



Rhone Delta: the Former Saltworks Pilot Fact Sheet

Olivier Boutron

Country: France

Area (ha/km²): 6527 ha

Geographic coordinates of the site centroid point (RGF93 Lambert 93): X=830750.528 ; Y=6256532.508

Ecosystem type

41 elementary natural and semi-natural habitats (EU-NIS typology) are identified on the Former Saltworks. 22 of these are habitats of "Community interest", listed in Annex 1 of the European "Habitats, Fauna and Flora" Directive. In REST-COAST, the habitats that will be specifically considered are: Coastal lagoons, including temporary lagoons (N 1150), Beach areas (N 1140), Mediterranean and thermo-Atlantic *halophilous* scrubs (N 1420), *Salicornia* and other annuals colonising mud and sand (N 1310).

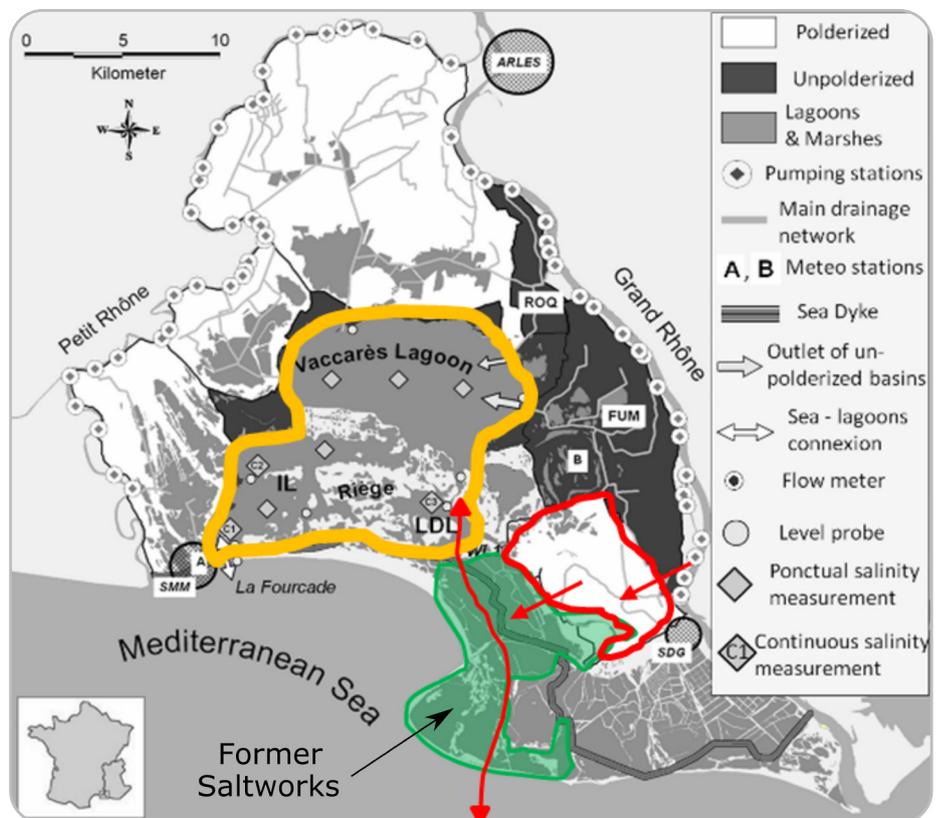


Fig. Location of the site © Boutron, Tour du Valat.

Key species

Mediterranean *halophilous* scrubs, *Salicornia* and other annuals; seagrass (*Zostera noltei*, *Ruppia cirrhosa*)

Organisation responsible for the pilot

Tour du Valat (<https://tourduvalat.org/>)



This project receives funding from the European Union's Horizon 2020 Innovation Action under grant agreement No 101037097.



Pressures, threats and issues

The site of the Former Saltworks, located in the south-eastern part of the Rhone delta, is an area of 6527 ha which was acquired by the Conservatoire du littoral (French "Coastal Protection Agency") between 2008 and 2012. Until 2008, and for economic reasons, for about 50 years, this site was devoted to industrial salt production. The acquisition of this site by the Conservatoire du littoral involved changes in management, compared to that implemented in an industrial salt production model. Water management by means of hydraulic pumps, as well as continuous maintenance of the dikes of the former salt production site in the context of sea level rise, was in particular no longer economically sustainable without the financial benefits of salt production. In addition, with the existing dikes of the former salt production site, and without the use of hydraulic pumps to generate water flows, the Former Saltworks site would have been with no change in management a very confined site with long renewal times. Due to the high evaporation rates in Mediterranean areas, this site would have been exposed to very high salinity and an absence of water for several months of the year, which would have been problematic for several plant species, birds and fish.

It was therefore decided since 2010 to implement a realignment strategy on the site:

- The sea-dikes protection of the former salt production site is no longer maintained, and the protection effort is now focused on a maintained dike which is located about 7 km inland, resulting in a new 4600 ha "Climate change buffer area" between the former and the inland dikes.
- Several works have been carried out (opening of dikes, dredging works, etc.) to create connections between the various former salt production basins (North-South red arrow in Fig. Location of the Site).
- Hydraulic works have reconnected the site to a nearby agricultural catchment, itself irrigated from the Rhone river, allowing new fresh water flows in the site (red arrows in Fig. Location of the Site).



Ruppia cirrhosa
© Fontes, Tour du Valat.



Althenia filiformis
© Fontes, Tour du Valat.



Salicornia and other annuals colonising mud and sand
© Fontes, Tour du Valat.

Expected impact of the project

The ongoing realignment strategy aims to address at least four of the "societal challenges" identified by IUCN (IUCN 2020):

- Environmental degradation and loss of biodiversity.
- Socio-economic development.
- Reduction of natural hazards.
- Adaptation to climate change.

In order to achieve these objectives, taking into account the existing dikes of the former salt production site, it is emphasised that this restoration operation needs to be part of a broader, hybrid approach, articulating "grey solutions" and "nature-based solutions". Involving many stakeholders in the Rhone Delta, well beyond the circle of environmental stakeholders, this hybrid approach is intended to combine the adaptation/reinforcement of the dike located about 7 km inland, on which the protection effort is now focused on, and the renaturation of this former industrial site. The idea is that the restored ecosystems in the buffer area will act as "buffer zones" to adapt to the effects of climate change (erosion, drought,

floods, very high salinities, ...) while the dike 7 km inland will directly protect human interests.

In terms of ecosystem services, the REST-COAST project targets in specific the following services:

- Reduction of coastal erosion risk:** with the restoration of the natural coastal dynamics in the south of the buffer area, due to the non-maintenance of the historic sea-dikes protection.
- Reduction of coastal flooding risk:** with the idea of dampening the wave energy upstream of the inland dike.
- Water quality purification:** by decreasing the historically high salinities of this system and increasing the water renewal times, thanks to the new hydraulic connections.

During REST-COAST, the objective is to restore 300 ha of coastal lagoons, and 60 ha of Mediterranean halophilous scrubs/*Salicornia* and other annuals colonising restored mud/sand. It is also expected that with the non-maintenance of the historic sea-dikes protection and the re-establishment of natural coastal dynamics, new beach areas will appear in the south of the site (overwash processes).



Illustration of the very high salinities that can occur on the site, with possible salt crystallisation. © Boutron, Tour du Valat.



Illustration of the very low water depths that can occur on the site, with the possibility of most areas drying up for part of the year. © Boutron, Tour du Valat.



Illustration of the appearance of new beach areas in the south of the buffer area, due to overwash processes in the context of non-maintenance of the historic sea-dikes protection. Mediterranean Sea – left, lagoons – right. © Willm and Arnaud, Tour du Valat.



One of the coastal lagoons targeted for restoration, in the south of the buffer area, © Fontes, Tour du Valat.



Illustration of the restoration of the natural coastal dynamics in the south of the buffer area, due to the non-maintenance of the historic sea-dikes protection. Mediterranean Sea – left, lagoons – right. © Willm and Arnaud, Tour du Valat.

Stakeholders

The owner is the Conservatoire du littoral, the French Coastal Protection Agency, which has entrusted the management of the site to three organisations: the "Parc Naturel Régional de Camargue", the "Société Nationale de Protection de la Nature", and Tour du Valat.

The following stakeholders are involved in different management committees related to the site:

- 🕒 Conservatoire du Littoral (Owner)
- 🕒 The 3 co-management organisations
- 🕒 Users under agreement (*Hunting Office, fishermen, nature guides, bull breeding*)
- 🕒 Salt production company
- 🕒 Representatives of Arles and Saintes-Maries-de-la-Mer
- 🕒 Financial partners : department, region, water agency
- 🕒 Several services of the French State (*in particular "SYMADREM", in charge of dyke management in the Rhone delta*)
- 🕒 Tourist office
- 🕒 Representative associations or users (*kite-surfing schools, ...*)

Key variables of relevance to REST-COAST

The dynamics of habitats restoration and the quantification of ecosystem services targeted by REST-COAST will be monitored by field measurements and remote sensing tools. The implementation of modelling tools will make it possible to anticipate restoration trajectories and the evolution of these services in the medium and long term, depending on the management choices that will be carried out, and in the context of climate change.

Out- and up-scaling implications

The Vaccarès Lagoon System, the central part of the Camargue National Nature Reserve (in yellow in Fig. Location of the site), is a major biodiversity site in France. This coastal lagoons system, with a surface area of 11,000 ha, is highly confined, with significant water renewal times. It presents major problems of hypersalinity and pollution. As this site is connected to the Former Saltworks, all the new hydraulic connections created within the Former Saltworks and between the site and the sea ultimately lead to new connections between the sea and the Vaccarès Lagoon System. The effects on water quality and hypersalinity problems of these new connections will be studied in REST-COAST.