Re**[making]** the Landscape 2014 2018

LAYMAN'S REPORT LIFE 13 NAT/ES/001001

life PLETERA

The LIFE-Pletera project (2014–2018) was an ambitious and innovative de-construction and ecological restoration project that aimed to satisfy a long-held local aspiration: the restoration of the ecologically highly valuable saltmarsh that was partially destroyed by a construction project at the end of the 1980s.

La Pletera is a saltmarsh that lies behind the beach stretching from Els Griells, a residential area in L'Estartit, to the mouth of the river Ter in the heart of the Montgrí, Les Illes Medes i el Baix Ter Natural Park. It covers a surface area of 86 ha and forms part of the Baix Ter wetlands included in the Natura 2000 network of protected areas. Construction began here in 1987 of a long paved promenade that was designed to connect six residential areas, of which only one was ever completed as in the early 1990s the project was halted and then abandoned.

1 INTRODUCTION LIFE-PLETERA

DEMONSTRATIVE PROJECT

The LIFE-Pletera project was devised as a practical example of territorial planning based on landscape preservation rather than on the simple occupation of and expansion into the territory. It has shown that even in an area subject to severe pressure from urban planning projects it is still possible to restore and renaturalize areas heavily altered by human activity.

During work on the LIFE-Pletera project all the material used in the construction of the incomplete built-up areas was removed, enabling the original landscape and proper ecological functioning of the coastal systems to be restored. The work performed is a good example of the feasibility of a multi-disciplinary project affecting matters of great public concern such as the fight against climate change, the protection of the biodiversity and wetland restoration, and proof of the viability of alternative methods of territorial planning.

The project also devoted a significant amount of time and recourses to educational and awareness-raising activities as a way of increasing public sensitivity towards wetlands, in many cases highly fragile and vulnerable ecosystems that are currently in regression all along the Mediterranean coastline.

AN UNFINISHED URBANIZATION

The construction project at La Pletera was approved by the Provincial Urban Planning Commission on 17 October 1986; the definitive go-ahead for Sector 1 of La Pletera was given by Torroella de Montgrí Town Council on 26 May 1987. Immediately afterwards, tonnes of building rubble began to be dumped in La Pletera to raise the marshes above sea level.

A number of ecologist groups tried fruitlessly to halt the work, which continued regardless. The first houses were occupied in 1988 and in all by 2001 77 houses had been built, all in one of the six planned sectors.

Nevertheless, in 1989 the building company stopped the work leaving unfinished paved roads, plots full of rubble, a pedestrian sea-front promenade and a single finished built-up sector. The halting of the work was due to the lack of success in selling the houses and the company's work on projects associated with the 1992 Barcelona Olympic Games.

OBJECTIVES

2 GUARANTEE THE ECOLOGICAL FUNCTIONING

IRREGULARITY

Irregularity is the word that best describes the ecological characteristics of La Pletera: episodes of flooding alternate with periods of droughts, during which time salinity levels rise as the seawater evaporates. Just a few centimetres difference in water levels means that the saltmarsh will be flooded for weeks or even months longer, and leads in turn to important variations in salinity and water composition affecting the composition of the animal and plant communities that thrive there.

The main aim of the LIFE-Pletera project was to recover the ecological functioning of the coastal systems in La Pletera.

To do so, a system of lagoons with permanently flooded areas, interconnected during high water levels but isolated during drought periods, was created. Around these wetlands, a broad swathe of temporary saltmarsh was left, where saltmarsh vegetation can develop behind the well-conserved dune system.

Schematically, the newly restored area consists of four bands or strips of habitat running parallel to the coastline that replicate the typical structure of a coastal saltmarsh under natural conditions.

These habitat strips depend on their proximity to the sea, their height and the type of substrata.

1. COASTAL DUNES consisting of a 1-km-long cordon of mobile and stable dunes.
2. GRADIENT ZONE consisting of a barrier of sandy material alternating with clayey and muddy saltmarsh deposits.
3. LAGOONS consisting of permanent pools in depressions below sea level, with lagoons either running parallel to the shore (in areas corresponding to former dune cordons) or perpendicular to the shore along former river courses.
4. SALTMARSH on impermeable clayey salt-rich substrata colonized by halophytic plants, which floods when permanently flooded areas overflow.

THREATS TO LA PLETERA IN THE PAST

- Destruction of habitats and the degradation of the structure and functioning of the ecosystem due to the presence of the unfinished building work in the saltmarsh.
- Few run-off areas for seawater during storms, which can cause increased marine intrusion.
- Little capacity for the Fra Ramon lagoon to flood.
- Degradation and loss of sand along the dune front and risk of sediment building up in lagoons.
- Notable loss of ability to fix carbon.
- Competition with exotic species endangering the Spanish Toothcarp population.
- Presence of small patches of invasive vegetation.
- Over-frequentation.

3 ADAPTING TO CLIMATE CHANGE

In recent years, the sea level at L'Estartit has risen on average by 4 cm every 10 years due to both global climate change and local factors.

Coastal protection is cheaper and much more effective if soft natural features such as dunes and saltmarshes are left in place. Solid infrastructures are costly and less efficient.

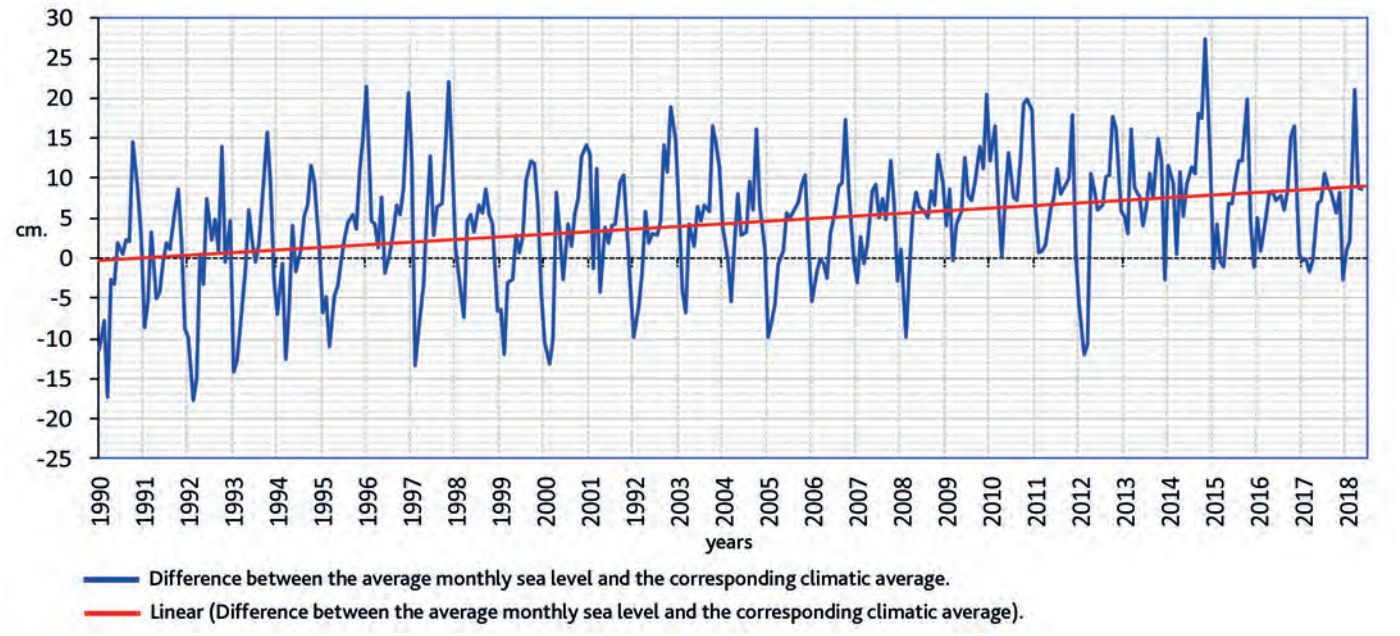
One of the aims of the LIFE-Pletera project was to regenerate a coastal system that would respond effectively to the predicted effects of climate change that include higher sea levels and more frequent severe coastal gales. The recovery of this natural area would also increase its capacity to fix CO_2 and contribute to reducing atmospheric emissions.

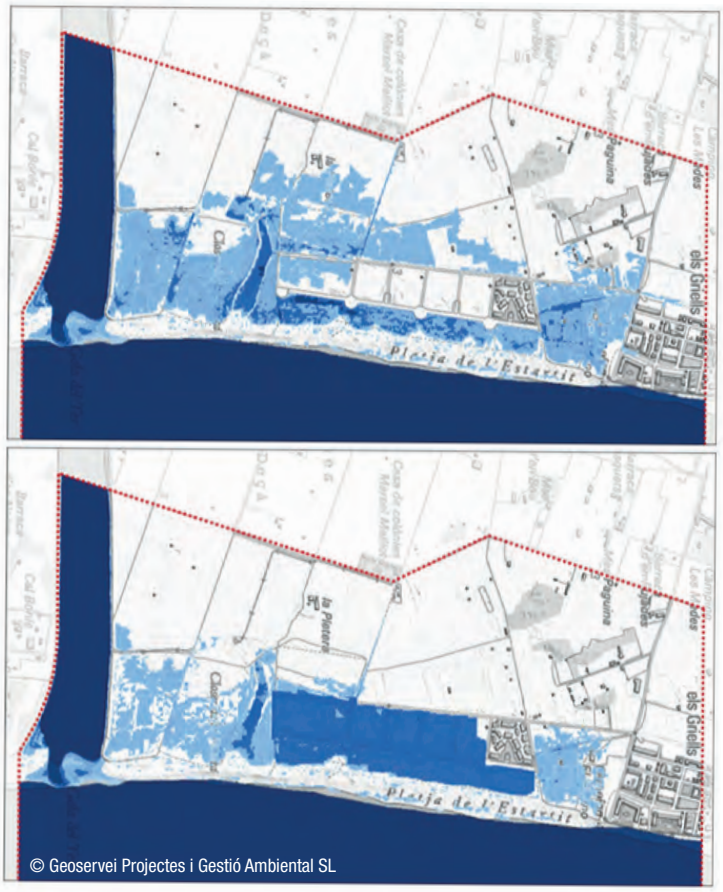
Under a scenario of climate change, storms will have a much greater impact on badly structured coastal systems since they will blow much more sand from the dunes into the lagoons and saltmarshes.

On the other hand, ecologically well-constituted coastal systems provide effective protection against marine intrusion and the salinization of groundwater reserves.

© Montserrat Janoher

AVERAGE MONTHLY SEA LEVEL AT L'ESTARTIT





SURFACE WATER DRAINAGE ABILITY

The restoration of La Pletera will improve the area's surface drainage and increase its capacity to absorb seawater. This is the main conclusion of a study that was performed to evaluate how the restoration of the coastal ecosystems will affect the hinterland of the saltmarsh in the event of river spates and a rise in sea level. The study was carried out in collaboration with the project LIFE+MEDACC, and was coordinated by the Catalan Office for Climate Change.

The aim of this project was to test in a Mediterranean context innovative solutions that will help prepare Catalonia's agro-forestry and urban systems for the impact of future climate change. The study also provides answers to the petitions made by landowner associations.

The study examined a number of different scenarios involving rises in both river and sea levels throughout the whole drainage network on the left (northern) bank of the river Ter. Computer models were used to show the impact that any such rises would have on the land. The results were positive and confirmed that the removal of the paved promenade and streets in the projected built-up area, which act as potential barriers, would restore the ecological conditions of the saltmarsh and reduce the potentially negative effects that hitherto existed. The impact of the sea stroms that have occurred since La Pletera was restored is evidence that the theoretical model was accurate.

SITES OF COMMUNITY INTEREST

Over half of La Pletera (58.7%; 35 ha) was occupied by Sites of Community Interest (SCI) before the LIFE project began.

The remaining part of the area consisted of landfill sites and the streets and promenade of the uncompleted built-up area. Once the project is completed, almost the whole of La Pletera will harbour Sites of Community Interest.

The Sites of Community Interest (SCI) are habitats that are either threatened, declining or are representative of one or more of the biogeographical regions present in the EU.

The following SCI are found in and around La Pletera:

COASTAL LAGOONS

Coastal lagoons. PRIORITY Site of Community Interest (EU code 1150)

SCRUB, SALT MEADOWS AND OTHER SALINE HABITATS

Salicornia and other annuals colonising mud and sand (EU code 1310)

Mediterranean salt meadows (*Juncetalia maritimi*) (EU code 1410)

Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (EU code 1420)

SAND DUNES AND BEACHES

Embryonic shifting dunes (EU code 2110)

Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") (EU code 2120)

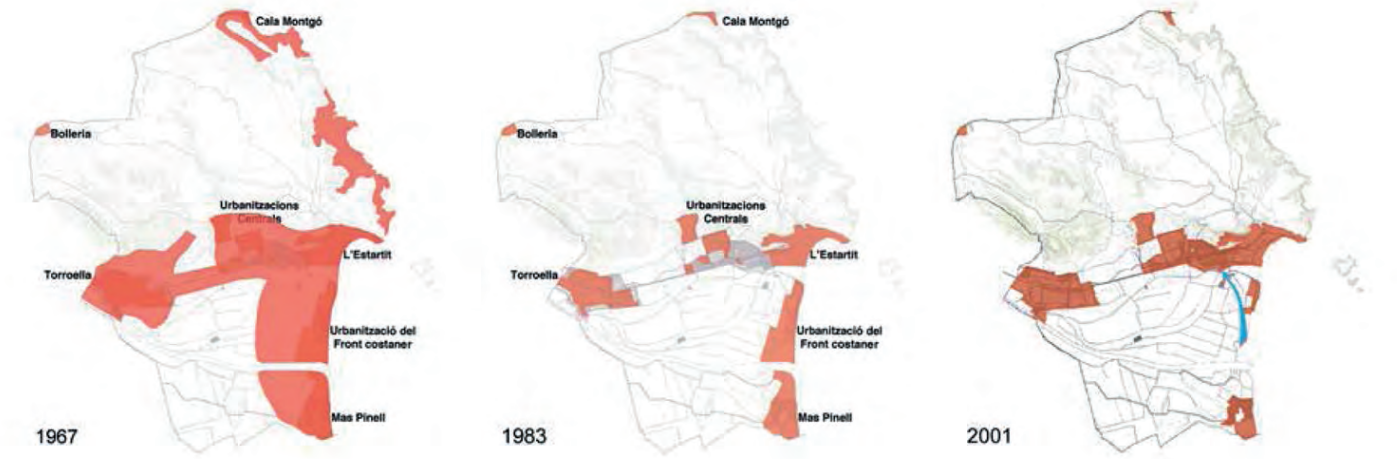
Crucianellion maritimae fixed beach dunes (EU code 2210)

Thero-Brachypodietalia dune grasslands with annuals (EU code 2240)

4 CHANGING THE MODEL OF REGIONAL AND TOURIST-RELATED DEVELOPMENT

The deconstruction and regeneration of La Pletera is closely linked to the new model of regional and tourist-related development approved by Torroella de Montgrí Town Council as part of its 2001 General Plan.

Work on this Plan began in 1997 and, once finished, it was awarded the Catalan Territorial Planning Prize as an example of a model that, despite being based on the environment and landscape, also takes into account the needs of agricultural, recreational and tourism-related land uses.



When the town's General Plan was being reviewed, it was decided – bravely – that the classification of the unfinished Pletera residential area would change. Part of the land surface would be declared coastal and the rest agricultural, the only exception being Sector 1 that was already built up and so was left de facto as an urban area.

This reclassification established the framework for the deconstruction and regeneration of La Pletera, an idea that finally saw the light of day in the LIFE-Pletera project (2017–2018).

At the same time as the town's General Plan was being reviewed, the Spanish Directorate General of Coasts agreed in 1999 to initiate action to redefine the public coastal domain between the port of L'Estartit and the mouth of the river Ter, which up to that point did not include all the land defined in the Catalan coastal inventory.

BOUNDARIES OF THE MARINE-TERRESTIAL ZONE (MTZ)

old boundaries of the MTZ new boundaries of the MTZ

In La Pletera, the Spanish State modified the limit of the public domain, which now runs inland of the area that was once regarded as land that could potentially be urbanized.

This change was justified by the existence of maritime habitats and halophyte plant communities in this sector, which was thus automatically declared a public protected area that now cannot be built upon.

The final approval of these changes arrived on 15 March 2004.

The territory is one of the most important attractions in the municipality of Torroella de Montgrí and L'Estartit as in few other places is there such a wide-ranging and rich variety of ecosystems so close together. Almost 60% of the municipality, of which only 10% is built-up, lies within the boundaries of the Natural Park.

OPTING FOR SUSTAINABLE TOURISM

Up to the 1990s the local model of tourism was based essentially on urban growth designed to ensure more built-up areas, more hotel beds and more campsites, all of which would satisfy the demands of 'sun and beach' tourism. La Pletera was to become home to a holiday complex divided into four sectors, each with capacity to accommodate 3,000 people.

Due to a glut of tourist-related products and services, the best-established holiday resorts were hit by a crisis in the 1990s that forced many destinations to seek attractions that would set them apart from their competitors. In Torroella de Montgrí and L'Estartit this concept was first mooted at the beginning of the 1980s and was based on the promotion of the municipality's cultural and natural heritage in its broadest sense.

The saltmarshes of La Pletera fitted the bill perfectly as a natural area of great ecological interest that required conservation and then restoration.

Thus, the dominant model of urban planning in the second half of the twentieth century, which advocated the progressive urbanization of the coastline, has evolved into one that highlights the value of local natural elements and formulates its tourism-related services in terms of these well-preserved natural areas.

THE IMPORTANCE OF THE LIFE PROJECT TO THE BAIX TER

The European Union's LIFE programme is having a highly positive impact on the restoration of the coastal ecosystems of Torroella de Montgrí and L'Estartit, and the Baix Ter marshes. This programme is the main funding mechanism for the EU's environmental projects, and was approved initially on 21 May 1992. Since then, Torroella de Montgrí Town Council has benefitted from three separate LIFE projects that have received total funding of 5.3 million euros. Of this figure, over half was financed by the EU and the rest by the Town Council and the other participating entities.

Celebrating the 25th Anniversary of the LIFE programme (30/09/2017)

LIFE-TER VELL-PLETERA *«Arrangement and management of the Baix Ter Coastal lagoons and marshes (1999–2003)»*

LIFE-EMYSTER *«Recovery of the habitat of amphibians and Emys orbicularis in the Baix Ter (2005–2008)»*

LIFE-PLETERA *«De-urbanizing and recovering the ecological functioning of the coastal systems of La Pletera (2014–2018)»*

ACTIONS

5 DECONSTRUCTING AND CREATING A LAGOON SYSTEM

The deconstruction of all the artificial elements built and then abandoned in the 1990s, the restoration of the site and the creation of the lagoon system constitute the most significant part of the project and together cost 1.3 million euros, over half of the project's total budget.

This work took place between November 2015 and April 2017.

DESIGN CRITERIA

The design and structure of La Pletera was carried out using the following criteria (in order of importance):

1. A floodable space based mainly on the presence of the sea, with a spatial distribution of strips of habitats running parallel to the coast as occurs in dune/saltmarsh habitats under natural conditions.

2. Conservation of the populations of the Spanish Toothcarp and an increase in the number of potential breeding nuclei.

3. No intervention in areas that have maintained their ecological interest.

4. The restoration of the height of the former ground level and its ability to receive and store flood waters.

5. The topographical design of the new area should remind visitors that the area was once an unfinished tourist complex.

WORK PERFORMED

The main elements of the work carried out are highlighted below.

DECONSTRUCTION

Demolition and removal of the former promenade (800 m), roundabouts, streets and service infrastructures. Removal of material dumped as landfill in the saltmarsh in order to raise the ground level and protect future constructions from rises in sea level.

CREATION OF THE STRIP OF SALTMARSHES

Excavation down to the original ground level of the three remaining sectors to create three saltmarsh areas (north, centre and south) covering 10.9 ha at a similar height to the habitats existing before the building work began. On the northern edge, three terraces at different levels were excavated to allow for a gradual transition zone between the built-up area and the lagoons and saltmarshes.

CREATION OF A LAGOON SYSTEM

Excavation to various depths to create a system of permanent lagoons separated by floodable areas. In this way, the lagoons are connected at high water but then revert to being separate once the waters recede. As well, a new lagoon was excavated to the west of the Fra Ramon lagoon. These new lagoons lie in the strip of land that was once occupied by the promenade and as such are a reminder of the recent past of the area.

LOWERING OF THE BANKS OF THE LAGOON FRA RAMON

The Fra Ramon Lagoon was the largest permanent lagoon in La Pletera but was surrounded by an embankment built to prevent it flooding at high water. This affected the quality of its water as it was unable to expel the organic material that entered during periods of high water. Thus, its banks were lowered to a height of 1.1 m, the exception being the landward bank next to the pedestrian route that was left intact to reduce disturbance to birds in the area.

WASTE MANAGEMENT

All the waste generated by the demolition projects and excavations was initially deposited in the northern sector of La Pletera where it was analysed by a qualified laboratory prior to treatment by a mobile reprocessing plant. Around 200,000 m3 of non-contaminated material was reprocessed, of which 41,000 m3 were used in the expansion of the Port of L'Estartit, 3,000 m3 in work in La Pletera itself and 5,000 m3 in other building work in the municipality. The remaining rubble was taken to a recycling plant.

6 EDUCATION AND AWARENESS-RAISING

COMMUNICATION PLAN

The LIFE-Pletera project included a concerted communication, education and awareness-raising strategy whose aim was to make the project more visible and, above all, improve the social perception of the importance of conserving fragile coastal ecosystems.

Communication in a general sense was regarded as an essential part of the project from the beginning and was planned and executed following an exhaustive Communication Strategy.

EDUCATIONAL PROGRAMME

This programme was coordinated by the Museu de la Mediterrània and designed by *Terregada, Cooperative per a la Sostenibilitat*, with support from the Spanish Ministry of Agriculture, Food and the Environment through the Fundación Biodiversidad. It began work in the 2016-2017 school year with an offer of guided visits and other activities for school children. To date, 280 children have taken part in at least one of its activities.

SCIENTIFIC COMMUNICATION

The LIFE-Pletera project is of a great interest from academic, scientific and management standpoints as it represents a practical case of deconstruction and rewilding. Consequently, the project has also undertaken awareness-raising activities aimed at a more specialized audience.

WORKSHOPS

- IV Workshop Research and Territory. Restoration and management of dune systems. 21 October 2016.
- V Workshop Research and Territory. Restoration and management of lagoons. 24 May 2018.
- Workshop Un(making) the territory. Cultural practices and landscape regeneration. Organized in collaboration with the Catalan Landscape Observatory. 17 June 2017.
- 8th European Pond Conservation Network. Organized by the Institute of Aquatic Ecology (University of Girona) with support from the Mediterranean Museum and Torroella de Montgrí Town Council. 21–25 May.
- Participation in workshops set up to enhance information exchange at both national and international levels.

PUBLICATIONS

- Restoration and management of dune systems. Case studies. *Recerca i Territori 8* (2016)
- Management and restoration of Mediterranean coastal lagoons in Europe. *Recerca i Territori 10* (2018)

END OF PROJECT EXHIBITION

- Re(making) the landscape. 15 June–15 October 2018.

EDUCATIONAL AND AWARENESS-RAISING ACTIVITIES FOR THE LOCAL POPULATION

- European Natura 2000 Day
- World Wetlands Day
- Commemoration of the 25th anniversary of the LIFE programme
- Presence on the Town Council's stand at the Sant Andreu Fair



AWARDS AND PRIZES

- CILMA 2017 Environmental Prize for La Pletera Project
- Carles Rahola Local Communication Prize 2016 in section 'Best Institutional Communication Initiative' for the communication plan of the LIFE-Pletera project
- Best Communication Strategy 2017 for the LIFE-Pletera art project awarded during the IX Edition of the *Premis Gabinets de Comunicació* organized by the Catalan Journalists Association.

INFORMATION PANELS

- Three information panels have been placed in strategically accessible points.

INFORMATION LEAFLET

- At the beginning of the project an information leaflet was published in Spanish, Catalan and English that included a brief description of the aims of the project.

WEB PAGES AND SOCIAL NETWORKS

- www.lifepletera.com and Facebook and Twitter accounts.

CONTACTS WITH THE PRESS

- Press releases and notes were sent our periodically. The impact of the project in the media was important, and it regularly appeared in both the local and regional press, and was also reported on in the national and specialized press.

NEWSLETTER

- An online newsletter was sent out on average once every three months.

GUIDED VISITS

- Guided visits for teachers, students and other interested groups were organized on a regular basis.

AUDIO-VISUAL MONITORING

- The audio-visual monitoring of the project was carried out by the company *Ingloba Group*, whose aim was to record the transformation of the space, thereby improving public-awareness of the project as a whole.



MONITORING BY THE GROUP *AMICS DE LA FOTOGRAFIA*

One of the entities that most collaborated with the LIFE-Pletera project was the photographic group Associacio d'Amics de la Fotografia who produced an exhaustive documentary record of how the space was transformed. This visual record of the work to deconstruct and restore the area, as well as the natural regeneration of its flora and fauna, was seen right from the start as an essential part of the project.

The members of this association worked in coordination with the project's management and scientific teams to produce many meaningful images that will enable future generations to look back at the work undertaken to restore this natural area. This group's work is a good example of the part played by volunteers in the project.

7 LIFE-PLETERA THROUGH ART

Forma 26 Pletera
2015-2018
Esteve Subirah

The artistic component of the LIFE-Pletera project was awarded a prize as the Best Communication Action 2016, part of the IX Gabinets de Comunicació prize awarded by the Catalan Journalists Association.

This prize aims to recognize the innovative idea of using art as a tool for communication, education and reflection.

Artists in first cycle (19 November 2016–31 August 2017): Mar Serinyà, Jofre Oliveras, Pep Aymerich and Jordi Esteban, INDI, Nico Feragnoli

Artistes in second cycle (30 September 2017–31 August 2018): Bàrbara Cardella, n'UNDO, Job Ramos, Lúa Coderch and Pere Noguera.

Exhibition

A selection of the artwork was displayed on 15 May–25 June 2018 in the Museu de la Mediterrània, and 12 December 2018–14 January 2019 in the Bòlit Contemporary Art Centre in Girona.

The LIFE-Pletera project has embraced contemporary art as a means of promoting both reflection and awareness-raising, and of breaking free from the conventional boundaries of photography and video, two disciplines that are essentially documentary in nature. Art reaches further than other disciplines and in this case enabled us to place an emphasis on intangible aspects of the project, which in turn meant that we could endorse an exchange of ideas between art, territorial management and science.

Lloc, memòria i salicòrnies

Programme *Space, memory and saltmarshes*

We asked a collective of five artists from a series of complementary disciplines to provide a personal view of the progress of the LIFE-Pletera project. Their work was collated as part of the programme *Space, memory and saltmarshes*, curated initially by Martí Bosch and then until its end by the academic and art critic Martí Peran. Other participants included Jordi Morell (Salt, 1975), Joan Vinyes (Torroella de Montgrí, 1954), Esteve Subirah (Ullà, 1975), Isadora Wilson (Santiago de Chile, 1984) and Ivó Vinuesa (Barcelona, 1975). Their work was exhibited in a variety of different formats, spaces and contexts, of which two are on view *in situ* in the restored areas of La Pletera.

S/T. Joan Vinyes

Cycle of events in the electricity transformer building

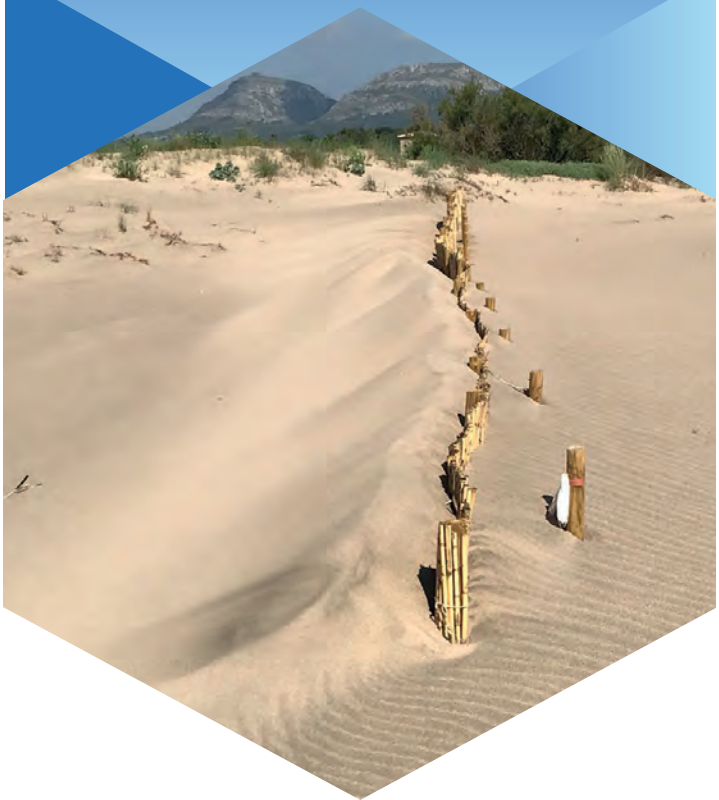
The local art group BUIT and El Bòlit, the Girona Contemporary Art Centre, were also part of the LIFE-Pletera project and organized two cycles of events in the electricity transformer building in the northern sector of the marshes.

Guest artists were asked to establish a connection with the space and to ensure that their work was a part of La Pletera rather than simply a work conceived for La Pletera. Over time, the transformer building has become a type of workshop where nature, art and all-comers can interact in a totally natural way.

ACTIONS

8 RESTORATION OF THE FRAGILE COASTAL DUNE CORDON

Due to their vast biological diversity, natural coastal systems are the richest and most productive ecosystems on our planet. Nevertheless, over the past 50 years over 60% of all the Iberian Peninsula's coastal ecosystems have vanished as a result of a series of different factors including, above all, urban development and the spread of cultivation. Thus, the restoration of La Pletera represents an important contribution to the recovery of one of Catalonia's most fragile and valuable natural habitats.



The LIFE-Pletera project has contributed decisively to the restoration of the fragile dune system whose degradation over the years had been exacerbated by the impact of storms and gales. The restoration work was carried out wholly by the Natural Park along a 1-km stretch of coastline varying in width between 15 and 25 m.

The presence of a well-consolidated dune cordon is essential as it helps stabilize the coastline by preventing the smothering of the saltmarshes by wind-blown sand and halting the regression of the beach.

The impact of heavy gales on dune systems differs if they are well conserved (photo 1) or severely modified (photo 2); in the latter case, sand from disturbed dunes is much more likely to penetrate the adjacent saltmarsh. The best way to prevent any such encroachment is to guarantee the presence of 'soft' structures whose purpose is the conservation of the coastline that are both more effective and more cost-efficient.

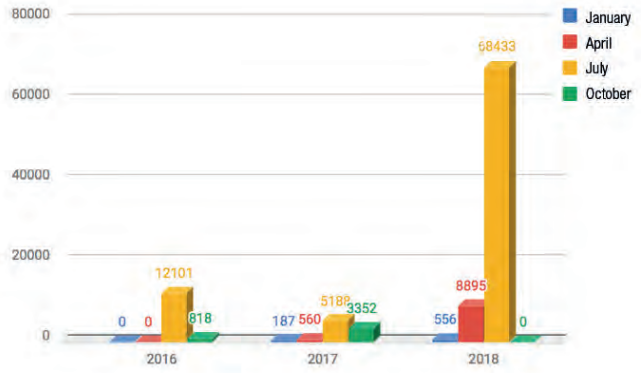
1

2

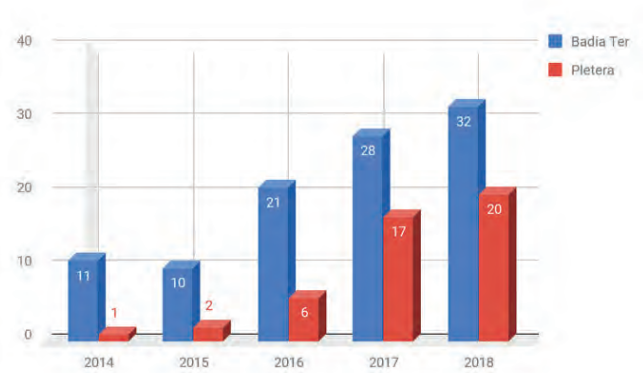
9 RECOVERY OF THE POPULATIONS OF SPANISH TOOTHCARP AND KENTISH PLOVER

The LIFE-Pletera project has directly improved the habitats of the Spanish Toothcarp and the Kentish Plover, two threatened species in danger of disappearing from many sites on the Catalan coast.

SPANISH TOOTHCARP PER YEAR AND MONTH



NUMBER OF KENTISH PLOVER CHICKS OBSERVED



SPANISH TOOTHCARP

La Pletera is one of the main strongholds in Catalonia of the Spanish Toothcarp (*Aphanius iberus*), an endangered fish that is endemic to the Iberian Peninsula.

One of the main threats to this species here and elsewhere in its range is the presence of the Eastern Mosquitofish (*Gambusia holbrooki*), an invasive American species that outcompetes the Toothcarp in lightly saline waters.

The only natural breeding population of the Spanish Toothcarp in La Pletera was once the Fra Ramon lagoon; however, the LIFE Ter Vell-Pletera (1999–2003) project created new lagoons that were repopulated with captive-bred Toothcarp.

As part of the LIFE-Pletera project, the Montgrí, les Illes Medes and el Baix Ter Natural Park, in collaboration with the Ebro Delta Natural Park Ichthyological Centre, have worked to improve the habitat of this fish. The results have been very positive to the extent that the Toothcarp population has increased every year and is now well consolidated in the site.

KENTISH PLOVER

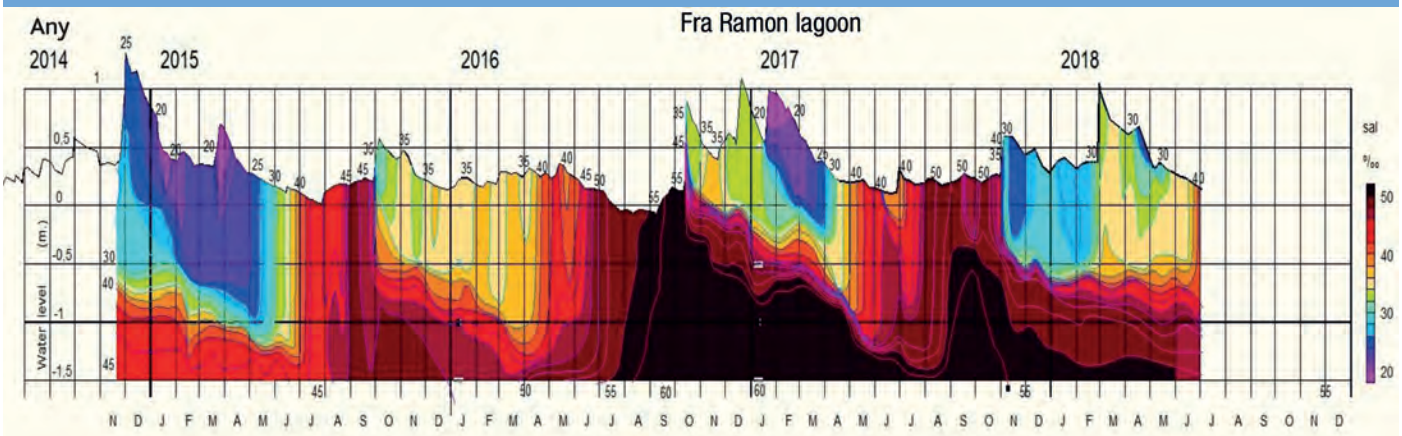
The LIFE-Pletera project has improved the quality of a number of natural habitats including that of the Kentish Plover, a threatened wader in Catalonia that makes it nest on the ground, either on the beach itself or in bare areas in the saltmarsh. In recent years its populations have declined significantly as the frequentation and occupation of coastal habitats has accelerated.

According to counts performed by the Natural Park, the restoration of coastal systems and the closing-off of certain dune and dune-slack areas is having a favourable effect on the Kentish Plover populations.

10 SCIENTIFIC MONITORING OF THE ECOLOGICAL STATE OF THE VEGETATION AND SALINITY LEVELS

The Chair in Mediterranean Coastal Ecosystems at the University of Girona and the Montgrí, les Illes Medes and el Baix Ter Natural Park are monitoring the evolution of the following indicators:

- water and salinity levels and general ecological estate of both the previously existing and new lagoons
- vegetation, above all the plants recolonizing the restored areas, and the carbon balance in the saltmarsh
- Toothcarp populations



Variation in the salinity (%) of Fra Ramon lagoon. The Y axis represents the level of the water surface in the lagoon (metres above sea level in 1990–1995). The graph also shows the stratification in winter caused by the influx of subterranean water and the uniform increase in salinity in summer due to the confinement of the lagoon. Salinity of seawater: approx. 35 (orange, red and brown colours indicate salinity levels above that of the sea).

La Pletera is a confined saltmarsh with typically great variations in water level and composition over the course of a year. Superficial flooding is sudden and irregular and only lasts for a couple of days. Rarely are there two years in which the number of storms – as well as their timing and impact – are the same.

Whilst the lagoon is cut off from the sea its water levels drop to sea level (0 m in the graph), and its salinity level increases to above that of sea water (brown colour on graph) due to the evaporation. The penetration of subterranean water (or, more correctly, sub-superficial water) can occur over long periods of time and represents an influx of much less saline water (blue colour). This less saline water is less dense and accumulates nearer the surface, whilst the more saline water falls to the bottom of the lagoon. As well, whilst the lagoon is cut off from the sea and, owing to evaporation, the amount of organic matter and nutrients increases. This summer increase in salinity and the amount of organic material, together with the general fall in water levels, should not be thought of as a drop in water or ecological quality but, rather, as an inherent characteristic of the saltmarshes along this coastline. Indeed, Mediterranean coastal marshes generally dry up almost completely in summer.

SOCIO-ECONOMIC IMPACT STUDY

All projects funded by the European Union have to include a socio-economic impact study. In the case of the LIFE-Pletera project, the study was carried out in collaboration with the Geography Department of the University of Girona.

The study consisted of a two-part survey of visitors to La Pletera and the inhabitants of L'Estartit, the first in summer 2015 before work began and the second in summer when the work was almost finished.

The results were analysed in terms of how the restoration of La Pletera has modified its use as a recreational space, whether or not the general public has welcomed the project, and the opinions of visitors before and after the restoration of the wetland. In general, the project has been well received, although the degree of acceptance depends on the type of person questioned. Visitors with an interest in natural history have a more positive attitude to the project than those who are more interested in access to the beach. Nevertheless, the people who most visit the space are the most critical of the project and criticize above all the loss of the promenade. The economic impact of the project has not modified the recreational value of the site nor had any economic impact on tourist-related activities in the area.

Even so, La Pletera does now seem to play a more important role as a tourist attraction than before the project got underway, and more tourists are now interested in visiting the space. It is vital that the monitoring of the progress of the project continues as a means of ensuring that none of the concerns that some visitors have voiced – for example, the over-frequentation of the area and its degradation due to a lack of vigilance –materialize.

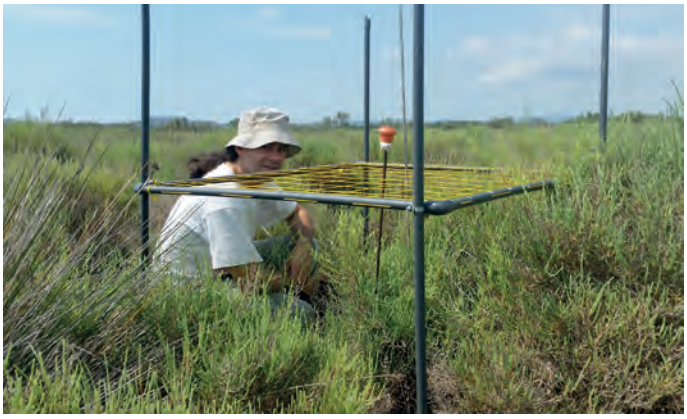
CARBON BALANCE IN THE SALTMARSH

Many elements varying over time and space affect the carbon balance in the saltmarsh. Some saltmarsh habitats such as the scrub accumulate more carbon than others and within the same habitat the ability to carbon capture varies throughout the year. In addition, the degree of carbon accumulation varies between different parts of the same habitat (i.e. between the photosynthetic part of the plants and their stems and roots) and plants' ability to absorb or emit carbon is also very changeable. In the overall carbon balance CO2 is not the only implicated compound; methane (CH4), for example, accumulates in oxygen-free sediments of the lagoons and has a much greater impact on global warming than CO2. All these factors mean that the calculation of the overall carbon balance of the saltmarsh is a highly complex task. During most of the year the vegetation assimilates carbon, which is accumulated above all in the soil (which can store up to twice as much carbon as the vegetation). The permanent lagoons, on the other hand, normally have a carbon balance of around zero or slightly negative, that is, they tend to emit more carbon than they capture.

CARBON BALANCE

	Area (ha)	CARBON STORED (kg C m^{-2})		CARBON FLUXES (g CO_2 $m^{-2}d^{-1}$ / g CH_4 $m^{-2}d^{-1}$)					
				Species		WINTER	SPRING	SUMMER	AUTUMN
Habitat 1	15.0	Vegetation	1.6	*Sarcocornia fruticosa*	Green CO_2	-10.5	-42.5	-13.5	8.0
					Woody CO_2	-1.8	-3.2	2.2	9.0
		Soil (0-20 cm)	2.2	Soil	CO_2	6.1	15.6	14.5	6.7
					CH_4	-0.019	0.137	0.005	-0.007
Habitat 2	10.8	Vegetation	0.6	*Elymus pycnanthus*	Green CO_2	-12.5	-16.4	-14.8	-1.3
				Atriplex portulacoides	Woody CO_2	-3.3	-13.0	-5.8	1.1
					Woody CO_2	-1.5	-2.4	0.3	1.8
		Soil (0-20 cm)	1.8	Soil	CO_2	6.7	12.7	12.8	5.6
					CH_4	0.011	0.005	0.081	-0.003
Habitat 3	4.1	Vegetation	0.1	*Salicornia patula*	Green CO_2	-	-2.4	-2.4 ± .6	-
		Soil (0-20 cm)	0.9	Soil	CO_2	2.3	10.7	9.9	3.6
					CH_4	0.055	0.057	0.006	-0.006

carbon capture emissions



11 A PROJECT FOR LOCAL DEVELOPMENT

The LIFE-Pletera project was conceived as much as an environmental restoration project as a tool for stimulating local tourism and economic activity.

Torroella de Montgrí-l'Estartit is one of the most popular resorts on the Costa Brava and many of the people who visit do so because of its natural surroundings. As such, the conservation of the area's natural habitats acts as both an integral part of the economic development of the area and a means of improving the quality of life of its inhabitants.

NETWORK OF TRAILS

One of the aims of the LIFE-Pletera project was to make the conservation of the restored habitats compatible with public use and visits. Thus, a network of walks and trails, with the appropriate signposting and infrastructures (e.g. hide, fences, viewing screens and ramps for people with reduced mobility), was designed to enable visitors to enjoy the flora and fauna to the full.

The main trail follows in part the old track that ran through the former non-built-up part of the saltmarsh. This route can be walked or ridden by bicycle as far as the retaining wall of the river Ter; there is also an alternative trail for horse-riders.

As well, the electricity transformer building nearest to the Fra Ramon lagoon has been converted into a hide whose surroundings have been excavated to create a lagoon. Access is along a raised wooden-slatted walkway, which provides good access for people with reduced mobility and ensures that this observatory blends in with the saltmarsh.

The Pletera project ran during July 2014–December 2018 as part of the European Commission's LIFE programme, the EU's main tool for funding environmental protection and conservation projects. The project was led and coordinated by the Torroella de Montgrí Town Council, with as beneficiaries the Montgrí, les Illes Medes and el Baix Ter Natural Park (Catalan Autonomous Government), the Chair of Mediterranean Coastal Ecosystems at the University of Girona (UdG), and the public company, TRAGSA. The Girona Provincial Council and the Fundación Biodiversity acted as co-funders.

LIFE PROGRAMME

The LIFE programme is the financial tool used by the EU to fund environmental, nature conservation and climatic action projects. It has been cofunding projects in the EU since1992 with the ultimate aim of contributing to the continent's sustainable development.

NATURA 2000 NETWORK

The Natura 2000 network consists of a European network of natural areas whose aim is to make habitats and species protection compatible with local sustainable development. Currently, in Catalonia there are 188 natural areas designated as part of the Natura 2000 network, of which the Montgrí, les Illes Medes and el Baix Ter Natural Park is one.

Contents and edition: Jordi Gamero Graphic design: Joan Carles Punsola Executive coordination: Agata Colomer Scientific Management: Xavier Quintana

Photographs: Torroella de Montgrí Town Council · LIFE-Pletera Project · Associació d'Amics de la Fotografia Aerial photographs: Ingloba Group

www.lifepletera.com