LIFE LAGOON REFRESH

Coastal lagoon habitat (1150) and species recovery in Venice Lagoon by increasing the fresh water input and restoring the salt gradient*

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LIFE LAGOON REFRESH: general informations

Coastal lagoon habitat (1150) and species recovery by restoring the salt gradient increasing fresh water input*

Budget info

Total amount: 3'315'130 Euro

% EC Co-funding: 74,13%

Duration

Start: 01/09/2017

End: 31/08/2022

Location

Venice Lagoon

ITALY

Coordinator

ISPRA – Italian National Institute for Environmental Protection and Research

Project leader

Rossella Boscolo Brusà (ISPRA)

Partners

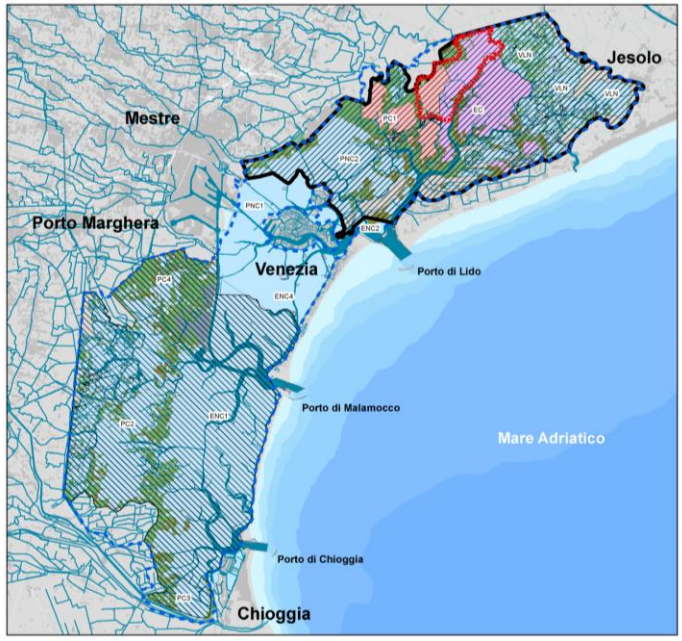
Veneto Region - Environmental Protection Department

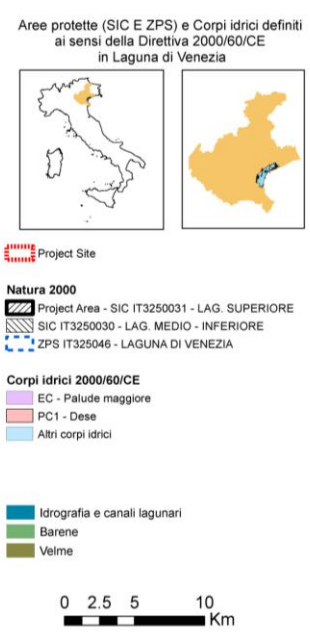
Interregional Superintendency for Public Works in Veneto, Trentino Alto Adige, Friuli Venezia Giulia

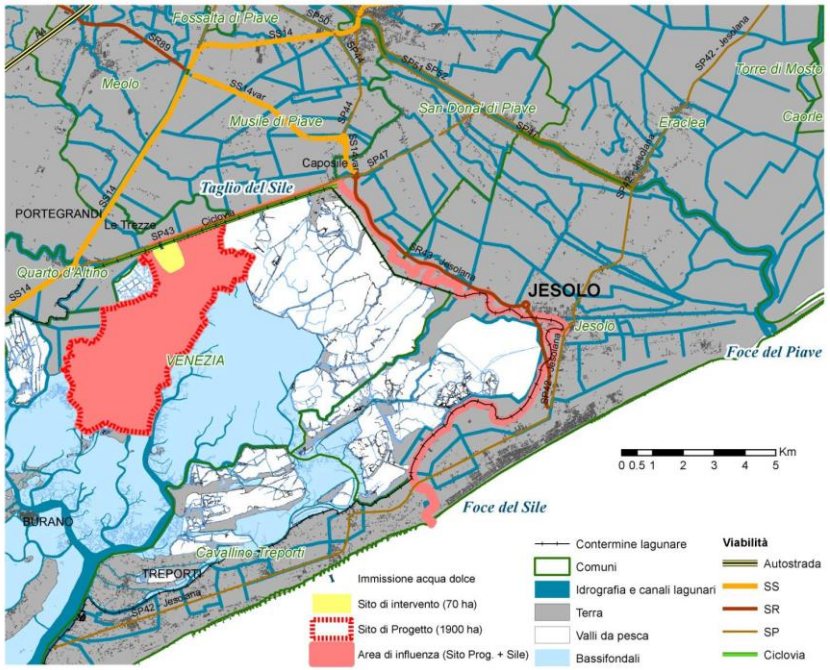
University Cà Foscari of Venice

IPROS Environmental Engineering s.r.l

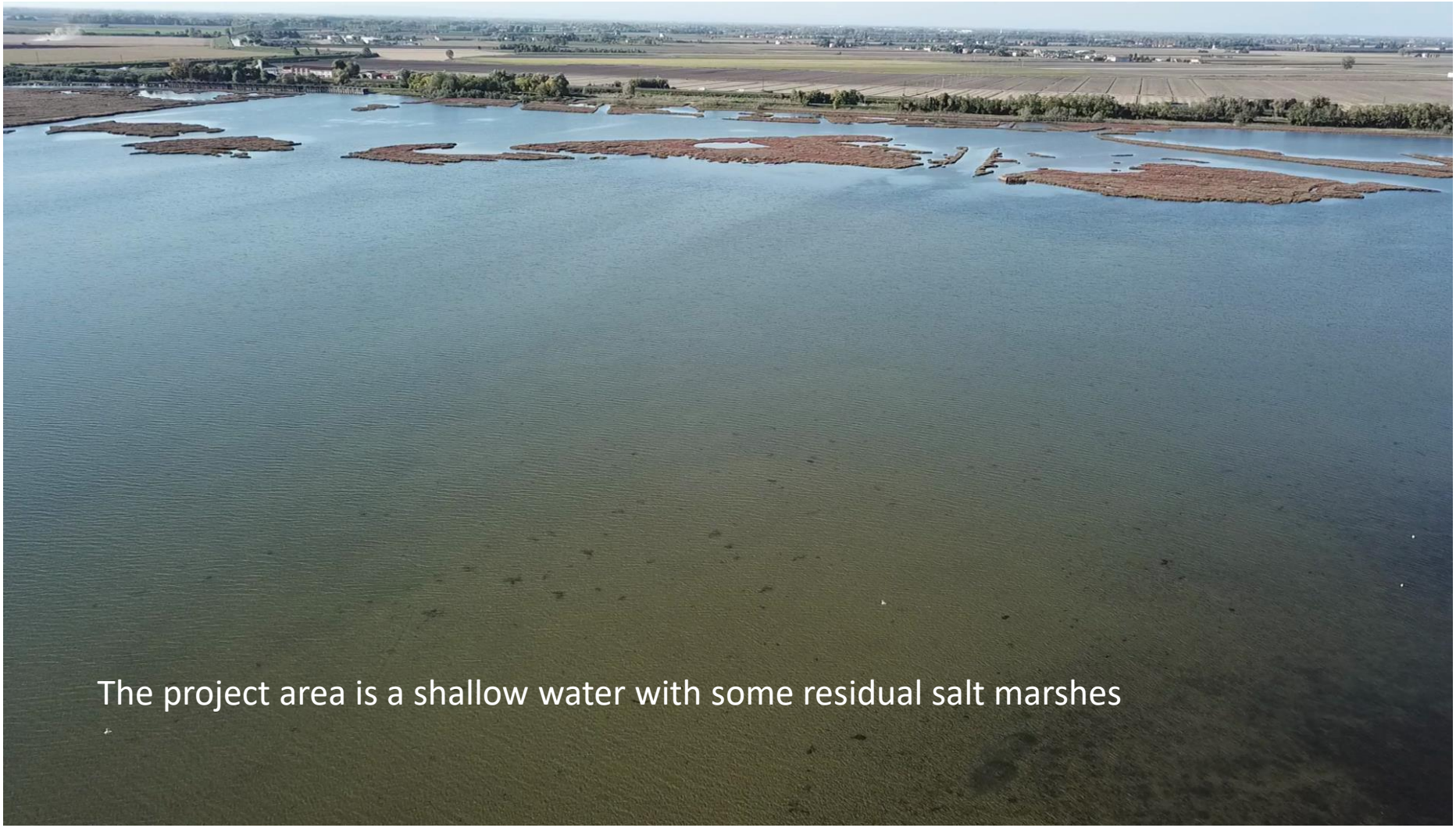
LIFE LAGOON REFRESH: project area







LIFE LAGOON REFRESH: project area



LIFE LAGOON REFRESH: project area

The Sile river flows parallel to the lagoon and a bike lane runs between river and lagoon

LIFE LAGOON REFRESH: project area

The water that currently spills from Sile river arrives directly in the lagoon without finding a buffer zone.

LIFE LAGOON REFRESH: project area

LIFE LAGOON REFRESH: project area

Human activities in the area:
hunting posts

LIFE LAGOON REFRESH: project background

RIVERS DIVERSION (from 1500 to 1800) → **Decrease of fresh water input; Decrease of sediment input** → **INCREASE OF THE SALINITY REED BED REDUCTION**

D'Alpaos, 2010. *Morphological evolution of the Venice Lagoon through historical and hydrographic maps*

*First modern hydrographic map based on surveys of **1809 and 1811***

*Hydrographic map based on surveys of **2000***

SEVERE REDUCTION OF THE ECOTONAL ZONE BETWEEN LAND AND LAGOON, CHARACTERIZED BY A MARKED SALINE GRADIENT

SALT MARSHES SURFACE DECERASED from 170 Km^2 (1901) to 43 km^2 (2003)

LIFE LAGOON REFRESH: project main objectives

TO RECREATE THE TYPICAL OLIGO-MESOHALINE ENVIRONMENTS OF ESTUARINE TYPE AND THEIR SERVICES

- to recovery the salinity gradient lost and to restore reed bed
- to improve the **Degree of Conservation of Habitat 1150** * - Coastal lagoons in the Northern Lagoon of Venice, SCI IT3250031
- to reduce the **degree of eutrophication**, thanks to reed phytoremediation function;
- to improve the **status of bird species** included in annex I of Dir. 2009/147/EC, that use the reed environment during the winter period and /or for breeding, foraging or nesting (*Phalocrocorax pygmeus*, Botaurus stellaris*, Ardea purpurea, Ixobrychus minutus, Circus aeruginosus, C. cyaneus, Alcedo atthis);*
- to increase the **presence of fish species** attracted by the presence of low-salinity environments;

The improvement of the trophic state of the habitat 1150* will contribute to the achievement of a good environmental status within the Water Frame Directive

LIFE LAGOON REFRESH: expected results

EXPECTED RESULTS:

- WATER SALINITY: FROM >30 (ANNUAL MEAN) TO <5 PSU (5 ha); <15PSU (25 ha); <25PSU (70 ha);

- REED BED SURFACE FROM CURRENTLY 30 IN THE SCI NORTHERN LAGOON OF VENICE TO 50 HA

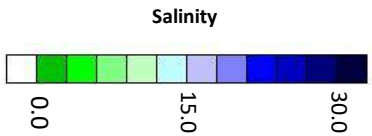
-IMPROVE THE DEGREE OF CONSERVATION OF HABITAT 1150* COASTAL LAGOONS

- IMPROVE THE STATUS OF BIRD SPECIES OF CONSERVATION INTEREST *(Microcarbo pygmeus*,Botaurus stellaris*, Ardea purpurea, Ixobrychus minutus, Circus aeruginosus, C. cyaneus, Alcedo atthis);*

HOW MUCH FRESH WATER DO WE NEED TO DIVERT FROM THE SILE RIVER INTO THE LAGOON TO OBTAIN THE EXPECTED RESULTS?

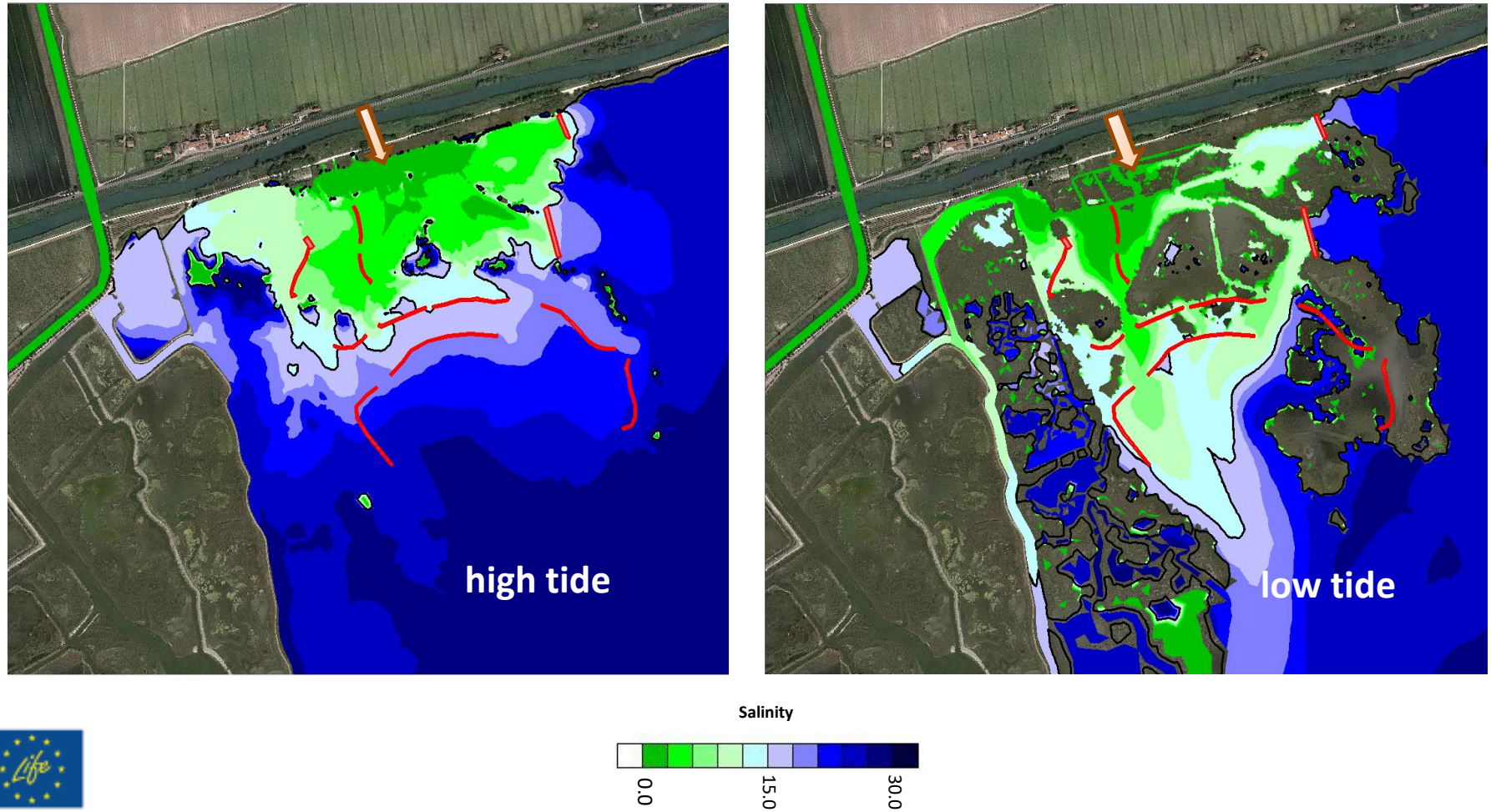
NUMERICAL MODEL WAS USED TO EVALUATE DISCHARGE VARIATION IN TERMS OF SALINITY DIFFUSION

Water inflow: 0 l/s

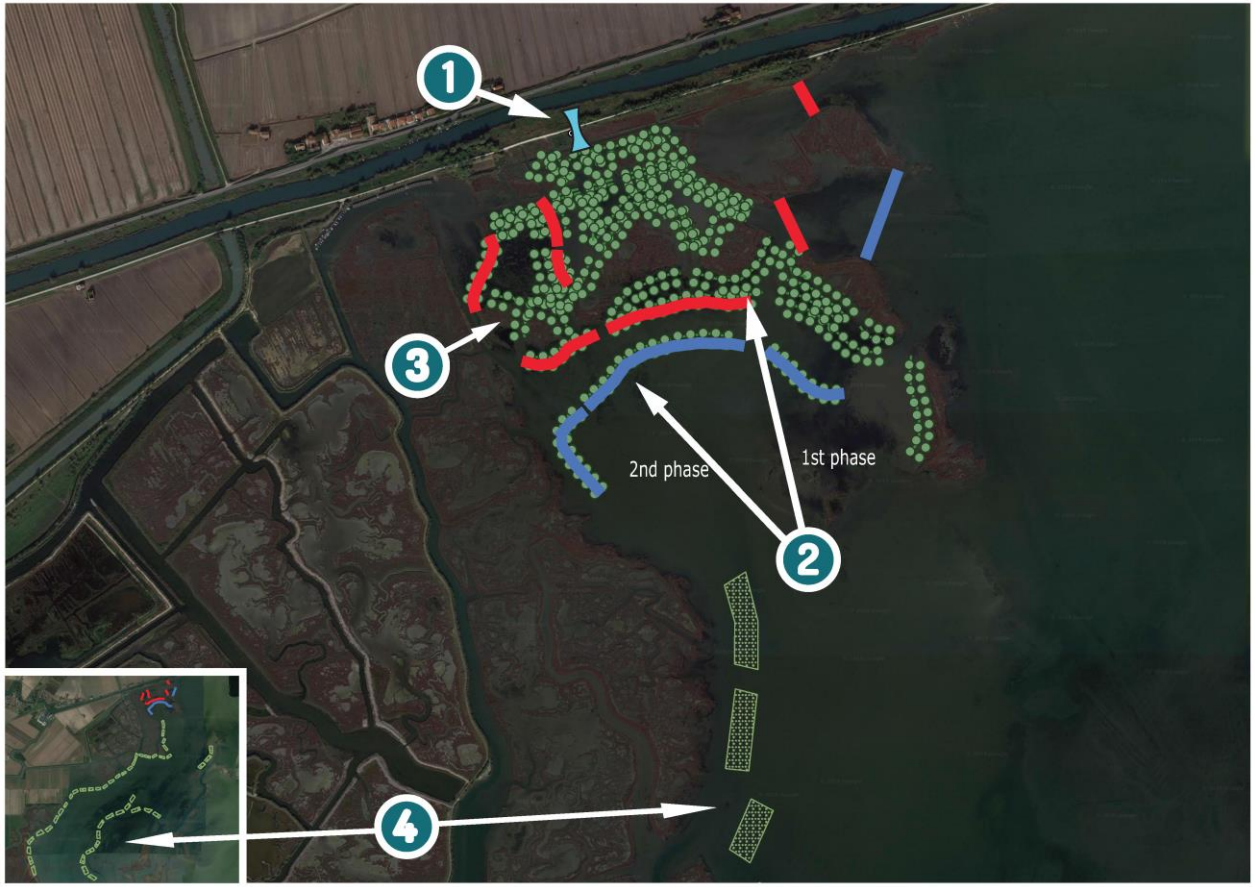


NUMERICAL MODEL WAS USED TO EVALUATE DISCHARGE VARIATION IN TERMS OF SALINITY DIFFUSION

Water inflow: 1000 l/s



The overall picture of the conservation actions



1) diversion of a **freshwater flow** (1.000 l/s) from the Sile river into the lagoon;
2) restoration of the **intertidal morphology** to sustain the reed development;
3) planting of ***Phragmites australis;***
4) transplantation of ***Ruppia cirrhosa, Zostera marina*** and ***Zostera noltei;***

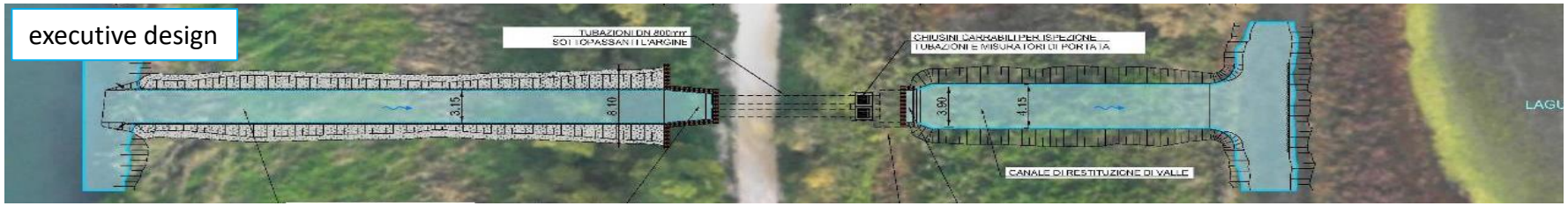
LIFE LAGOON REFRESH: project key actions, conservation actions

1 HYDRAULIC WORKS

The Hydraulic works consist of two pipelines crossing the right embankment of the Sile river.

river side

executive design



Work in progress

Completed Hydraulic work

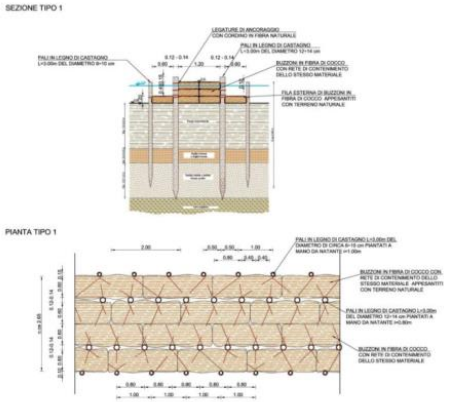
lagoon side

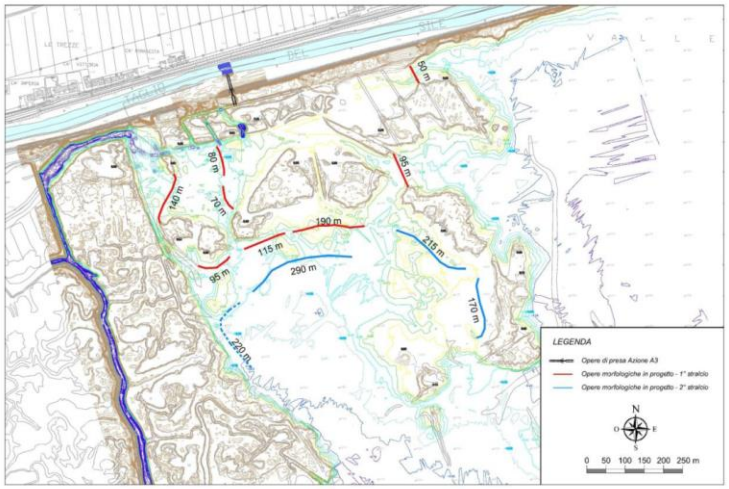
The diversion of a freshwater flow from the Sile river into the Lagoon was gradually increased starting from 300 l/s to 1000 l/s.

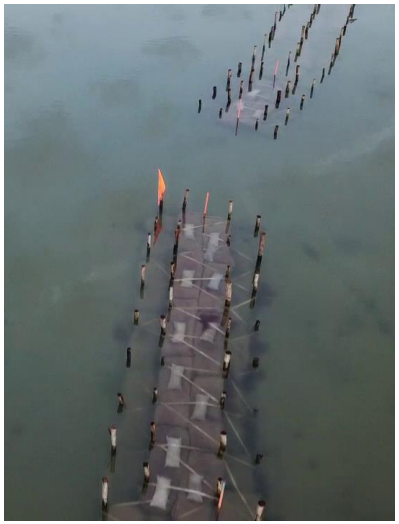
LIFE LAGOON REFRESH: project key actions, conservation actions

❷ MORPHOLOGICAL STRUCTURES

Two lines of modular biodegradables elements, placed on the lagoon shallow area in front of the freshwater intake area







FISHERMEN, HUNTERS, STAKEHOLDERS ARE INVOLVED IN THE TRANSPLANT ACTIONS AFTER A TRAINING COURSE

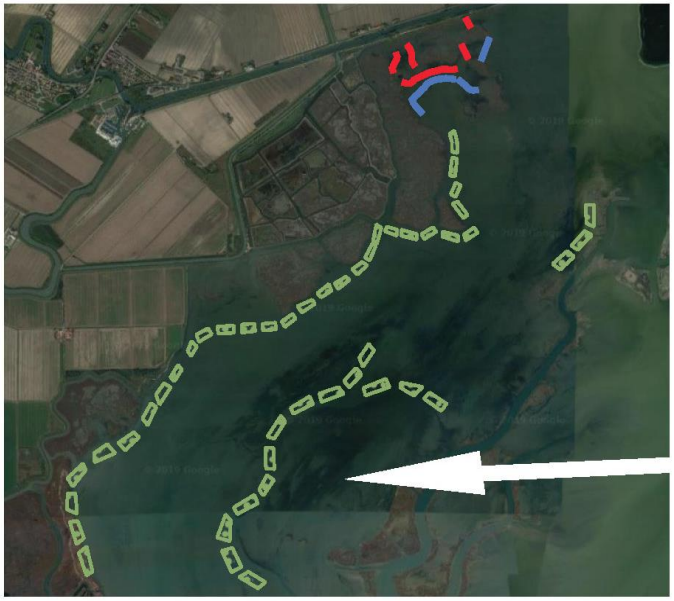
LIFE LAGOON REFRESH: project key actions, conservation actions

3 REEDBED TRANSPLANTATION

Planting of clumps (ca. 1000 of 10-15 cm in diameter) and rhizomes of *P. australis* over a total linear extension of approximately 10 Km in order to accelerate the development of reedbeds.

The clumps are explanted from natural reedbed in Venice Lagoon and transplanted in mud flats of the project area and above biodegradables elements

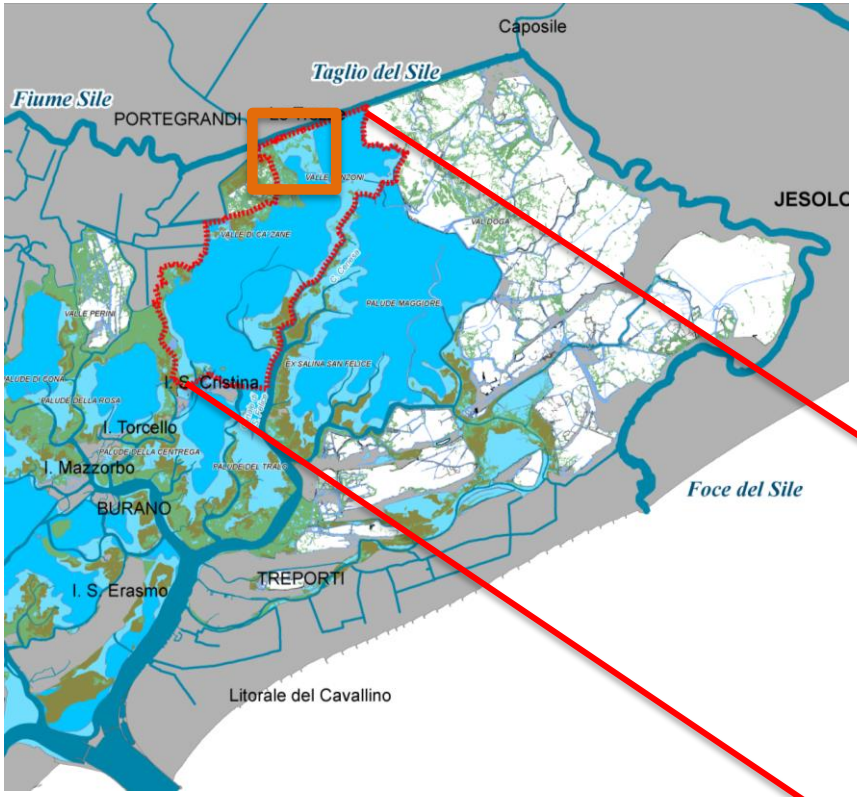
4 AQUATIC ANGIOSPERMS TRANSPLANTATION



From the experience of Life SeResto

Transplantation of small clumps (approximately 1300) and rhizomes (approximately 2500) of *Ruppia cirrhosa, Zostera noltei* and *Zostera marina*. The aquatic angiosperms transplantation is ongoing in an area more extensive respect to the intervention area, where SeResto was not successful

Environmental monitoring



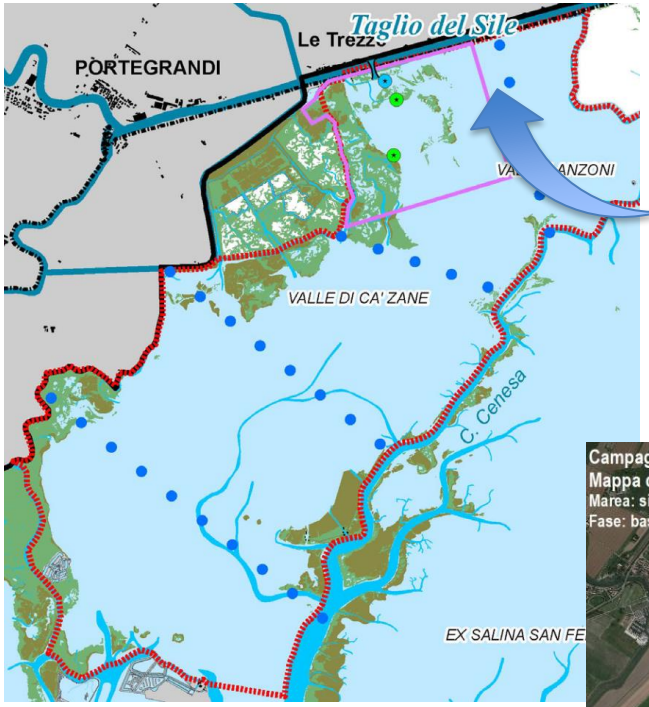
- Restoring saline gradient
- Restoring reedbed
  - Habitats of fish and bird species

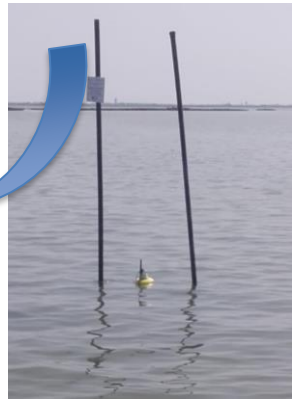
MONITORING AT LOCAL LEVEL

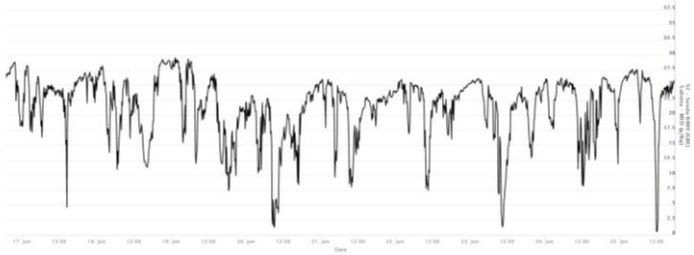
- Habitat Conservation Degree 1150* (Habitat Directive)
- Ecological status of water bodies (WFD)

LARGE SCALE MONITORING

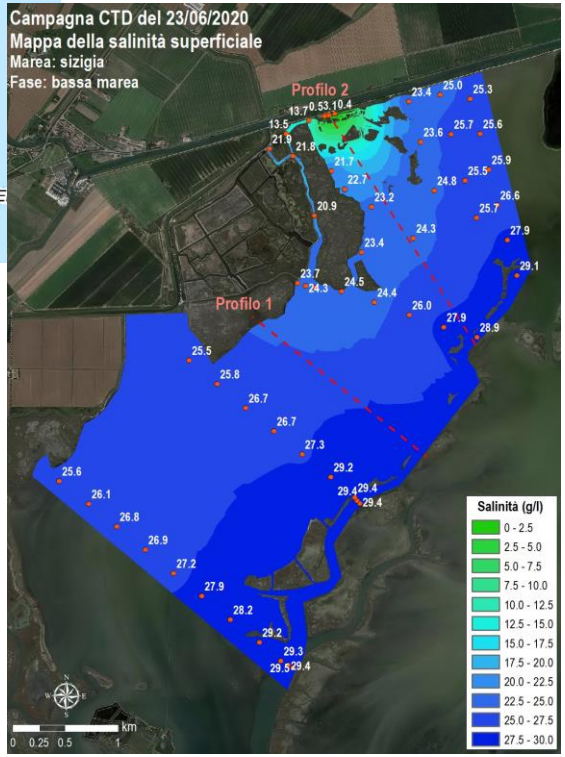
LIFE LAGOON REFRESH: monitoring the impact of the measures







The monitoring of salinity consists in characterization in time and space of salinity variations, performed before and after the conservation actions, by the acquisition of continuous data (moored salinity probes), field campaigns (CTD probes) and numerical modelling.



The monitoring activities collect data about

✓THE COASTAL LAGOON HABITAT
(BENTHOS, WATER, SEDIMENTS, MACROPHYTES, SALINITY, BATHYMETRY)



✓ HALOPHYTIC HABITATS AND HABITAT OF TARGET SPECIES


✓TARGET ORNITHIC SPECIES

✓ TARGET FISH SPECIES

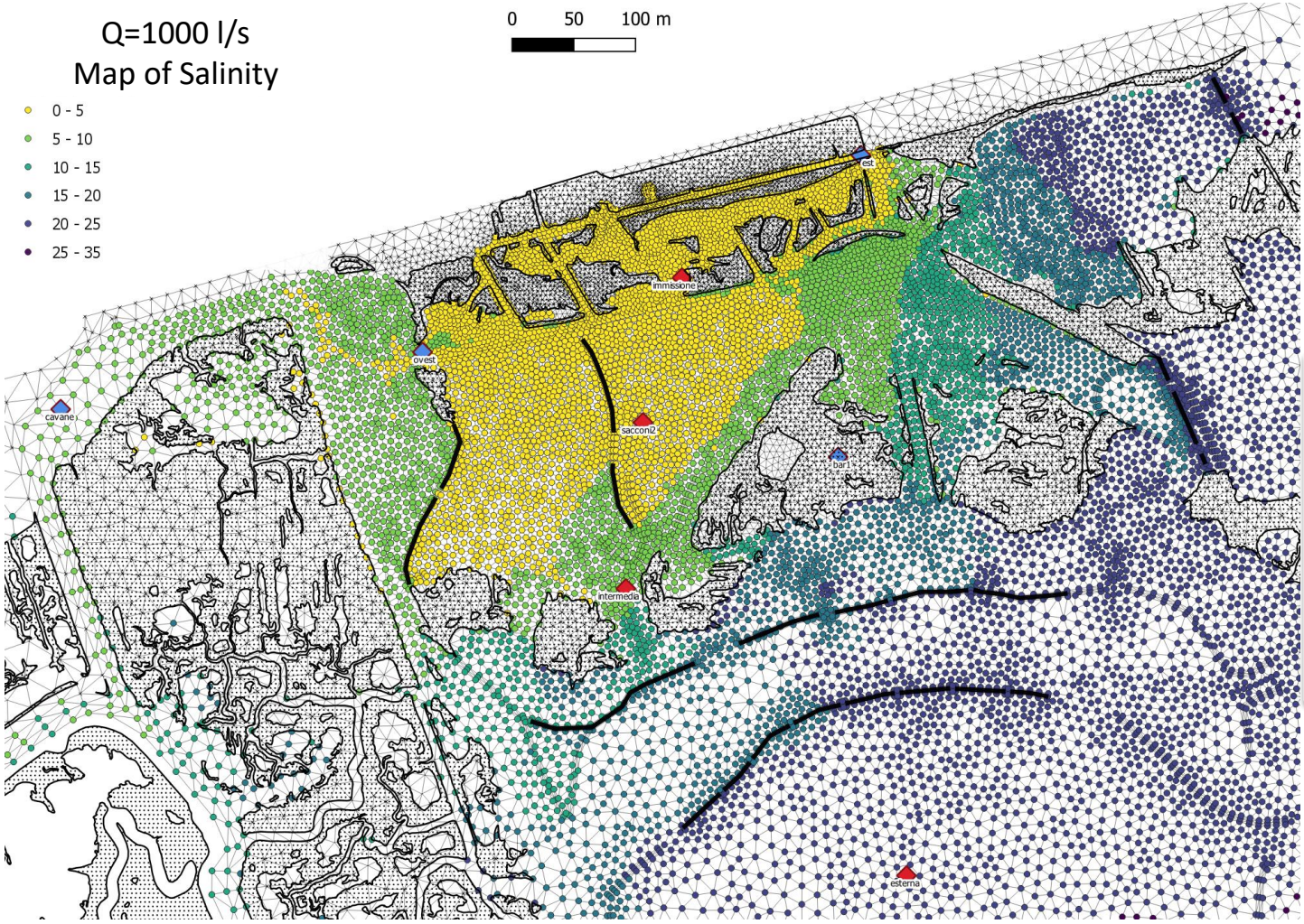
The project is a little bit on late for two main reasons

The bad weather conditions and high tide events at the end of 2019

LIFE LAGOON REFRESH: first results

The sluice gates were opened at 1000 l/s only on February 2021

The salt gradient is already to the target



Map of salinity distribution obtained from numerical modelling, calibrated with field campaigns and continuos data from moored probes

www.lifelagoonrefresh.eu

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Life Lagoon Refresh

www.researchgate.net/project/Life-LAGOON-REFRESH

Stay tuned

Thank you

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