Karavasta National Park - INCA, PPNEA, National Park Administration, and other environmental organisations such as ETMI. The objective of the first meeting was to exchange information about the values and major threats of the area, as well as to know management practices, the main uses and the stakeholders involved.
- (3) Fieldwork aimed at observing the ecosystems and the conservation status of the space; firstly, with the biologist of the Administration of the Park (Fier County Protected Area Administration) who was in charge of monitoring, and later, on my own. To participate in environmental education activities in a school developed by the Administration of the Park, INCA (Institute of Nature Conservation in Albania) and PPNEA (Protection and Preservation of Natural Environment in Albania).
- (4) To meet the last partner organisation in order to gather general information about nature in Albania and to pool all the information gathered.
- (5) To reflect on and suggest some guidelines for wetland management.

Partner organisations and stakeholder meet

- **Fier County Protected Area Administration** is the Regional Office for the Fier County of the National Agency of Protected Areas (NAPA). NAPA is an entity subordinated to the Ministry of Tourism and Environment (MoTE), whose objective is the management, protection, development, expansion and operation of the protected areas in Albania. Likewise, NAPA manages the network of protected areas and other natural spaces, including Natura2000. The Regional Office develops fieldwork such as monitoring, surveillance and management of the space. Ardian Koçi, the Director of the Regional Office, and Ervin Allushi, one of the ranger-biologist in charge of monitoring and surveillance attended the meeting.
- **Protection and Preservation of Natural Environment in Albania**. PPNEA is a non-governmental environmental organisation that operates nationwide in Albania; it is known for being the first environmental organisation in Albania, as it was officially established in 1991. Elisabeta Shkurti, a project assistant, attended the meeting.
- The **Institute for Nature Conservation in Albania (INCA)** is a non-governmental and non-profit organisation (NGO) established in 2000. The institute has its main office in Tirana but it operates in the region and all over the country through its partner organisations. The project assistant Vilma Kadiu attended the meeting.

- The **Regional Environmental Centre (REC)** in Albania is a non-profit organisation that takes part of the REC offices network. Their mission –as a worldwide Albanian organisation– is to support NGOs and environmental institutions and stakeholders, as well as to promote participatory processes and the exchange of information. There I met Daniela Ruci, an education expert on REC Albania Country Office.
- The **Environmental and Territorial Management Institute (ETMI)** is a young non-profit organisation founded in 2014 with the aim of promoting environmental and territorial management in accordance with modern sustainable development standards. There I met Mevis, one of the responsible people for the organisation.

3.1.2. The Blackwater, Crouch, Roach and Colne Estuaries in Essex, United Kingdom

The Blackwater, Crouch, Roach and Colne Estuaries in Essex, is a low lying estuary/shallow coastal area that was designated due to its rare habitats. Currently, they have fishery management and a management plan for the restoration of the native oyster in the area is being developed, as well as a plan for habitat creation in order to restore the eroding salt marsh. Although they had problems with agricultural runoff in the past, it has improved these days.

The River Thames –as the Thames Estuary– is highly occupied and supports big human pressures, including land occupation due to buildings or pollution from industry and agricultural runoff. In the last decades, the wetland ecosystem has been preserved and recovered; management plans and some measures have been established to eliminate the arrival of pollutants.

The society of the United Kingdom has a great tradition of associationism. Non-governmental associations have hundreds or thousands of members and volunteers. For instance, the Zoological Society of London (ZSL) involves hundreds of local volunteers that collaborate in the monitoring of eel migration in rivers, for example, in the uses of specific channels created to allow the eel movements up and down the river. Other organisations such as Wildlife International have thousands of members in each county office.

The high associationism enables that the Administration relies on the vigilance of the population through a third sector, as well as that associations carry out diverse actions in an autonomous way without depending on governmental finance. Thus, in the United Kingdom there are private reserves that complement the conservationist objective of the reserves and protected spaces at a governmental level.

A management plan for the restoration of the native oyster in the area and habitat creation to restore eroding salt marshes is being developed. There is fishery management and they had problems with agriculture runoff in the past, but now the situation has improved.



Figure 8: Meeting with Natural England and the Environmental Agency, in the company of ZSL members, and eel specialist, from ZSL.

The river Thames, as the Estuary, is highly occupied and supports big human pressures, as land occupation by buildings or pollution from industry and agricultural discharges. In the last decades, the wetland ecosystem has been preserved and recovered. Management plans have been settled out and some measures have been set to dismiss the arriving of pollutants.

Specific aims of the visit

- To learn how to involve society in real management.
- To get information about pollution control and management.
- To know about the management of the eel and other fisheries, and the relationship between fisheries and other sectors.

Specific steps followed during the visit

- (1) To meet a ZSL member and talk about the specific aims of the visit. Members of the ZSL have been previously contacted, and the visits are organised and scheduled.
- (2) To meet different partner organisations and stakeholders, including Essex Wildlife Trust, the Environment Agency (EA), and Natural England, as well as to meet an oyster fisherman and a consultant ecologist, in the company of members of ZSL. To visit different points of the Blackwater, Crouch, Roach and Colne Estuaries such as Abbots Hall Farm during some meetings.
- (3) To meet an eel specialist from the ZSL.
- (4) To reflect on similarities and differences, as well as on some proposals suggested during the meetings about work lines that could be applied in the Mar Menor in order to improve the lagoon.

Partner organisations and stakeholder met

- The **Zoological Society of London (ZSL)** is an international conservation charity whose aim is to protect and to conserve wildlife worldwide. They work through three different lines: research, conservation and information and education; engaging people from two zoos. The ZSL has conducted conservation programmes in Great Britain and in over 50 countries worldwide. Besides, it has worked with local communities for 180 years. Apart from these issues, they work for river and wetland restoration, and eel conservation, participating in the development of

management plans. Alison Debney, the manager of the Marine and Freshwater Conservation Programme, was the organiser of the meetings and she participated in almost all of them. Likewise, Joe Pecorelli participates in the European Eel Programme and Europe Conservation Programme.

- The Wildlife Trusts is a movement made up of 46 Wildlife independent charities with a shared mission for wildlife and people. **Essex Wildlife Trust** is the county's conservation charity of this movement, one of the largest offices of Wildlife Trusts. It was established in 1959 and has more than 34,000 members; it manages and protects over 8,200 hectares of land in 87 nature reserves and 2 nature parks, as well as it runs 11 visitor centres. Besides, it is financially supported by members, local businesses and grant-making organisations.
- The **Environment Agency (EA)** is an executive non-departmental public body sponsored by the Department for Environment, Food and Rural Affairs (DEFRA). Its aim is to create better places for people and wildlife, as well as to support sustainable development. This administration takes charge of the regulation of wastes, contaminated land, water quality and resources, fishery, inland navigation, the risk of flooding, and conservation and ecology. Mike Neale, the Specialist and Team Leader of the Environmental Agency attended the meeting, which took place in Kent, South London and East Sussex Office.
- **Natural England** is an executive non-departmental public body sponsored by the Department for Environment, Food and Rural Affairs. This organisation acts as the government's adviser for the natural environment in England, helping to protect nature and landscapes due to the services they provide and to let people enjoy them. Lisa Jenner, the Senior Marine Advisor, attended the meeting.
- Mark Dixon, a **consultant ecologist** from Client Earth who has developed fisheries and tern sampling, as well as plans for developing coastal restoration.
- Alan Bird, a **Blackwater Oysterman**, Director of the Tollesbury & Mersea Native Oyster Company Ltd, who has fought against estuaries and marine pollution.



Figure 9: The meeting with Wildlife Trust includes a visit to Abbot's Farm, in Essex.

3.1.3. Mediterranean coastal wetlands in the south of France

Several protected wetlands placed in the regions of Languedoc-Roussillon and Provence-Alpes-Côte d'Azur in the south Mediterranean coast were selected. The three areas visited included around 200 km of coastline and they are:

Réserve Naturelle Nationale du Bagnas: the Park -classified as National Natural Reserve and Natura 2000- has a special interest for migratory species, and the protection of the space should be balanced with the management of human activities.

Parc Naturel Régional de la Narbonnaise en Méditerranée (Sigean): it is one of the biggest Mediterranean protected spaces in France. Besides the complexity of the diverse uses of the land, this space holds rare spaces under extreme conditions. The management of pollution including agriculture and the protection of plants products is one of the main issues to be strengthened.

Parc Naturel Régional de Camargue (Arlés): This large wetland includes 7 Natura 2000 places; it was named a *Biosphere Reserve* by the UNESCO and it is included in Ramsar Convention. The main aim of this regional park is to conciliate both the sustainable development of human activities and nature conservation considering the richness of the local culture.

The public organisation *Conservatoire du Littoral* is the owner of some areas of the protected spaces, which predictably ensures the conservation of the area above private interest. Likewise, management is carried out by local communities, NGOs or mixed unions, involving people in the area; that is why this organisation was chosen as the partner organisation to contact with.

Specific aims of the visit

- To discover the advantages and drawbacks of public ownership.
- To detect the conflicts among different social groups activities and how they have been solved.
- To learn how to involve society in real management.



Figure 10: Visiting the Reserve de Bagnas.

Specific steps followed during the visit

- (1) First contact with *Conservatoire du Littoral*; visiting the organisation and having a conversation.
- (2) To visit different spaces and to organise a meeting between managers and members of *Conservatoire du Littoral*, including visiting *Marais du Viguerat* in the *Parc Naturel de Camargue* (Arles) and meeting the director of the organisation *Amis de Marais*, who manages the space; visiting *Etang de Méjean* in Montpellier and meeting Jérôme and part of the team; meeting Matthieu Delabie – the director of the regional office of Languedoc-Roussillon *Conservatoire du Littoral*– and Patrice Laffont, an oyster farmer; visiting the *Réserve Naturelle Nationale du Bagnas* and meeting Julie Bertrand – the director of the reserve, from ADENA.
- (3) To participate in the regional meeting of the rangers of the places owned by *Conservatoire du Littoral*. To visit *Canaverier*, in *Montpellier*.
- (4) September, 13th. To visit the *Etang du Méjean*, the *Parc Naturel Régional de la Narbonnaise en Méditerranée* (Sigean) with members of the team that have done some fieldwork in water sampling.
- (5) Visiting the *Etang de Berre* in Marsella and the dunar restoration in *Seringnan*, next to the Natural Reserve *des Orpeillières*.
- (6) To ponder similarities and differences, as well as some guidelines suggested during the meetings that can be applied.

Partner organisations and stakeholder meet

- The *Conservatoire du littoral*, coastal protection agency – whose official name is *Conservatoire de l'espace littoral et des rivages lacustres* – is a public organisation that depends on the Ministry of Environment (or equivalent). It was created in 1975 to ensure the protection of outstanding natural areas on the coast such as shores of lakes and stretches of water of 10 square kilometres or more, by purchasing the most singular and threatened areas. Nonetheless, local authorities and the European Union, as well as corporations and private benefactors contribute as well. Mathieu Thevenet was a permanent contact; Domitille Le Huédé, a technician, and Fabrice Bernard, the director of the international office of *Conservatoire du Littoral*, attended the visit. We met Matthieu Delabie, the director of the regional office Languedoc-Roussillon *Conservatoire du Littoral*.



Figure 11: Visit to the Etang de Méjean.

- Amis de Marais, manager of Marais du Viguerat in the Parc Natural de Camargue (Arles)
- Patrice Laffont, oyster farmer.
- ADENA, which manage the Réserve Naturelle Nationale du Bagnas. Julie Bertrand (director of the Reserve
- Regional meeting of the rangers of the places owned by conservatoire du Littoral. Visiting Canaverier, in Montpelier.
- *Etang de Méjean*, in the *Parc Naturel Régional de la Narbonnaise en Méditerranée* (Sigean) with members of the team, such as Jérôme, that did some fieldwork in sampling of water.



Figure 12: Some of the visits done in the *Parc National de Camargue* (Arles). Left; *Marais du Viguerat*, while the director of the organisation Amis de Marais explained the managing of the Reserve. Right: The visit to *Domaine du Canavérier, Aigues-mortes*, with rangers of the protected spaces.

3.2. Travel plan

The travel plan carried out was:

Albania: **Divjaka-Karavasta National Park and other wetlands.**

March, 27th-April, 1st. **Previous visit to different wetlands.** Visiting the Natural Reserve Kune-Vain-Tale, a coastal wetland and the inland Lakes Skadar and Orhid.

April, 1st. **Travelling to Tirana.**

April, 2nd. **Tirana.** Meeting the partner organisations INCA, PPNEA and ETMI, as well as travelling to Divjaka-Karavasta National Park.

April, 3rd-5th. **Divjaka-Karavasta National Park.**

April, 3rd. Meeting National Park Administration and visiting the Divjaka-Karavasta National Park with a biologist of the Park Administration in charge of monitoring and, later, on my own.

April, 4th. Meeting INCA, PPNEA and the Park biologist and visiting and participating in and environmental activity in a school.

April, 5th. Visiting the south part of the Divjaka-Karavasta National Park and travelling to Tirana

April, 6th. **Tirana.** Meeting REC.

United Kingdom: **The Blackwater, Crouch, Roach and Colne Estuaries. Essex Estuaries European Marine Site (England).**

June, 17th. Travelling to Essex.

June, 18th. Visiting different points of the **Blackwater, Crouch, Roach and Colne Estuaries**, such as Abbots Hall Farm and Abberton Reservoir Visitor Centre. Meeting Essex Wildlife Trust in the first of them, the Environment Agency and a consultant ecologist in company with ZSL members. Visiting Mersea Island.

June, 19th. Visiting different points of The Blackwater, Crouch, Roach and Colne Estuaries, and meeting an oyster fisherman, and Natural England in company with ZSL members. Travelling to London.

June, 20th. Visiting the **Zoological Society of London** and meeting an eel specialist.

France: Three different protected areas in the Languedoc-Roussillon and Provence-Alpes-Côte d'Azur Régions, in the South Mediterranean coast – the **Réserve Naturelle Nationale du Bagnas**, the **Parc Naturel Régional de la Narbonnaise en Méditerranée** (Sigean) and the **Parc Natural Regional de Camargue** (Arlés). Visiting 3 spaces located in an area of more than 200 km of coast with wetlands and lagoons.

September, 7th. Arriving at France.

September, 8th-10th. Visiting different protected spaces.

September, 10th. Meeting *Conservatoire du Littoral*, and visiting the office in Aix-en-Provence. Visiting *Marais du Viguerat* in the *Parc Naturel de Camargue* (Arles), and meeting the director, from the organisation Amis de Marais, which manage the

Space. The visit was carried out by members of Aix-en-Provence *Conservatoire du Littoral* Office.

September, 11th. Visiting *Etang de Méjean* in Montpellier and meeting Jérôme and part of the team. Meeting Matthieu Delabie (director of the Languedoc-Roussillon *Conservatoire du Littoral* Regional Office) y Patrice Laffont, an oyster farmer. Field visit of the *Réserve Naturelle Nationale du Bagnas* and meeting Julie Bertrand (the director of the Reserve, form ADENA). The visit was done with the company of members of Aix-en-Provence *Conservatoire du Littoral* Office.

September, 12th. Participating in the regional meeting of the rangers of the places owned by *Conservatoire du Littoral*. Visiting *Canaverier*, in Montpellier.

September, 13th. Visiting *Etang de Méjean Parc Naturel Régional de la Narbonnaise en Méditerranée* (Sigean) with members of the team that have done some fieldwork in water sampling the dunar restoration in Seringnan, next to the Natural Reserve *des Orpeillières*.

September, 14th. Visiting the *Etang de Berre* in Marsella.

September, 15th. Leaving France.



Figure 13: Visiting *Etang de Méjean Parc Naturel Régional de la Narbonnaise en Méditerranée* (Sigean).

4. Results: detailed information of the areas visited

4.1. Divjaka-Karavasta National Park in Albania

Albania is one of the youngest and poorest countries in Europe. Moreover, currently, it is one of the Candidate Countries to be included in the European Union. Even though the coast is swampy and/or sandy, the Dinaric Alps and other pre-coastal high mountain ranges are found a few kilometres away, which make the rivers generally short and wide due to the abundant rain and the thaw. There is a Mediterranean climate but with a major rainfall than in the Iberian southeast (between 930 and 2200 mm per year); this makes that freshwater runoff has great importance. The Adriatic coast is characterised – among other things – by a high variation in temperature and productivity, with levels of salinity and nutrients that vary according to water runoffs.

It is considered as one of the poorest countries in the European continent with a population of almost 3 million inhabitants. In addition, industrialisation is low, with an unemployment rate of around 15% and 20%. Its form of government is a parliamentary democracy, and the management of the country is centralised, although it is divided into 12 counties that manage certain areas. After the fall of communism, an exodus towards the coast took place, increasing the population quickly, producing disordered and lacking planning constructions. This situation has entailed environmental and management problems; for instance, floods are common in populations close to riverbeds.

The area is characterised by a rich biodiversity, including endemic species, and large, diverse and unspoiled ecosystems. Wetlands are home to significant populations of nesting and migratory birds. Albanian wetlands consist of a network of interlinked and rich areas. However, after the 1950s, agriculture began to expand and the riparian forest became altered due to drainage and land occupation. Likewise, the landscape has been degraded and fragmented. The channels communicating the lagoons and the sea were dredged until the 1990s.



Figure 14: The Divjaka-Karavasta National Park in Albania protects around 22,000 hectares of a coastal wetland and its surroundings, including dunes and coastal forests.

The Divjaka-Karavasta National Park is placed on the Adriatic coast. Around 22,200 hectares are protected since 2007, including the largest wetland in Albania. This wetland includes the Karavasta lagoon, the largest of the 8 Albanian coastal lagoons. It is separated from the Adriatic Sea by a large strip of sand. Despite existing permanent and relevant freshwater inputs, the salinity of the lagoon is increasing due to the low communication between the lagoon and the sea. Besides, it is an active geomorphological area. The river continues changing its form; for instance, between 1995 and 1996, a new wetland emerged.

The protected area is located in Fier County. The National Park has small villages and hamlets in the interior which gather around 9,000 people.

The wetland is regarded as the most important area in the Albanian coastline and one of the most important areas in the Mediterranean Sea. It is managed by the National Agency of Protected Areas (AKZM) under the Fier Regional Administration of Protected Areas. It was also declared a Ramsar site since 1994.

The protected area includes a high diversity of ecosystems such as river deltas, lagoons, sand dunes, pine forest and aquatic vegetation, as well as species including plant communities such as coarse-grained juniper (*Juniperus monocarpa*) and endemic herbal plants and fauna; important populations of Dalmatian pelican (*Pelecanus crispus*); and some common species like collared pratincole (*Glareola pratincola*) and little tern (*Sterna albifrons*). The islands inside the lagoon are a breeding place for pelicans and some other birds due to disturbances in other parts of the lagoon.



Figure 15: The landscapes are characterised by the small wet areas surrounding the main lagoon. It is a highly important wetland for birds, especially for the Dalmatian pelican, the emblem of the park.

Different historical, cultural and archaeological values, as well as socioeconomic uses, are added to the potential of this place. The main activities are smallholding agriculture, livestock and fishing; however, there is a small-scale tourism and trade offer. Likewise, there is an important potential of ecotourism and ornithological tourism.

Urbanisation is scattered and poorly controlled. Moreover, there is illegal construction. Many of the constructions do not have sanitation, pouring dirty waters directly into riverbeds and the lagoon. Furthermore, pollution arrives through the river because of wastewaters and pesticides from urban and agricultural areas located upstream, as well as substances from the metallurgical industry. Likewise, the presence of plastics and wastes is evident. There are only 3 treatment plants in specific areas in the whole country; therefore, many populations pour wastewater directly into rivers and the sea. Waste recycling is limited since there are a few companies. The central government has recently built an incineration plant, where most part of the collected garbage arrives.

There is a high land occupation in the innermost area, mainly dedicated to smallholding agriculture, generally polyculture. There is intensive agriculture of watermelon, carrots, and broccoli, as well as crops under plastic. Likewise, there is a brand of products in the park that only includes organic products.

The fishery is common in the lagoons but only authorised fishers are allowed to exploit the resources through one of the traditional fishing gears, that is, fish barriers placed in channels. Recently, uncontrolled urban development and illegal fishing have increased. The consumption of fish products is 2.34 kg per person each year (2010), although some data show that the number rises in an undetermined quantity because of illegal fishing. The main fisheries in the Albanian coastal lagoons are grey mullet (*Mugil cephalus*), European eel (*Anguilla anguilla*), seabass (*Dicentrarchus labrax*) and seabream (*Sparus aurata*). Fifty-three fishermen are authorised in the lagoon. They have paid a license fee and they all belong to a unique fishing guild. The main fishing gears are fish barriers settled in channels around the lagoon, as well as fyke nets.



Figure 16: Agricultural intensive activities and, especially, the use of phytosanitary treatments can affect water quality.

There are blast or dynamite fishing and electric fishing (which are completely illegal). Stops are established during the breeding season, in which barrier fishing gears are limited and/or forbidden. There is an important illegal extraction among poor populations. Legal fishermen ask the government for stronger policies against illegal activities.

The main fishing gears in the Albanian lagoons are the fish barriers (*dajlan*) installed in the channels in front of the water current. This is a generally artisanal fishing gear similar to the one used historically in the Mediterranean lagoons and composed of natural and/or plastic cans combined with wooden poles. Their construction and use are regulated by law according to fishing periods, and the areas close to fish barriers are forbidden to external users.

Fyke nets are also a very common fishing gear for eel fisheries in all the Albanian lagoons. These can be made up of one or more traps and they are called *gogola*.

The sand bar presents non-continuous urbanisation –mainly dedicated to tourist accommodation– although it is increasing progressively. There is seasonal sun and beach tourism. Some establishments are open the whole year, but most of them only open in the summer months. However, some conflicts about its development have appeared because a resort is being planned in the area. According to the plan, the resort will include around 370 buildings; some of them with more than 20 floors. Whereas the national government promotes it in order to foster the economic development of the area, the administration of the park disagrees since they consider that it will affect negatively the conservation of the area. The local population agreed with the construction, but after the information provided by conservationist organisations, a great part of the population rejects the construction.

In Albania, there is a hunting moratorium, which has improved the situation; however, there is still poaching. Legal hunters pay a fee. In the Natural Park, there is a moratorium for both hunting and logging.

The offices of the park were created in 2015; therefore, there is no management tradition. The administration of the park is very young but it displays great interest.



Figure 17 Fishing is an important activity for the inhabitants of the park and its surroundings. Most of the fish catches are conducted through different traps. Although fishing is regulated, there is a significant uncontrolled and unaccounted extraction, especially among poor population.

A centre of interpretation is being created, but is not open yet. Organisations consider that the park management has improved. There is a plan to evaluate the ecosystem resources and services to use them sustainably; however, more finance is needed. It is still necessary to improve the management as well as to implement measures in order to carry out a responsible use of resources; for instance, creating special rates for fishing extraction in protected areas.

Rangers take charge of the monitoring, mainly of the populations of the pelican and other birds. There is 24 hours' ranger vigilance.

The situation of the pelican –the emblem of the park– has improved in the last years, thanks to the creation of artificial islands which facilitate their breeding, as well as limit navigation around these areas. Notwithstanding, some fishermen approach these areas at night, possibly causing the pelicans to abandon the nest, thereby increasing the pressure on the bird population.

In general, the population is not directly involved in environmental policy; people usually participate through organisations. There are around 50-60 NGOs.



Figure 18: Some of the main threats to the national park are illegal constructions and intensive agricultural practices. Besides, a large resort has been proposed in the north part, which would alter the landscape and the functioning of the wetland. Top image: a design of the resort planned. Source: PPNEA.

PPNEA and INCA are involved in the program –Wetland Management and Dalmatian Pelican Conservation in the Mediterranean Basin– with national and international partners for conserving and supporting the management of some valuable wetlands and with the involvement of local communities in favour of their natural heritage and through the emblematic pelican as an umbrella species. This program considers 4 parts: gathering knowledge, networking, engaging locals, as well as disseminating and mainstreaming environmental conservation. Likewise, it includes the improvement of fishing practices.

4.1.1. Some challenges

Some of the main challenges to improve coastal wetland conservation and its biodiversity in Albania start from ensuring the planning, management and control of both territory and human activities, as well as monitoring biodiversity to ensure a good conservation status. Similarly, to improve the social and economic situation of the local population and the involvement of stakeholders is essential, including the finance of necessary measures to ensure the conservation of the areas.

- To involve civil society at an individual and collective level through nature conservation NGOs. To facilitate the environmental information and education to stakeholders with the ultimate goal of increasing the participation of the local population in the decision-making and the governance of the protected areas. To improve transparency in management and local decision-making.
- To improve spatial planning and management. To develop a planning for territory uses and the resources that enable their development for a continuous period of time, without affecting the environment and avoiding the main substantial alterations (changes in use, pollution, overexploitation of resources, etc.).
- To ensure the financing of necessary actions for environmental conservation (research, monitoring, control, etc.) through different resources and alternatives.



Figure 19: In the wetland, wastes can be found, mainly plastics and pieces of glass due to the limited management of urban wastes.

- To establish environmental conservation as one of the priorities, at the same level as the socioeconomic development of the population. To create integrated policies that allow the development of societies from the environmental, social and economic perspective. To integrate environmental conservation transversally into other sectoral policies (spatial planning, economic activities such as agriculture and fishing, etc.). To include the three aspects (environmental, social and economic) in the development of management plans for natural protected areas and species, taking into account other aspects such as the financing of the planned actions and the adaptation to socio-environmental changes, as well as the development needs of the population.
- To improve the formation, training and exchange of experiences among the managers of protected areas. Specific formation in diverse subjects can complement the vitality and interest in the young teams of space management.
- To improve the monitoring of singular species apart from the pelican. In the area, there are other singular species such as endemic and endangered species. Certain species have economic value (fisheries) and others can be a good indicator of the ecosystem state. It is important to have enough information –regular and updated, and taken from established and comparative methodologies– in order to ensure an efficient management and conservation of the environment and its biodiversity. Data collection must be conducted regularly through established methodologies in order to have comparative data.
- To limit and control scattered urbanisation. There is a lack of spatial planning in most of the area, which is characterised by a generally scattered urbanisation. This can entail the occupation of areas of environmental value or some environmental risks, for example, flood areas.



Figure 20: Although bird life is one of the most well-known and striking values, this space has landscape values, as well as other flora and fauna species of interest that must be paid attention to the management.



Figure 21: The Park has important landscape values that can be a resource for quality tourism.

- To reduce urban and agricultural effluent wastes. The lack of planning entails that part of the dwellings in the area is not connected to the sewerage system and treatment systems are limited and insufficient. To advance in spatial planning is fundamental, as well as to improve the treatment system to reduce agricultural waste. The diffuse pollution from agricultural activity can be reduced through agricultural advice and the development of sustainable practices.
- To increase the value of protected areas among the local population by identifying direct and indirect benefits of those spaces, disseminating the ecosystem services that provide the benefits, and raising awareness; as well as by using the protected areas for job creation. To create brands in the national park (products produced inside/around the protected area under quality and sustainability norms), or to professionalise the tourist activity to offer a specialised product based on environmental values (ecotourism, nature tourism) can be two pillars to foster a local economy that respects the environment. Additionally, to improve the visibility of natural spaces, their values and products by increasing the information available about them through governmental channels.
- To foster literacy and employment among the local population as a way to fight against illegal activities. Improvement in education and literacy will favour the creation of quality employment, as well as a minor dependence in irregular activities based on the extraction of natural resources or changes in soil use. It is necessary to increase both general and specific education about the protected area among the population surrounding the park since environmental education is an indispensable tool. The most sustainable activities must be rewarded versus those which entail major resource exploitation. It is possible to create employment opportunities to improve the status of the protected area (e.g. brigades for waste removal, the conservation of exotic species, the restoration of

the ecosystem and landscape, etc.). In addition, it is also possible to foster cultural and nature tourism –alternative to sun and beach tourism– which favour a more specialised and higher quality employment.



Figure 22: The creation of quality employment among poor population could reduce the pressure on natural resources.



4.2. The Blackwater, Crouch, Roach and Colne Estuaries in Essex, United Kingdom

In the Anglo-Saxon countries, the state has historically had a minor prominence in social matters. Unlike other countries (such as France and Spain among others) where civil society has had more difficulties in organising and expressing themselves, Anglo-Saxon legal culture defends a space of expression for social initiative liberty. In these countries where there is more respect for individual autonomy and will, the development of the third sector has been faster.

Other causes or consequences of this subject-matter are that Anglo-Saxon civil society has been traditionally more open and more institutionalised. Besides, it is characterised by a great degree of cooperation and altruism among other aspects. In these countries, volunteerism is more rooted and it assumes corporative forms, and the social movement for conservation is undoubtedly extraordinarily powerful. Likewise, non-governmental entities have thousands or millions of stakeholders (e.g. The Royal Society for the Protection of Birds, The Wildlife Trust, The Zoological Society of London), thereby enabling the financing of these entities and the development of their work without depending on the state.

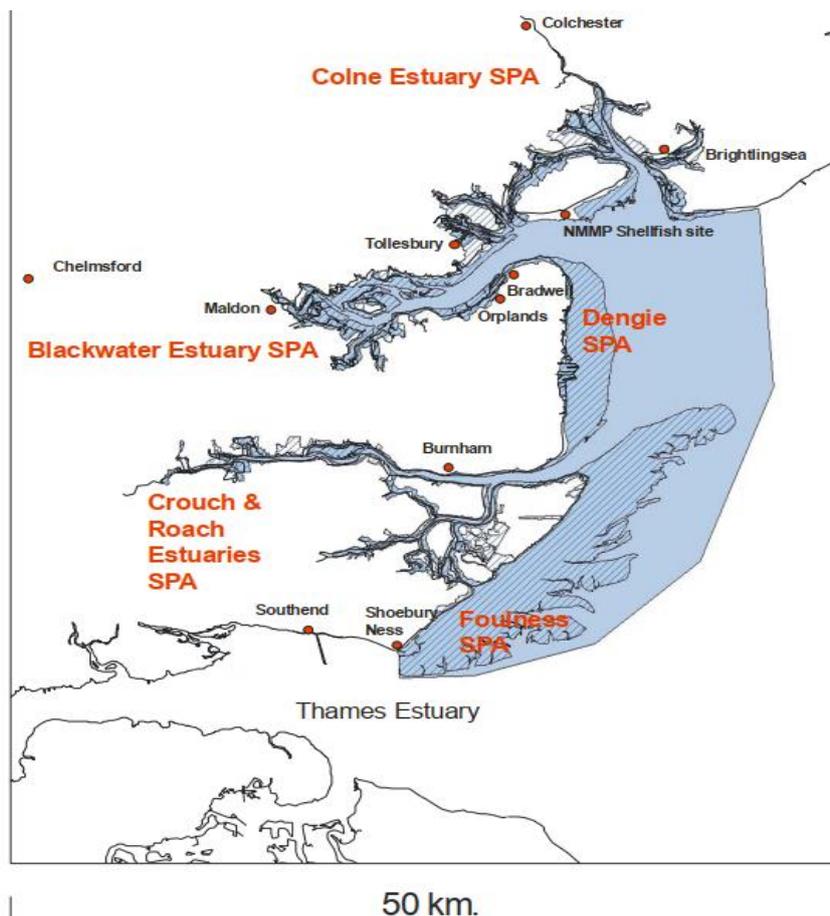


Figure 23: The Essex Estuaries European Marine Site. The boundaries of the SAC and components of the SPAs are shown. Source: retrieved from Chesman *et al*, 2006.

Public conservation tools for natural spaces are completed with other protection types managed by non-governmental organisations, which enable widening the conservation degree of spaces and it also helps to increase social implication due to the visibility of the associations work.

The Blackwater, Crouch, Roach and Colne Estuaries are located in the north of the Thames Estuary in the coast of Essex, where the estuary mouths join the North Sea. Its global name is Essex Estuaries European Marine Site, but it has a combination of National, European and international designations. The area includes Sites of Special Scientific Interest, 3 National Nature Reserves, the Essex Estuaries Special Area of Conservation, six Special Protection Areas and 5 Ramsar sites, and it is the largest inshore Marine Conservation Zone in the UK.

It was designated due to its rare habitats as well as a mosaic of habitats including subtidal and intertidal sands, gravels, mud and mixed sediments. This mosaic of habitats is home to a wide range of species including the rare and vulnerable native oyster (*Ostrea edulis*) and waterfowl such as brent goose (*Branta bernicla*) and curlew (*Numenius sp.*). The native oyster provides a key habitat that supports a great variety of associated species –it forms beds made up of the oysters themselves and dead shells; many marine species live amongst these beds.

Apart from its biological values, the protected area includes the Clacton Cliffs and Foreshore, a geological feature of international importance. It is one of the best Ice Age sites in Great Britain, which contains fossils of molluscan and mammals deposited during the interglacial periods.

The area is highly populated and some of the estuaries are used for recreational purposes. Moreover, it supports economically important fishing and shellfish (oyster) industries.

There is a hypereutrophication with a proliferation of macroalgae in some areas. One of the main pressures is the arrival of wastewater. There are agricultural and urban sewage inputs upstream. In the area, there is a population of 1,700,000, but only the wastewater of 1,100,000 people is purified due to the extensive and, in some cases, disordered urbanisation. One of the aims is to purify the water of the totality of residents. Additionally, management aims at caring for and minimising the pouring of harmful substances. Thus, for instance, in the purification processes, chlorine is not used in order to avoid the creation of persistent compounds.

There are small quantities of copper and zinc that – themselves or in combination with other contaminants – can cause sublethal stress in some organisms. In general, pesticides and herbicides levels are low, and some occasional enrichments are associated to both urban and agricultural inputs. Episodic pulses of high concentrations can occur after their application in the agricultural area next to tidal water.

The hydrography of the area is regulated artificially by ditches and a network of channels which is dredged periodically. These structures constitute a high cost of maintenance, and do not allow the permeability and functioning of the ecosystem natural dynamic; therefore, nowadays, there is a debate about its maintenance. The isostatic subsidence in the southeast of England, the sea level rise due to global warming and the increasing of the erosion in comparison with the accretion rate of the coast cause a rise in relative sea level. That is why saltmarsh losses and erosion become a serious problem in the disappearance of coastal habitats. It is considered that sea walls have increased saltmarsh erosion due to coastal squeeze since the defences have prevented saltmarsh landward migration in response to sea level rise. Therefore, the reduction of coastal wetlands extension such as marshland is substantive. It is considered that up to 60% of the coastal marshes of Essex have disappeared in the last 20 years due to sea erosion.

The Native Oyster populations are susceptible to a wide range of threats including invasive species and overfishing. Currently, a new energy plant modifies water temperature, causing effects and death in the ecosystem and oyster population.

Management of protected areas is being prioritised nationally concerning the current adverse impacts of activities. However, it should be implemented at a local level in order to improve the regulation of activities that have a detrimental impact on both the habitat and species.

Monitoring is essential for management functioning. As an example, chlorophyll measures are being taken with a drone.

Some pioneering restoration actions have taken place, eliminating some ditches and dams and letting the sea recover its space following the coastal dynamic. In some places, the population has managed retreat, freeing up some lands around the estuary.

Many activities are regulated under marine licenses. Fishing activities are regulated under European legislation, national statutory instruments, as well as bylaws and self-imposed voluntary agreements. Other activities that may cause an impact in protected areas could use similar agreements.

Fisheries are regulated by Kent and Essex IFCA (Inshore Fisheries and Conservation Authority) according to the national and European legislation. Relevant restrictions in relation to this site include restrictions on the size of the vessel that is able to operate in the area. A temporary closure of the native oyster has been implemented in the MCZ (Marine Conservation Zones) to prevent a decline in the populations.

A management plan for the restoration of the native oyster in the area and habitat creation to restore eroding saltmarsh is being developed. Fishery management exists in the area and, even though there were problems with agricultural runoffs in the past, nowadays it has been improved.

In order to improve the water quality, volunteer agreements are established by which agricultures are committed to developing the best practices. There is a special service dedicated to engaging farmers in the best practices. Likewise, the government helps them pay a part of the changes that the farmer should adopt. The biggest companies prefer products that come from agriculture based on the best practices. That is why some farmers compete to be selected by these companies.

Rural Sustainable Drainage Systems have been implemented as non-mandatory, among other practices. The government advises the farmers to help them carry out the action.

This initiative uses a sequence of techniques that make the water flow through the system in a controlled velocity, while the pollutants are removed. These measures are designed to emulate the natural process of pollutants catchment, including methods to decrease the volume of water entering in the drainage; to remove pollutants from the surface in a pre-treatment step through vegetated swales or trenches; to delay the discharge through retention systems such as ponds or wetlands, as well as infiltration in infiltration trenches and soakaways which mimic natural recharge, allowing water to soak into the ground. Equally, meadow restoration activities in river and streams have been developed.

Civil society is involved in the conservation at both, the level of an environmental organisation –which has thousands of stakeholders– and organised economic sectors. This social participation leads to evident and clearly visible results. An environmental association –Essex Wildlife Trust– and a fishermen organisation show examples of these acts undertaken in the area.

Essex Wildlife Trust –with more than 34,000 members– is one of the largest offices of Wildlife Trust. The organisation manages and protects over 3,300 hectares of land on 87 nature reserves, 2 nature parks and it runs 11 visitor centres.



Figure 24: The area has been realigned to enable the changeable coastal dynamics.

Abbotts Hall Farm is a reserve owned by Essex Wildlife Trust. This coastal farm of 300 hectares is located in the Blackwater Estuary. Two main lines of work have been developed as an example: how to farm commercially and form wildlife, and how coastal defences can lead to the creation of coastal marshes for wildlife and people.

The area was purchased in 1999. Wildlife Trust and the Environmental Agency were interested in creating and re-growing coastal marshes. As the sea wall in Abbotts Hall needed repairing, the organisation tried a new strategy for combining human protection and ecosystem conservation facing sea level rise. After more than two years of study, the coast was realigned and walls were constructed for protecting neighbour lands from flooding. Nonetheless, a big low-lying land behind those walls let the marshes exist, recovering their space and functioning. Marshes have proved to be important not only for migratory birds but also for fish nurseries.

Therefore, Abbotts Hall has become a place of demonstration to show what can be achieved after a studied and monitored land restoration. In addition, the information of this project is being used to help plan new projects across the country. This could be the right option in some places where an expensive sea defence can be replaced by a superb marshland.

The reserve is also a working farm that acts as a demonstrative project of the best practices for both wildlife and people. The farm has been improved for wildlife by means of some practices such as restoring and creating hedgerows or green fences, and ponds; as well as creating beetle banks through the middle of arable fields and planting woodland on field edges and corners. The organisation is now producing its own bird seed and some fields have been established as grazing fields for sheep.



Figure 25: Floral bands have been created to foster the presence of pollinators.

The area also includes many footpaths for visitors to enjoy, as well as a new lake where a variety of waterfowl and historical landscape can be seen.

Economic sectors, such as oystermen, have been traditionally organised. Fishermen have pressured to improve the management of industrial and agricultural wastes, as well as to reduce the frequent wastes in the past that posed an important threat to native oyster populations. The pressure of the sector has constituted a significant weight when making decisions about limiting wastes from other activities, and coordinating different uses.

Environmental organisations have hundreds of volunteers who perform continuous works, and participate in specific days. According to some of these organisations, it is important to define the reason for the selected task in order to involve the volunteers. Motivation is essential for engaging them.



Figure 26: Native oysters are endangered, threatened by both an invasive oyster species and water pollution.

4.3. Mediterranean coastal wetlands in the south of France

Similar to Spain and different from countries like Great Britain, France is a state with many competencies. There is a tradition of direct intervention in a wide range of policies but open to social participation and policies consensus with social sectors. Thus, the government is responsible for conserving and protecting the environment as well as for the risk management, including the increasing risk in the context of global change.

France has gradually integrated the guidelines of the international conventions and European law for the protection of landscapes and biodiversity and the creation of Natura 2000. For this purpose, the established National Strategy includes general guidelines to stop biodiversity loss that should be implemented in all the sectoral departments as well as by stakeholders and local administrations.

In order to do so, the government had to create an adequate framework that would allow the application of these guidelines in the different policies, prioritising the protection and conservation of natural spaces and their species, as well as taking into account both the natural functions and the traditional uses of the population.

All of this has been based on the integrated management that characterised the environmental policy in France, as well as on the prioritisation of social participation and the concertation of measures with sectors and affected groups, bearing in mind that these aspects were decisive in the efficacy of public policies for nature conservation. In this way, the spaces proposed by the state to be part of Natura 2000 were agreed on with the local population and the relevant actors. In the beginnings of the 21st Century, new laws act as the culmination of the decentralisation process that began 20 years ago which provide new competencies to regional and local authorities for creating nature reserves and having a greater role in the governance of national parks; as well as for creating new national consultation forums on environmental issues. Currently, a wide range of stakeholders is involved in the management of protected areas, although the central and local government are both responsible for other kinds of protection. Both should base their decisions on the work of scientific and technical institutions. The governance of the protected areas involves stakeholders through different mechanisms. Nature reserves have an advisory committee which involves local stakeholders who work as a local parliament: they issue opinions on any decision related to the area. National parks are managed by management boards, involving local councillors. In Natura 2000 places, an advisory local steering committee is responsible for the planning and following up of the management.

Nature conservation in France has developed landscape conservation, considering the relationship between humans and their environment. The country has developed a wide range of tools for the protection of its natural areas, which may be established and managed by several stakeholders and different government levels. The main challenges are enhancing knowledge tools for a better understanding of natural heritage; extending

the protected areas to ensure their representativeness; improving the management and its effectiveness; integrating the management of the protected areas into the policies of spatial planning and connecting different landscapes; encouraging the connection between protected areas and social environment, and fostering the involvement of local stakeholders in order to promote sustainable development.

The main forms of nature protection developed under legal forms are land purchase and management, as well as regulatory protection and management agreements. Likewise, they are complementary and can overlap in some spaces.

Conservatoire du littoral (Coastline and Lakeshore Protection Agency) is a public organisation that depends on the Ministry of Environment (or equivalent). It was founded in 1975 with the objective of ensuring the protection of outstanding natural areas in the coast, banks of lakes and stretches of water of 10 square kilometres or more, mainly by purchasing strategic areas of the land.

This organisation acquires land by private agreements, by pre-emption or expropriation. In addition, land can also be given to Conservatoire du littoral by donation or legacy. Conservatoire du littoral is mainly funded by the government, but local authorities and the European Union, as well as corporations and private donors contribute as well. After ensuring the restoration work, this organisation entrusts the management of its lands to local authorities or other local groups and organisations. Conservatoire du littoral uses specialists to decide how the places should be managed and which activities (such as agricultural and recreational activities) can take place.

When Conservatoire du littoral was born, the objective of the purchase was to protect the integrity of certain areas in order to enable the ecosystem functioning. Coastal areas, especially in the south of France, have a high land occupation. The purchase would enable the conservation of the unbuilt spaces and ensure the maintenance of the coastal dynamics, biodiversity and the ecosystem services that are developed in these areas.

Currently, in the prospect of sea level rise due to climate change, the purchase includes a preventive strategy against foreseeable flooding in the lower areas. There are several objectives, including protecting the population and facilitating the natural setback of the ecosystems. That is why this organisation develops innovative management practices that aim at improving the attractiveness and dynamism of the coastline. Some of these areas act as laboratories in order to verify the suitability and efficacy of the new protection and restoration measures, sometimes including agricultural, livestock, fishing and recreational uses, and promoting social development through traditional and cultural activities, as well as awareness-raising activities.

Box 2: Space Protection tools and protection types

In France, there is a wide range of tools for the protection of natural areas, and all of them could interact and overlap in order to enhance protection effectiveness. Such variety offers the possibility of adapting the choice of the tool according to local circumstances and protection goals.

At an international level, there are mixed natural World Heritage sites and RAMSAR sites, Biosphere Reserve and Marine Mammal Sanctuary, with the same aims than in other countries. At a European level, there are 1,753 Natura 2000 sites and 35 Biogenetic Reserves.

At a **national level**, 7 different categories designated and managed by the Ministry of Environment can be found. Some of them are:

- Ten national parks, intended to protect large land and marine ecosystems, as well as unique cultural heritage and landscapes. They include strictly regulated core areas, and peripheral areas of adhesion, where sustainable policies are taken voluntarily by municipalities. The management is run by an administrative public entity with regulatory powers, including local stakeholders and authorities.
- 165 National Nature Reserves, established with the aim of exerting long-term protection for unique, functional and ecologically representative natural habitats and species, as well as geological and paleontological sites. Places are managed by a local agency in consultation with local stakeholders.
- 233 Biological Reserves have been settled up with the objective of protecting outstanding and representative species and habitats. They are under the responsibility of the National Forests Office (ONF).
- 2,687 Classified Sites are enacted to preserve natural monuments, landscapes and sites of public interest.
- Conservatoire du littoral sites are vulnerable and threatened areas, such as coastal and lakeshore areas, which are acquired to ensure their protection. The Conservatoire sets up management partnerships among local communities, including local authorities and NGOs.

At a **regional level**, there are 3 different tools. The most common are:

- Regional Nature Parks are a rural or peri-urban area created with the purpose of conserving natural, cultural and landscape values. Different human uses are permitted and managed by a joint management board including local stakeholders.
- Regional Nature Reserves have the same purpose as national reserves. They are managed by regional authorities of three different parties through an agreement.

Apart from the levels previously mentioned, **departmental** and **municipal levels** have 2 different tools each.

4.3.1. The study cases

The three areas visited in the regions of Languedoc-Roussillon and Provence-Alpes-Côte d'Azur include 200 km of south coastline with different wetland ecosystems, all of them placed in the Mediterranean biogeographic region. These areas include different protection types, as well as spaces owned by Conservatoire du Littoral with diverse objectives and strategies for conservation, which result in different study cases.

Parc Naturel Régional de la Narbonnaise en Méditerranée (Sigean)

The *Parc Naturel Régional de la Narbonnaise en Méditerranée* (Sigean), established in 2003, is one of the biggest Mediterranean protected areas in France, with around 80,000 hectares, of which 12,000 are coastal wetlands placed in 42 kilometres of coast. The regional park does not have specific legislation since, in the case of this protection figure, the establishment, limits and directives of the protected area management are decided by several local councils.

The park includes a Ramsar area (*Les étangs littoraux de la Narbonnaise*, of 12,300 hectares) and several Natura 2000 places. It is recognised by its diversity in landscapes, biodiversity and ecosystems. The area includes 29 natural habitats of communitarian interest and around 1,500 flora species and 350 bird species have been sighted. Currently, 3,500 hectares have been acquired by Conservatoire du Littoral. The area comprises twenty-one villages with a population of around 35,000 inhabitants. Nine places have been denominated as Historical Monument and three sites as Places and Landscape.

The management of this space is carried out by a mixed union that includes local people. The instalment contract of the Natural Regional Park is a contract established about the management and it is signed by both the inhabitants and councils.

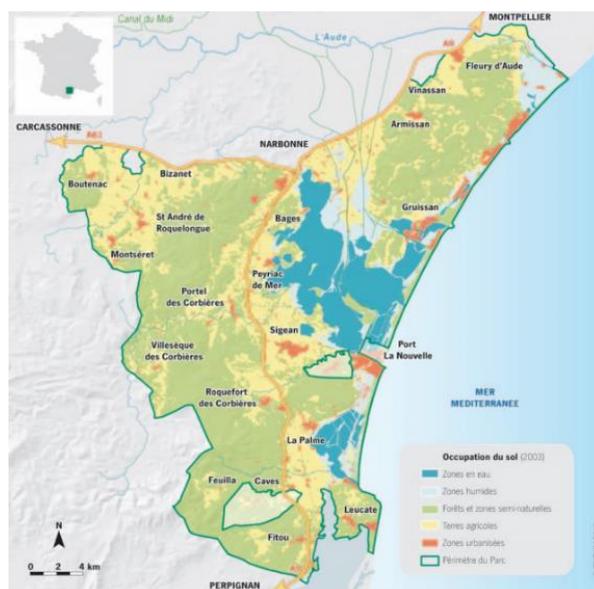


Figure 27: Map of the land uses of the area. Source: retrieved from *Parc Naturel Régional de la Narbonnaise en Méditerranée* (www.parc-naturel-narbonnaise.fr).

Besides the complexity of the diverse uses of the land, including natural and agricultural lands, this space conserves rare spaces with extreme conditions and many contrasts, such as spaces between wetlands and arid areas, wildlands and farmlands. Wine production is the main agricultural activity and there is still extensive farming. Nature activities such as kayaking or biking have been developed in/around the lagoons.

Some of the key challenges that the management of the space had to face were water pollution and demographic pressure due to tourism, especially during the summer. Despite being the third main tourist area in France, its coastal wetlands are relatively preserved.

The lagoon is disconnected from the rest of the wetland due to the existence of communication routes such as roads and the train.

Currently, the lagoon is also disconnected from the sea during part of the year due to the sand deposit. This connection is generally open certain times of the year, and some years it is artificially opened. Water chemical levels are frequently monitored.

The lagoon of La Palme (*Étang La Palme*) has been zoned; the areas were distributed between traditional professional fishermen and recreational uses, mainly surfing and kite-surfing. Motorised traffic access has been restricted in the lagoons in order to reduce pressure on certain areas. Tourist population entails certain conservation conflicts, such as complaints concerning the discomfort of the fauna.

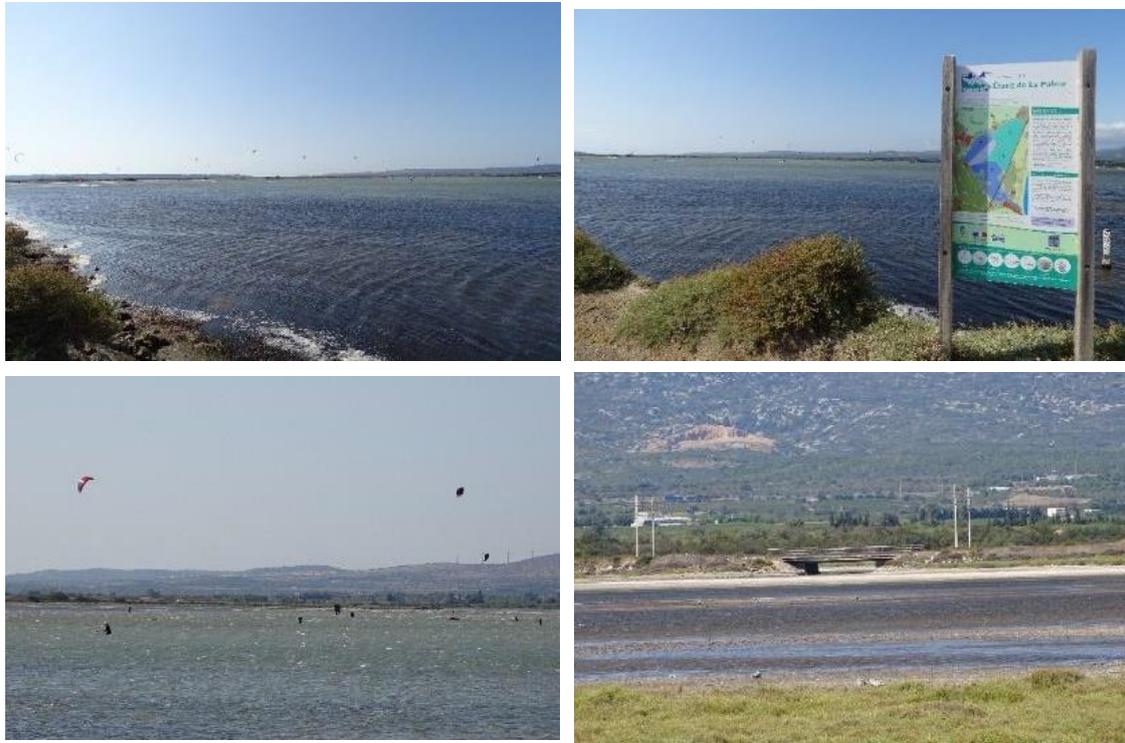


Figure 28: *Étang La Palme* is one of the main lagoons in the *Parc Naturel Régional de la Narbonnaise en Méditerranée* (Sigean). It has been zoned, and the area distributed between recreational use and traditional fishery. In some of the delimitation perimeters, there are main communication routes such as main roads. Vehicle traffic within the area has been limited.

Réserve Naturelle Nationale du Bagnas

The area was classified as a National Nature Reserve in 1983 and Natura 2000 in 2010. This space includes around 8 different ecosystems where there are more than 250 bird species. It has a special interest for migratory species, but also for critically endangered species such as the eel (*Anguilla anguilla*).

Prior to the establishment of the reserve, there was a mostly agricultural (viticulture) and salt-producing use. The area has a high urban pressure due to the vicinity, and it is surrounded by important communication routes, namely a motorway, rail tracks, and the Channel du Midi (a channel which connects the Mediterranean Sea and the Atlantic Ocean created for ship navigation). A Disneyland project was proposed to create a theme park, but a great social mobilisation stopped its construction.

This space has been managed by ADENA NGO (*L'Association de Défense de l'Environnement et de la Nature des pays d'Agde*) for more than 30 years, and with the involvement of Public Bodies (local, environmental and Conservatoire du Littoral) and researchers.

The protection of the space should be balanced with the management of human activities; the management provides strict protection including restricted access to the heart of the reserve. In the case of reserves, human uses are restricted, therefore, activities are forbidden. In the surroundings, agricultural activities are carried out, but as it is a Natura 2000 site, a series of compulsory indicators are established in order to undertake sustainable agriculture.

Some of the human uses are horse extensive breeding and tourism, which was highly developed in the second half of the 20th Century. The fishery is forbidden, however, bass and eel aquaculture is developed.



Figure 29: Human use in the Réserve Naturelle Nationale du Bagnas has been tightly regulated; however, it is surrounded by communication routes, including a motorway and rail tracks.

Management actions such as environmental dissemination and education, as well as ecosystem restoration actions, are undertaken. The water level of the lagoon is managed artificially through dams and channels. In addition, as it is a reserve, fauna monitoring is necessary. Up to 10,000 birds are recorded. There are monitoring activities such as bird banding and the reinforcement of the European pond turtle population (*Emys orbicularis*).

Parc Naturel Régional de Camargue (Arlés)

The Parc Naturel Régional de Camargue (Arlés) is a large wetland located in the Rhone delta and delimited by the two branches of the river - The Petit Rhône and the Grand Rhône. The park includes seven Natura 2000 places and a Biosphere Reserve. Likewise, it is included in the RAMSAR Convention. The park spreads more than 100,000 hectares and includes 3 villages. One of its main features is that more than 90% of the area is flood-prone.

The park not only covers different kinds of wetlands, such as lagoons, freshwater marshes and salt ponds but also cultivated land (rice fields), beaches and dunes.

The main aim of the regional park is to find a balance between the sustainable development of human activities (agriculture, fishing, salt extraction, as well as urban development and tourism) and nature conservation, taking into account the rich local culture.

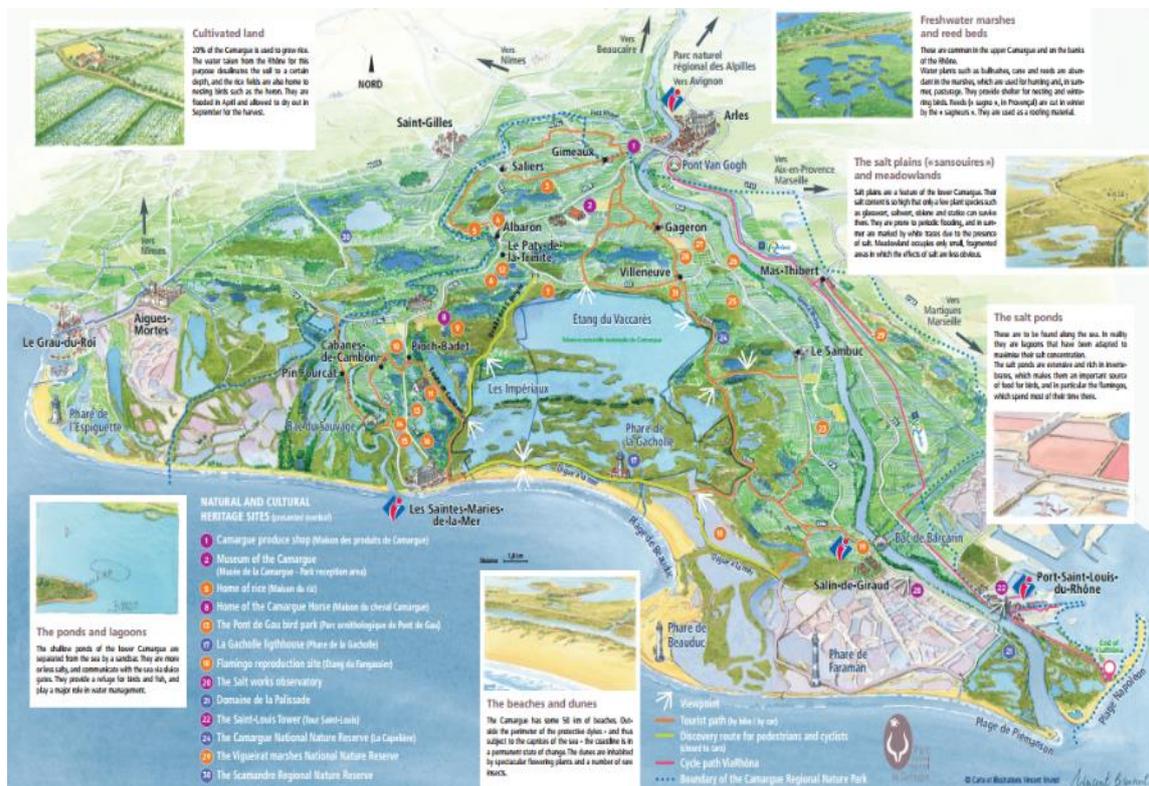


Figure 30: An interpretive map of the main places of interest and habitats in the Parc Naturel Régional en Camargue (Arlés).

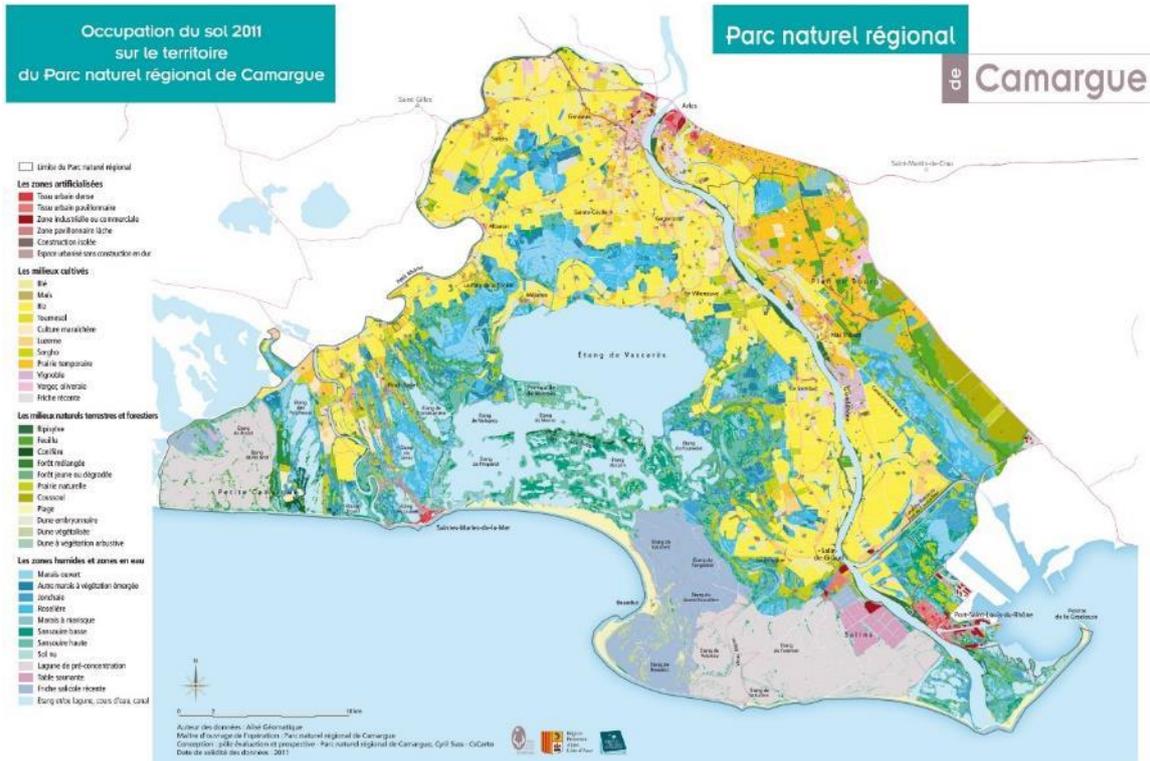


Figure 31: Land occupation in the territory of Camargue Regional Natural Park. Source: *Parc Naturel Régional de Camargue*. Retrieved from www.parc-camargue.fr/Local/parc-camargue.

CASE Les Marais du Vigueirat en Camargue. A natural protected area as example of sustainable local development.

Les Marais du Vigueirat (Arles) is a space of almost 1,200 hectares, and it is located within Camargue Natural Park. It is a mosaic of ecosystems in which almost 900 plant species, 1,900 invertebrates and 396 vertebrates have been sighted. It is located next to Mas-Thibert village with 1,300 inhabitants. The area is under different protection types: it is part of Natura 2000 – SCI and SPA –; it was included in the Camargue Regional Natural Park and declared a National Natural Reserve in 2011; it is part of the central area of the Camargue Biosphere Reserve since 2006; and it was declared a RAMSAR site in 2012.

It was acquired in 1983 and managed since 1987 by Conservatoire du Littoral. The current management body is the organisation Amis des Marais du Vigueirat, founded in 2000 with the partnership of the City of Arles and the Office of Tourism of Arles.

Space management has 3 objectives of similar importance that must be balanced.

- To manage the space in order to protect Natural Heritage.
- To manage sustainable development of the area, including the village, through a nature tourism project with the stakeholders of the territory.
- To guarantee employment for people with difficulties or at risk of exclusion.

The current management plan (2016–2025) is focused on three themes and horizontal guidelines.

- Heritage conservation implies maintaining the conservation function of the historical and natural landscape heritage of the place, as well as developing functional coherence between the place and the territory. For this purpose, cartographies of habitats and species have been developed, from which a space zoning has been established, permitting the public use of a small area, and limiting and restricting it in most of the reserve. In this area, entrance is restricted; it is only permitted to nature guided tours, and a ticket must be purchased. All public use is situated within the area of interpretation, where there is a small picnic area destined for family groups, and small interpreted tours can be undertaken through different spaces and restored or created habitats. Conversely, even though water management is artificial since the area has dams and channels, it is developed according to the Mediterranean climate cycle. Plant management is developed by the cattle. In addition, different projects for the restoration of small areas have been developed.

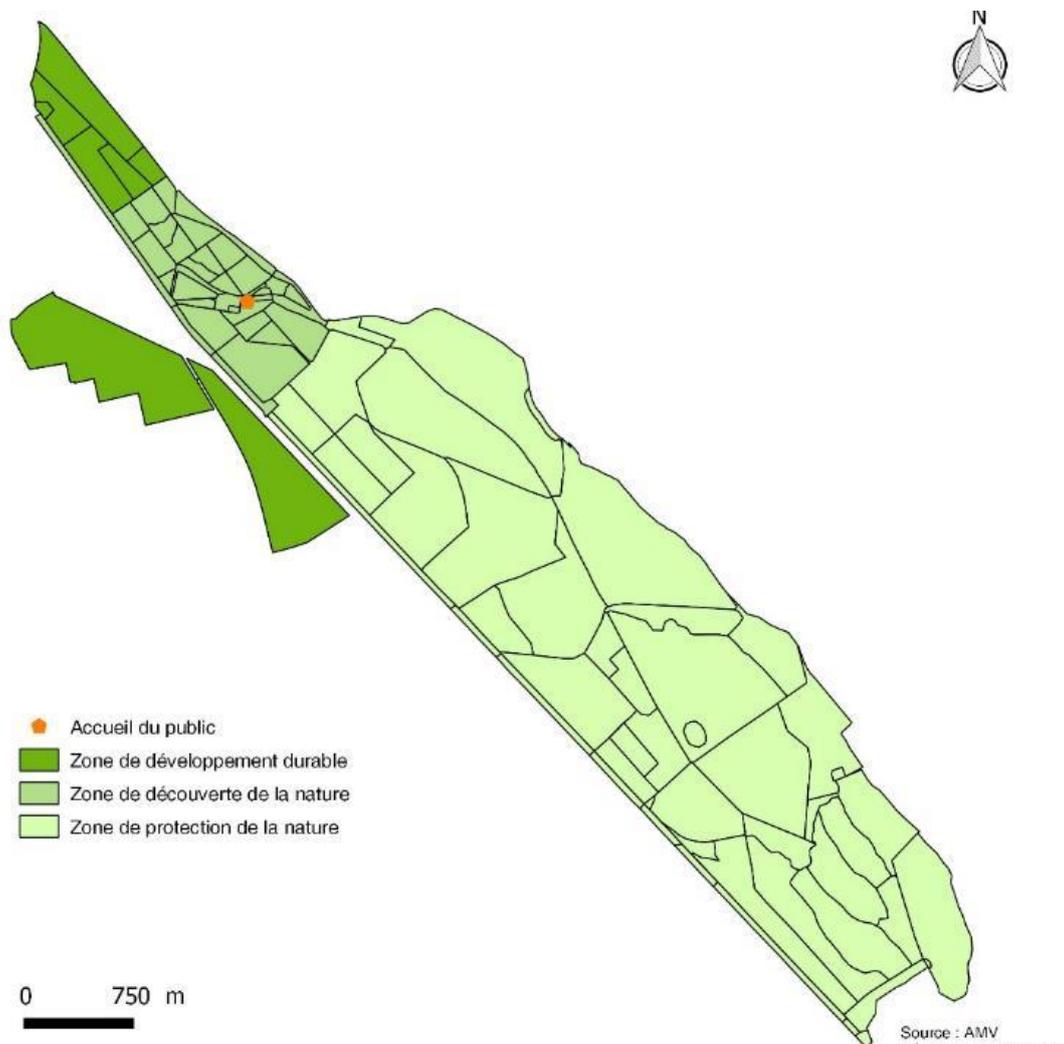


Figure 32: The zoning of the space includes a comprehensive reserve area, whose priority is to protect nature. It is an area where access is strictly limited and restricted; it is regulated but

free visits are allowed. Sustainable uses are allowed, whereas human uses are limited. It is an area of nature discovery with a pedagogical and awareness-raising aim. Source: AMV.

- Economic development focuses on maintaining and developing economic activities on the place and territory within the scope of sustainable development. Traditional agricultural and livestock activities, as well as tourist and cultural activities are the economic activities developed in the area. The protected area functions as a revitalisation area of the rural space, enabling not only the awareness of the visitors but also the fundraising to finance a significant part of the natural heritage management. In order to do so, certain strategies such as fostering consumption in the local businesses in the associated rural area, as well as promoting several strategies to advertise and facilitate the purchase of products produced in/around the protected area have been established. Additionally, it is expected to increase the number of visitors in the area in order to improve the financing of the management. In order to avoid the effects of the influx of visitors to the environment, the following actions are required: to create suitable zoning, to conduct load capacity studies, and to create infrastructures and regulations adapted to necessities.
- Social development aims at maintaining and developing social activities on the place and territory within the scope of sustainable development. In this case, stakeholders of the territory are expected to be involved in the activities so that the population and the local workers take part of the different bodies that are in charge of carrying out different activities, as well as they contribute to social projects in the territory and undertake activities for work inclusion. The Park is one of the main sources of employment in the town where the professionalisation of tourism is prioritised in order to offer a quality product and product differentiation.

Transversal aspects expect to develop experimental, innovation and demonstrative functions of the place as well as multi-partnership development and facilitation of task implementation on site. Those tasks include environmental certificates, energy and water environmental management, and travel management, fostering electric trips.



Figure 33: The landscapes of the interpretive walking tours in *Les Marais du Vigueirat* in Camargue have been created through the restoration of the ecosystem by coordinating it with the traditional uses of the land. In this way, visitors are able to observe both animals and different spaces throughout the tour.



Figure 34: There are different interpretive elements throughout the tour.

CASE Etang du Mejean

The wetland is located in Languedoc lagoon complex, 8 kilometres far from Montpellier, within the municipality of Lattes. The area includes different habitats, such as marshes and mudflats, and the lagoon creates a patchwork landscape where plants and animals coexist.

The place was threatened by an urbanisation project, but it is protected since 1985, the time when the area was purchased by Conservatoire du Littoral. The main objectives for conservation are the protection and management of the ensemble of wetlands and lagoons, the water level, as well as environmental awareness and education in *Maison de la Nature*, a restored ancient sheep pen.

The area has a high public use due to its proximity to the large city of Montpellier. This space has an interpreted area where most of the visits are congregated. The rest of the paths are freely accessible. The interpreted area is adapted for people with disabilities, and it is considered an example of adapted interpretation.

Other human uses are fishing and agriculture. Professional fishing is developed with pots. The main products are sea bream, sea bass and eel. However, despite the regulations, there is not much control.

The channels are artificially regulated to control salinity and quantity of water with the objective of conserving biodiversity, pasture, etc. Birds and snakes are monitored; however, there are no resources to carry out a monitoring of the rest of taxonomic groups.



Figure 35: The *Étang du Méjean* has a room for the interpretation of the area. The centre has been adapted to improve the knowledge of the area; and the paths have been adapted to enable people with different abilities to enjoy them.

CASE Centre du Scamandre, Vauvert

The *Réserve Naturelle Regionale du Scamandre* protects 146 hectares since the 1990s. The space is representative of the Mediterranean wetland, and most of the ecosystems in Camargue can be found here. In the 1960s, the area was seriously threatened by agriculture. Nowadays, most of its spaces and ecosystems –which include different habitats– have recovered.



Figure 36: Location of the *Réserve Naturelle du Scamandre*. Source: www.reserves-naturelles.org/scamandre

The area is managed by the *Syndicat Mixte de Protection et Gestion de la Camargue Gardoise*. The main objective of the management is to protect and improve the space. The Syndicate office is placed in the Interpretation Centre, *Centre de découverte du Scamandre*, which was built to manage the public use and visitors in the reserve.

The centre has several paths and trails of different length, being 4 km the longest. Access is free provided that the interpretation centre is open. The diverse paths are interconnected, which allows visitors to extend or reduce the tour, adapting it to their interest. During the tour, there are 3 observation points. Most of the tour is accessible for people with reduced mobility as it is indicated through signage. The centre has also a leisure area, a picnic area and public toilets.

Water dynamics is managed in an anthropogenic way, through a complex network of channels and dams. Water management priorities are focused on biodiversity conservation, improving the quality of surface water, and reducing flood risk. It is intended to carry out a management similar to natural dynamics; therefore, letting the reserve dry up is allowed at certain times of the year.

There are exotic species of flora and fauna. The area will be salinised due to water level rise, so management activities of exotic species which cannot tolerate salinity will not be undertaken.

Hunting is managed, the number of birds is limited and shooting wading birds is forbidden. An experienced hunter must share the position with a young hunter with less experience in order to share knowledge.

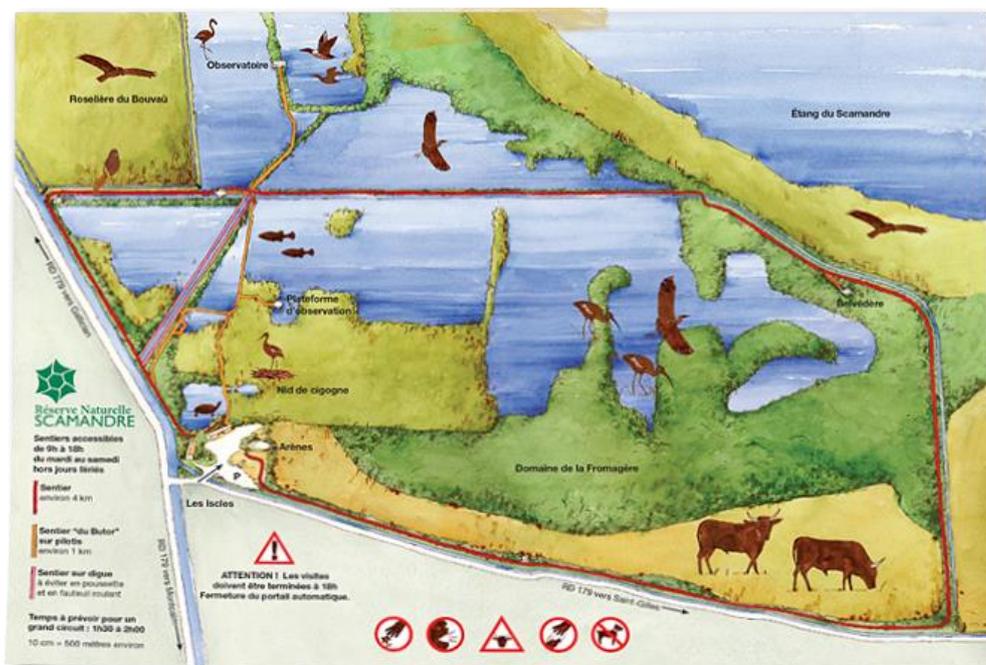


Figure 37: Interpretive map of the *Reserve Naturelle du Scamandre*. Source: Syndicat Mixte de Protection et de Gestion de la Camargue Gardoise <http://www.camarguegardoise.com/>

CASE Domaine du Canavérier, Aigues-mortes

It is a reserve of 650 hectares that includes natural and cultivated areas in the meeting point between the fluvio-lacustrine part and the marine-influenced part. The area is 50 metres under sea level; therefore, there are dams to limit water entrance.

Its name refers to the vast extensions of reeds, but there are areas with trees such as ash and bushes, as well as saline steppes and marshes. The area is irrigated by the Petit Rhône, but in the 1950s, it was isolated from other lagoons due to a dam that was constructed in the area for salt exploitation.

The owner of most of the land is Conservatoire du Littoral, which purchased it in 2015 by first refusal and pre-emptive rights after several decades of attempts. Currently, it is managed by Syndicat Mixte de Protection et de Gestion de la Camargue Gardoise, whose main objective is to preserve biodiversity and landscapes, as well as to establish a place for pilot experiences in water management.

Generally, management plans are conducted every 5 years, but in this place, it is necessary to wait for 2 more years to update the management plan due to the agreements with the users of the land. Therefore, it will be done every 10 years, but it will be flexible to be able to modify what is necessary.

The previous owner still owns 100 hectares that limit the use of the shared channels. Therefore, agreements must be reached for water management. However, conflicts may arise.



Figure 38: The *Domaine du Canavérier* is a space recently purchased by Conservatoire du Littoral, in which innovative practices for restoring and conserving the ecosystems will be undertaken. In these ecosystems, agricultural uses and uses for biodiversity conservation coexist. There are populations of clam (*Margaritifera margaritifera*) and the European pond turtle has recently been detected (*Emys orbicularis*).

The area is polluted by nitrates due to agricultural use (rice). Regular water surveys and researches are conducted, including hydrology, the morphology of the land, and sediment properties, which are funded by The Water Agency.

The Water Agency –in charge of water management– has a conservationist vision. Its main objective is to preserve the functioning of the ecosystem and to implement innovative measures that can be exported to other areas. As an example, letting the reserve dry up is allowed in order to regulate reed populations. However, the entrance of water must be regulated to avoid flooding. Dams cannot be eliminated for now, since the reserve would flood because it is below sea level. Nonetheless, they will not be maintained once they are damaged by the sea. On the other hand, other proposal has been to flood certain areas to create new lagoons for waders. The current proposal is to create semi-flooded meadows for pasturing in order to consume nitrates and avoid their passage to the subsoil.

In the interior of the reserve, there are more than 50 km of road, although currently, the use of vehicles has been restricted, except those that belong to the administration and those that carry out conservation and/or research work, as well as those having a land use. In the future, they will not be all kept.



Figure 39: The *Étang de Berre*. Despite the significant human pressure, the lagoon has natural areas of interest. Management has established fishing and traffic limitations after the purchase.

The southern part is mainly destined for agricultural use, mainly rice. The use can be continued through agreements (periods of 5 years), and fulfilling a series of requirements. A normative for implementing good agricultural practices has been established with the objective of developing sustainable agriculture and fostering the harmonisation of this activity with biodiversity conservation. Notwithstanding, the farmer who has the licence is not fulfilling this agreement. Thus, it is being contemplated that once this licence expires, it will not be renewed.

Subsequent to the ceasing of this use, salinity has been rebalanced and fish populations are now recovering.

CASE *Etang de Berre, Marsella*

It is the largest lagoon on the European Mediterranean coast. It has been recently purchased by Conservatoire du Littoral. There are diverse spaces such as dune areas, coastal forests, salt mines and small peripheral lagoons, which makes the lagoon an important place for biodiversity, especially birds which find a complementary refuge to the wetlands of Camargue.

The lagoon has a high human pressure due to the compendium of present and past human uses, including several populations of small and medium size, such as industrial, military, commercial, and agricultural areas, as well as the airport of Marseille, one of the largest airports in France. The creation of channels resulted in the transformation of a natural ecosystem, leading to the creation of new rice fields. The hydroelectric power station that was operating between 1966 and 2005 entailed the entrance of freshwater, causing a significant decrease in the salinity of water, the suffocation of 80% of the bottoms of the lagoon due to sludge deposits, and even a change in fish populations.

Moreover, the lagoon receives effluents from the surrounding agricultural spaces. This compendium of pressures has provoked its fragile status and a highly contaminated space. However, its status is improving currently.

At present, new limitations have been established after the purchase of the area by Conservatoire du Littoral. On the one hand, fishing has been regulated. On the other hand, vehicle traffic has been limited in some areas to improve the conservation of the coastal area. In order to do so, access to some of the small roads has been restricted.

CASE Dune restoration on the Serignan Beach next to *Réserve Naturelle des Orpellières*

The *Réserve des Orpellières* is located in the mouth of the river Orb. It is constituted by a beach where there is a dune ridge of more than 2 km, and a brackish humid zone. The area has had significant agricultural exploitation, mainly vineyards. Currently, the pre-coastal area is occupied by a tourist area with second home dwellings and a camping. The coastline has suffered coastal erosion and water salinisation, causing the disappearance of water exploitation.

Coastal dune systems are variable in space and dynamic. They represent a high environmental and socioeconomic value. However, they are fragile in the face of human actions due to the delicate coastal balance –both at the geomorphological and biological levels– and the wide range of use and pressure they suffer. In fact, most of dune systems in Europe are modified or have been destroyed mainly by tourism and urbanisation. These systems play a fundamental role in the response to the climate change, since they are highly adaptable to climate and sea level variations. For this reason, offering the space and the resources that allow its re-adaptation (source materials, that is, sediments) is necessary.

In the reserve, an area of 150 hectares was purchased by Conservatoire du Littoral in 1980. In the last few years, a dune restoration has been implemented, based on the creation of protection and regeneration systems. On the one hand, access to visitors and tourists has been limited and dune forming fences have been created in order to reduce wind speed by friction and favour the deposition of the transported sand, reducing eolic erosion in turn. Structural captures based on sheet piles have been installed. Previous studies have enabled to design and choose sheet piles as the most efficient method when capturing sand. The restoration of the dune enables to establish reserve areas (source) of sediment, which would allow the surplus to be exported to the surrounding areas with the objective of recovering the balance of the dune-beach system.

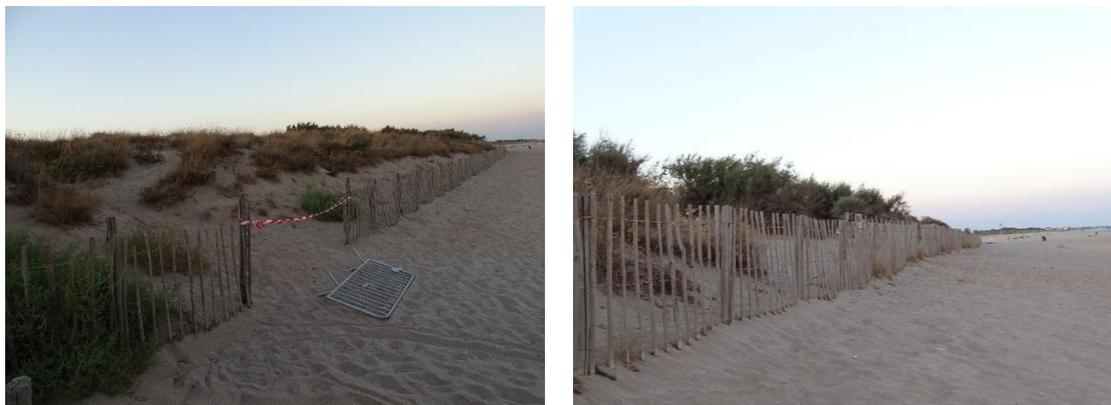


Figure 40: An area in which the access has been limited to avoid erosion. Sediment trap systems have been established to favour the restoration of the dune. These areas act as a source of sediment for restoring the dune-beach system.

5. Lessons learned and some conclusions

5.1. First overview and comparison

- The priorities, management and conservation systems are different in each of the spaces and areas visited. They are clearly influenced by the social background and the tradition of environmental conservation. However, it is favoured by a series of policies and legislation that promote participation, which undoubtedly helps to improve acceptance.
- Karavasta National Park has a status and physiology similar to that of the Mar Menor before the alteration of the ecosystem. Nonetheless, urban and agricultural pressure is increasing its degradation.
- In the United Kingdom –where most of the coastal and urban areas are strongly modified– the ecosystems came to present a serious degradation status. They were affected mainly by nature elimination and alteration, as well as pollution. Urbanisation is not developed under spatial planning policies, thereby complicating their management. The current policies are based on the improvement and control, as well as on the restoration of ecosystems, with the aim of recovering the naturalness of riverbeds, rivers, and wetlands. The existence of private reserves allows carrying out innovative management proposals, fostering conservation and sustainable use, and facing the retreat of the coast due to sea level rise.
- In France, coastal wetlands and channels of certain entity are strongly anthropised and regulated, but management is based on the re-naturalisation whenever possible. Space management has been prioritised in order to conserve and/or recover their functionality. For the states, preparing themselves for the effects of the climate change that will happen in the following decades, such as the retreat of the coast due to sea level rise, is a priority. In this case, management is based on the preparation for the changes, allowing the inland migration of ecosystems. Land purchase has also been a way to avoid constructions in these areas and to assume the social and economic impacts that the flooding (punctual or permanent) of these lands would imply.
- In the south of France, space management is highly flexible, especially the areas belonging to Conservatoire du Littoral. On the one hand, management is transferred to a different entity which shapes a specific team. On the other hand, these entities can make independent decisions that they consider the most suitable to ensure on the long-term the conservation of the space. This has a positive part, since management can be personalised according to the intrinsic characteristics of the space and its surroundings, as well as innovative measures can be established. The negative aspect can be the absence of certain transversal policies and the establishment of certain priorities. For example, this is evident in

the management of exotic invasive species, since the control in part of the land is ineffective if they proliferate in other part that acts as a source.

- Despite the management differences between France and the United Kingdom, the experiences observed show that both countries have innovative experiences that allow to “try” different management strategies to face the great challenges in biodiversity conservation, such as restoring the functionality and connectivity of land, promoting the sustainable use of resources, limiting the impacting activities and allowing the natural evolution and ecosystem displacement.

5.2. Some measures that could be applied in the Mar Menor lagoon

5.2.1. From Albania

- Creating boat exclusion areas in order to facilitate the breeding of birds and to improve the status of the flora. The limitation of navigation in the areas of greatest interest will reduce the inconveniences to the bird colonies and the removal of funds.
- Fishing management based on the breeding season. The fishing management normative must be updated and, for this purpose, biological parameters such as the breeding season of fishing species must be taken into account.

5.2.2. From the United Kingdom

- Innovative actions for habitat restoration. The actions for the restoration of the habitat and its naturalness allow reversing certain modifications that they have suffered. The main objective must be the restoration of the natural functioning of the ecosystem. For that purpose, certain aspects are required, such as to have in-deep knowledge of the space, human and economic means, as well as a courageous attitude to face any opposition.
- External control of the Administration by non-governmental entities that ensure suitable and impartial management, whose main objective is environmental conservation and its balance with the population equitable socioeconomic development. Therefore, it is essential that society acts as a control body, for which it must be motivated and be able to rely on bodies and systems of effective participation, both at an individual level (citizen) and at a collective level (entities such as associations, cooperatives, etc.).

5.2.3. From France

- Public property – participative management. The property purchase tool can allow the protection of priority spaces. Even though this requires a significant

investment, land purchase can facilitate the management and save future risks and costs, meaning that the benefit surpasses the cost.

- To anticipate changes. The management must have a medium-long-term vision when establishing the objectives and structural actions, although management plans are designed and developed for periods of between 3 and 10 years. The coastal dynamics, ecosystems succession, and climate change effects are some of the processes that require further work based on information from long periods of time in the past and with a view to the future.

5.3. Conclusions

- There is not a single model for the management of the ecosystems and coastal wetlands, but it should accommodate to the specific necessities and the reality of the space and its surroundings. However, to create some common guidelines and conservation priorities is also essential.
- The protected spaces should have a management plan to set up the main criteria, priorities and conservation priorities of the space, and the way to reach the defined objective (a governance model that establishes who, how and when the actions will be carried out). The management plan should be flexible and adaptive to the requirements and changes, and be updated periodically. The lack of the management criteria and plan or the lack of adaptability would cause inefficiency in the management process.
- The managers of a protected space should know their space and its reality, as some other similar spaces placed in the same geographic region. The training of technical and intersectoral network building is essential for securing the ecosystem conservation.
- The integrity of the natural areas and the ecosystem process should be ensured as the only way to get a long term conservation and management. The only way of preserving the Protected Spaces is taking into account the natural functioning and the inevitable changes that will occur over the next decades.
- The management strategies for preservation and use of the spaces and resources could only be effective through the social participation in one or other way. The local population and economic sectors should identify themselves with the spaces and their conservation objectives and be interested in their protection. The involvement model and process will depend on the social characteristic of the area and the local population.
- The nature-based solutions could be more efficient than hard grey infrastructures, but they need better nature and natural process understanding in order to enhance the resilience of ecosystems and the provision of services. The implementation could increase the investment in, mainly, human resources, and the measures taken should be agreed with local population and users.

- The effectiveness of the conservation also depends on the existence of strong institutions, which let take agreed measures. Successful management of nature includes well organised cooperation of different institutions involved in nature conservation, enough and evidence-based information on biodiversity and natural process, and appropriate socio-economic indicators and the courage of establish innovative long-term solutions.

6. References and Bibliography

- Avery, L. M. 2012. *Rural Sustainable Drainage Systems (RSuDS)*. Environment Agency, Bristol, 146 pp. Available in: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291508/scho0612buwh-e-e.pdf
- Becerra, S, García-González, T.J., Moyano, E. (2008). Proteger la naturaleza en España y Francia: un análisis comparado del proceso de aplicación de la directiva europea Hábitat. *Revista de Sociología*. 88:103-128. Available in: <https://papers.uab.cat/article/view/v88-becerra-garcia-moyano/pdf-es>
- Belando MD, García-Muñoz R, Ramos A, Franco I, Bernardeau-Esteller J, García P, Ruiz JM. (2015). Distribution and abundance of *Cymodocea nodosa* meadows and *Pinna nobilis* populations in the Mar Menor coastal lagoon (Murcia, South East of Spain) *PeerJ PrePrints* 3:e1063v1 <https://doi.org/10.7287/peerj.preprints.1063v1>
- BirdLife International (2018). *Important Bird Areas factsheet: Mar Menor coastal lagoon*. Downloaded from Available in: <http://www.birdlife.org> on 28/11/2018.
- Borrini-Feyerabend, G., Dudley, N., Jaeger, T, Lassen, B., Pathak Broome, N., Phillips, A. and Sandwith, T. (2013). *Governance of Protected Areas: From Understanding to Action. Best Practice Protected Area Guidelines*. Series No. 20. Gland, Switzerland: IUCN. xvi + 124 pp. Available in: <https://portals.iucn.org/library/node/29138>.
- Cabezas, F., 2009. Balance hídrico del Mar Menor (Murcia). In: *El Mar Menor. Estado actual del conocimiento científico*. Murcia, pp. 167–206.
- Cataudella, S., Crosetti, D. and Massa, F. (eds) (2015). Mediterranean Coastal Lagoons: Sustainable management and interactions among aquaculture, capture fisheries and the environment. *Studies and Reviews* No. 95. General Fisheries Commission for The Mediterranean. FAO. Rome.
- Chesman, B.S., Burt, G.R. y Langston, W.J. (2006). *Characterisation of the European Marine Sites: Essex Estuaries European Marine Site*. Marine Biological Association of the United Kingdom Occasional Publication (17). 198 pp. Available in: http://plymsea.ac.uk/1340/1/pdf/occ_pub_17.pdf
- Dixon, Alan. (2008). Wetlands and Indigenous Knowledge in the Highlands of Western Ethiopia. 10.1007/978-1-4020-6748-8_12.
- Dudley, N. (ed.) (2008). *Guidelines for Applying Protected Area Management Categories*. Gland, Switzerland: IUCN. Available at: <https://doi.org/10.2305/IUCN.CH.2008.PAPS.2.en>
- Durá Alemañ, C. J. (2015). “La custodia del territorio”. *Cuadernos de sostenibilidad y patrimonio natural* nº 23. Fundación Banco Santander. Madrid, España. 130 pp.
- FIEA, Montoro, J.A. y IEH, (2009). *El Mar Menor: Estado actual del conocimiento científico*, Instituto Euromediterráneo del Agua.

- García-Moreno, P., Ibarra-Marinás, D., Sánchez-Balibrea, J.M. y WWF/España (2018). *La burbuja del regadío: el caso del mar Menor. Evolución de los regadíos en el entorno del Mar Menor, Campo de Cartagena. 1977-2017*. WWF y ANSE. 79 pp.
- Gilabert, J., 2001. Seasonal plankton dynamics in a Mediterranean hypersaline coastal lagoon: the Mar Menor. *Journal of Plankton Research*. 23: 207-217.
- Graham, J., Amos, B. and Plumptre, T. (2003) *Governance Principles for Protected Areas in the 21st Century. A Discussion Paper*. Ottawa: Institute on Governance in collaboration with Parks Canada and Canadian International Development Agency.
- Huel, D. (2000). *Managin Saskatchewan Wetlands – A landowner’s Guide*. Saskatchewan Wetland Conservation Corporation: Regina, SK.
- Jeffrey Pfeffer, J. y Salancik G.R. (1978). *The External Control of Organizations: A Resource Dependence Perspective*. Harper & Row, New York. Pp.
- Lambert, A. (2003). Economic Valuation of Wetlands: an Important Component of Wetland Management Strategies at the River Basin Scale. Ramsar Convention.
- Leung, Y-F., Spenceley, A., Hvenegaard, G., and Buckley, R. (eds.) (2018). *Tourism and visitor management in protected areas: Guidelines for sustainability*. Best Practice Protected Area Guidelines Series No. 27, Gland, Switzerland. IUCN. xii + 120 pp.
- Mitchell, B.A., Stolton, S., Bezaury-Creel, J., Bingham, H.C., Cumming, T.L., Dudley, N., Fitzsimons, J.A., Malleret-King, D., Redford, K.H. and Solano, P. (2018). *Guidelines for privately protected areas*. Best Practice Protected Area Guidelines Series No. 29. Gland, Switzerland: IUCN. xii + 100pp.
- Pérez-Ruzafa, A., Fernández, A.I., Marcos, C., Gilabert, J., Quispe, J.I., García-Charton, J.A., 2005. Spatial and temporal variations of hydrological conditions, nutrients and chlorophyll a in a Mediterranean coastal lagoon (Mar Menor, Spain). *Hydrobiologia*. 550: 11-27.
- Regalado, J.J., Carmona-Martin, E., López-Granero, M. et al. *Plant Cell Tiss Organ Cult* (2018) 132: 573. <https://doi.org/10.1007/s11240-017-1346-9>.
- Roig-Munar, F. X. y Quintana Pou, F. J. (Coords.) (2016). *Restauración y Gestión de Sistemas Dunares*. Estudio de casos. Colección Recerca i Territori, 8. Catalunya: Càtedra d’Ecosistemes Litorals Mediterranis, Parc Natural de Montgrí, Illes Bledes i el Baix Ter. 220 pp.
- Schietecatte L-S (2006). *Sustainable Management of critical Wetlands ecosystems*. FAO.
- Sousa, L.P. et al., (2016). *Ecosystem services provided by a complex coastal region: challenges of classification and mapping*. *Scientific Reports*. 6(1): p.22782.
- Thomas, L. and Middleton, J. (2003). *Guidelines for Management Planning of Protected Areas*. Best Practice Protected Area Guidelines Series No. 10, IUCN Gland, Switzerland and Cambridge, UK. ix + 79 pp. <https://doi.org/10.2305/IUCN.CH.2003.PAG.10.en>.

- U.S. Army Corps of Engineers, (2002), *Coastal Engineering Manual (CEM), Engineer Manual 1110-2-1100*, U.S. Army Corps of Engineers, Washington, D.C. (6 volumes).
- U.S. Environmental Protection Agency. 1995a. *Wetlands Fact Sheets*. EPA843-F-95-001. Office of Water, Office of Wetlands, Oceans and Watersheds.
- U.S. Environmental Protection Agency. 1995b. *America's Wetlands: Our Vital Link Between Land and Water*. EPA843-K-95-001. Washington, DC: U.S. Environmental Protection Agency, Office of Water, Office of Wetlands, Oceans and Watersheds.
- UNESCO, 1981. Coastal lagoon research, present and future. UNESCO technical papers in marine science. 33, p.348
- Vasiljević, M., Pokrajac, S., Erg, B. (eds.) (2018). *State of nature conservation systems in South-Eastern Europe*. Gland, Switzerland and Belgrade, Serbia. IUCN, xii+58pp.
- Verdiell-Cubedo, D, Oliva-Paterna, F. J. and Torralva-Forero, M. (2007). Fish assemblages associated with *Cymodocea nodosa* and *Caulerpa prolifera* meadows in the shallow areas of the Mar Menor coastal lagoon. *Limnetica* 26 (2): 341-350.

7. List of figures

Figure 1: The Mar Menor lagoon is a coastal wetland placed in the Iberian Southeast.	8
Figure 2: The Mar Menor lagoon.	10
Figure 3: Iberian toothcarp, an endemic small fish in the Mediterranean coast of Spain.....	12
Figure 4: Up: some of the most valuable land ecosystems in the surroundings of the Mar Menor lagoon – Left: sandbeaches; Right: salt plains wetlands. Down: some singular species. Left: Mar Menor Asparagus, a local endemism; Right: slenderbilled gull (<i>Larus genei</i>).....	13
Figure 5: Left: salt pan; Right: small-scale fishermen.	16
Figure 6: The three visited areas.....	21
Figure 7: The visit includes meetings with different organisations, such as NGOs and the Environmental Administration, and participating in environmental activities.....	22
Figure 8: Meeting with Natural England and the Environmental Agency, in the company of ZSL members, and eel specialist, from ZSL.....	25
Figure 9: The meeting with Wildlife Trust includes a visit to Abbot's Farm, in Essex.....	26
Figure 10: Visiting the Reserve de Bagnas.	27
Figure 11: Visit to the Etang de Méjean.....	29
Figure 12: Some of the visits done in the Parc Natural de Camargue (Arles). Left; Marais du Viguérat, while the director of the organisation Amis de Marais explained the managing of the Reserve. Right: The visit to Domaine du Canavérier, Aigues-mortes, with rangers of the protected spaces.	29
Figure 13: Visiting Etang de Méjean Parc Naturel Régional de la Narbonnaise en Méditerranée (Sigean).....	31
Figure 14: The Divjaka-Karavasta National Park in Albania protects around 22,000 hectares of a coastal wetland and its surroundings, including dunes and coastal forests.....	32
Figure 15: The landscapes are characterised by the small wet areas surrounding the main lagoon. It is a highly important wetland for birds, especially for the Dalmatian pelican, the emblem of the park.....	33
Figure 16: Agricultural intensive activities and, especially, the use of phytosanitary treatments can affect water quality.	34
Figure 17 Fishing is an important activity for the inhabitants of the park and its surroundings. Most of the fish catches are conducted through different traps. Although fishing is regulated, there is a significant uncontrolled and unaccounted extraction, especially among poor population.	35
Figure 18: Some of the main threats to the national park are illegal constructions and intensive agricultural practices. Besides, a large resort has been proposed in the north part, which would alter the landscape and the functioning of the wetland. Top image: a design of the resort planned. Source: PPNEA.....	36
Figure 19: In the wetland, wastes can be found, mainly plastics and pieces of glass due to the limited management of urban wastes.	37
Figure 20: Although bird life is one of the most well-known and striking values, this space has landscape values, as well as other flora and fauna species of interest that must be paid attention to the management.	38
Figure 21: The Park has important landscape values that can be a resource for quality tourism.	39
Figure 22: The creation of quality employment among poor population could reduce the pressure on natural resources.	40

Figure 23: The Essex Estuaries European Marine Site. The boundaries of the SAC and components of the SPAs are shown. Source: retrieved from Chesman et al, 2006.	41
Figure 24: The area has been realigned to enable the changeable coastal dynamics.....	44
Figure 25: Floral bands have been created to foster the presence of pollinators.....	45
Figure 26: Native oysters are endangered, threatened by both an invasive oyster species and water pollution.....	46
Figure 27: Map of the land uses of the area. Source: retrieved from Parc Naturel Régional de la Narbonnaise en Méditerranée (www.parc-naturel-narbonnaise.fr).....	50
Figure 28: Étang La Palme is one of the main lagoons in the Parc Naturel Régional de la Narbonnaise en Méditerranée (Sigean). It has been zoned, and the area distributed between recreational use and traditional fishery. In some of the delimitation perimeters, there are main communication routes such as main roads. Vehicle traffic within the area has been limited...	51
Figure 29: Human use in the Réserve Naturelle Nationale du Bagnas has been tightly regulated; however, it is surrounded by communication routes, including a motorway and rail tracks. ...	52
Figure 30: An interpretive map of the main places of interest and habitats in the Parc Naturel Régional en Camargue (Arles).....	53
Figure 31: Land occupation in the territory of Camargue Regional Natural Park. Source: Parc Naturel Régional de Camargue. Retrieved from www.parc-camargue.fr/Local/parc-camargue	54
Figure 32: The zoning of the space includes a comprehensive reserve area, whose priority is to protect nature. It is an area where access is strictly limited and restricted; it is regulated but free visits are allowed. Sustainable uses are allowed, whereas human uses are limited. It is an area of nature discovery with a pedagogical and awareness-raising aim. Source: AMV.	55
Figure 33: The landscapes of the interpretive walking tours in Les Marais du Vigueirat in Camargue have been created through the restoration of the ecosystem by coordinating it with the traditional uses of the land. In this way, visitors are able to observe both animals and different spaces throughout the tour.	56
Figure 34: There are different interpretive elements throughout the tour.	57
Figure 35: The Étang du Méjean has a room for the interpretation of the area. The centre has been adapted to improve the knowledge of the area; and the paths have been adapted to enable people with different abilities to enjoy them.	58
Figure 36: Location of the Réserve Naturelle du Scamandre. Source: www.reserves-naturelles.org/scamandre	58
Figure 37: Interpretive map of the Reserve Naturelle du Scamandre. Source: Syndicat Mixte de Protection et de Gestion de la Camargue Gardoise http://www.camarguegardoise.com/	59
Figure 38: The Domaine du Canavérier is a space recently purchased by Conservatoire du Littoral, in which innovative practices for restoring and conserving the ecosystems will be undertaken. In these ecosystems, agricultural uses and uses for biodiversity conservation coexist. There are populations of clam (<i>Margaritifera margaritifera</i>) and the European pond turtle has recently been detected (<i>Emys orbicularis</i>).	60
Figure 39: The Étang de Berre. Despite the significant human pressure, the lagoon has natural areas of interest. Management has established fishing and traffic limitations after the purchase.	61
Figure 40: An area in which the access has been limited to avoid erosion. Sediment trap systems have been established to favour the restoration of the dune. These areas act as a source of sediment for restoring the dune-beach system.....	63