



Natura 2000 seminar for the Mediterranean biogeographical region , 4-7 May 2021



*Knowledge market session*

## LIFE LAGOON REFRESH

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

***Rossella Boscolo Brusà  
ISPRA***

***Institute for Environmental Protection and Research, Italy***

**[rossella.boscolo@isprambiente.it](mailto:rossella.boscolo@isprambiente.it)**  
**[lagoonrefresh@isprambiente.it](mailto:lagoonrefresh@isprambiente.it)**

**[www.lifelagoonrefresh.eu](http://www.lifelagoonrefresh.eu)**





## LIFE LAGOON REFRESH: general information

*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*

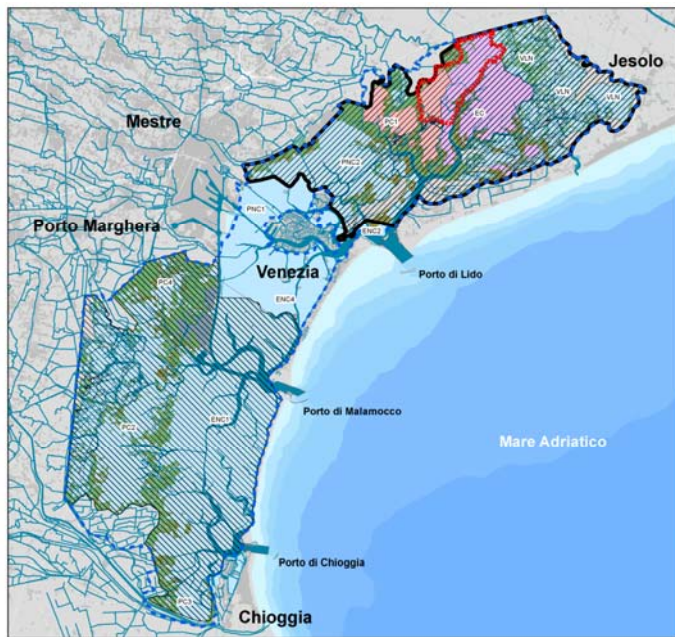
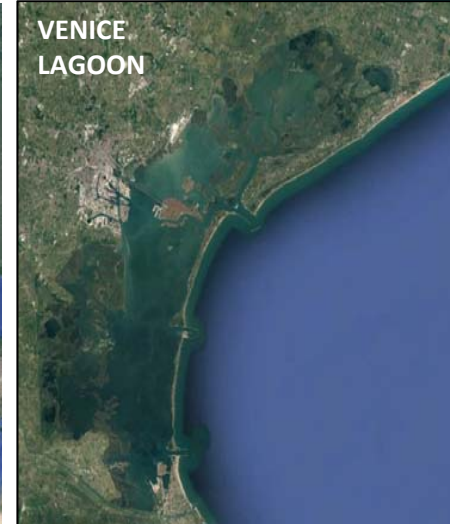
*University Cà Foscari of Venice*

*IPROS Environmental Engineering s.r.l*

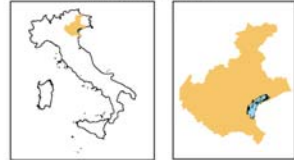




# LIFE LAGOON REFRESH: project area

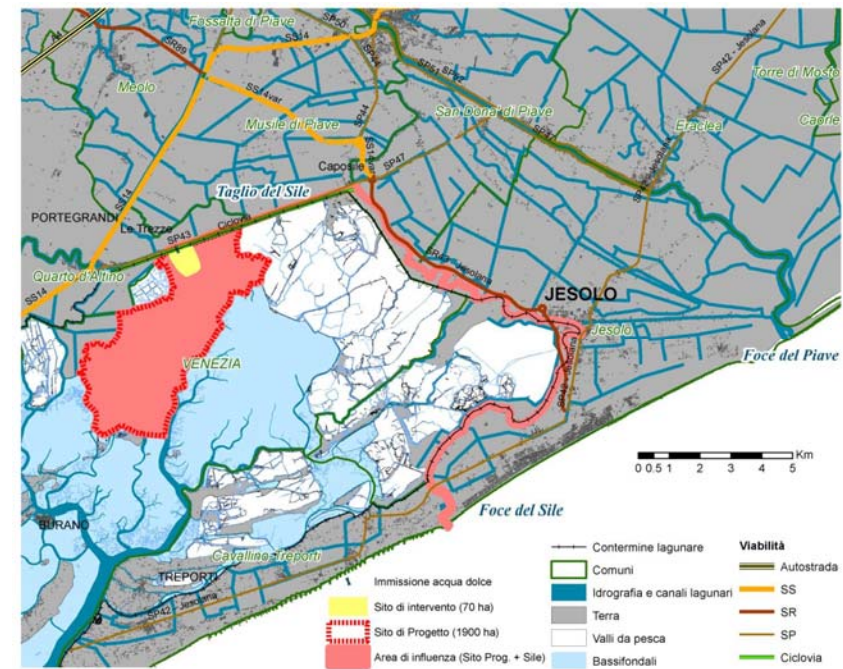


Aree protette (SIC E ZPS) e Corpi idrici definiti ai sensi della Direttiva 2000/60/CE in Laguna di Venezia



- Project Site
- Natura 2000**
- Project Area - SIC IT3250031 - LAG. SUPERIORE
- SIC IT3250030 - LAG. MEDIO - INFERIORE
- ZPS IT325046 - LAGUNA DI VENEZIA
- Corpi Idrici 2000/60/CE**
- EC - Palude maggiore
- PC1 - Dese
- Altri corpi idrici

- Idrografia e canali lagunari
- Barene
- Velme



- Contermine lagunare
- Comuni
- Idrografia e canali lagunari
- Terra
- Valli da pesca
- Bassifondali
- Viabilità**
- Autostrada
- SS
- SR
- SP
- Ciclovia





## 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<sup>2</sup> (1901) to 43 km<sup>2</sup> (2003)**





## LIFE LAGOON REFRESH: project main objectives

### TO RECREATE THE TYPICAL OLIGO-MESOHALINE ENVIRONMENTS OF ESTUARINE TYPE

- to recovery the salinity gradient lost and to restore reed bad
- 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 (*Phalacrocorax 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 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.

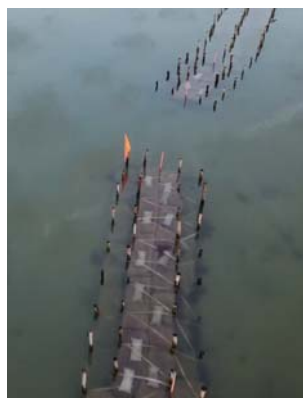
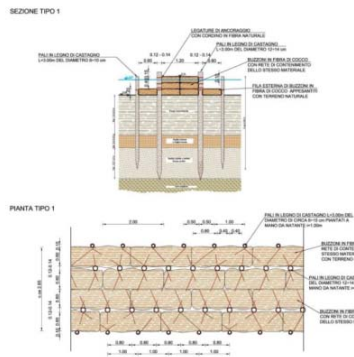


Sile river

Venice Lagoon



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



## 2 MORPHOLOGICAL STRUCTURES

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



## LIFE LAGOON REFRESH: project key actions, conservation actions

### FISHERMEN, HUNTERS, STAKEHOLDERS ARE INVOLVED IN THE REED AND SEAGRASS TRANSPLANT ACTIONS AFTER A TRAINING COURSE

#### 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



#### 4 AQUATIC ANGIOSPERMS TRANSPLANTATION



Transplantation of small clumps (approximately 1300) and rhizomes (approximately 2500) of *Ruppia cirrhosa*, *Zostera noltei* and *Zostera marina*, aquatic angiosperms species.



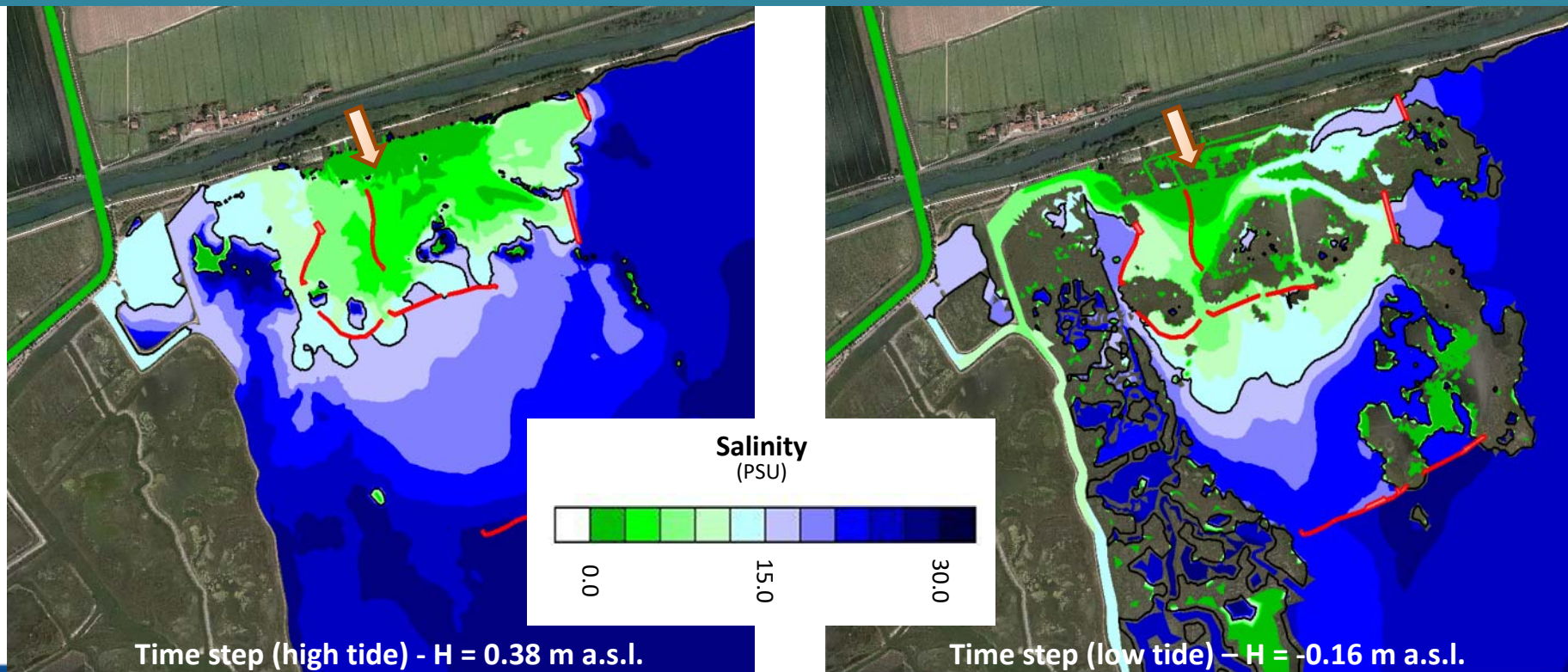
## Recovery of the salinity gradient

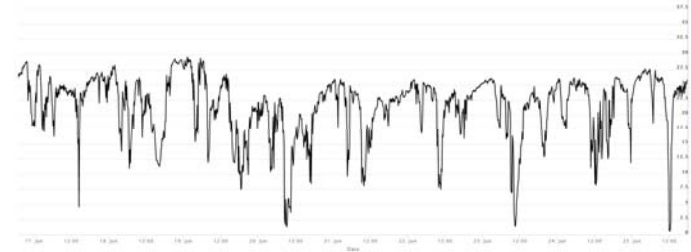
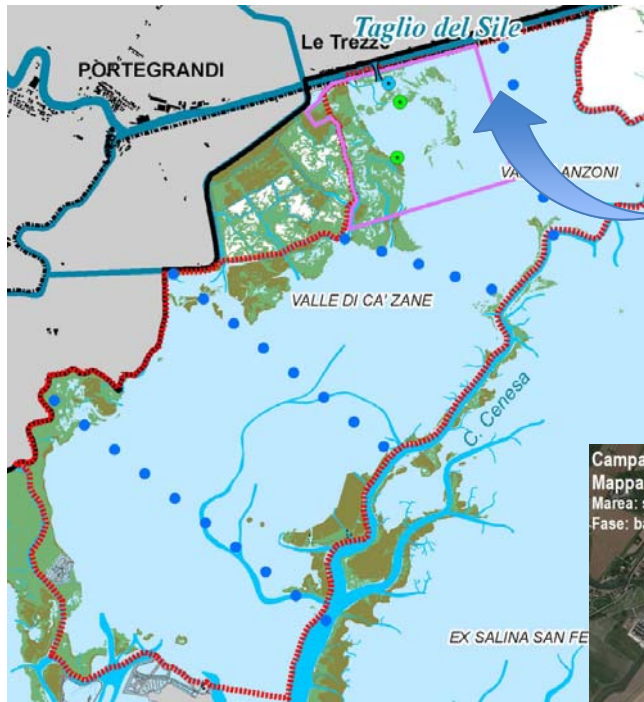
## NUMERICAL MODEL IS USED TO EVALUATE DISCHARGE VARIATION IN TERMS OF SALINITY DIFFUSION

### EXPECTED RESULTS:

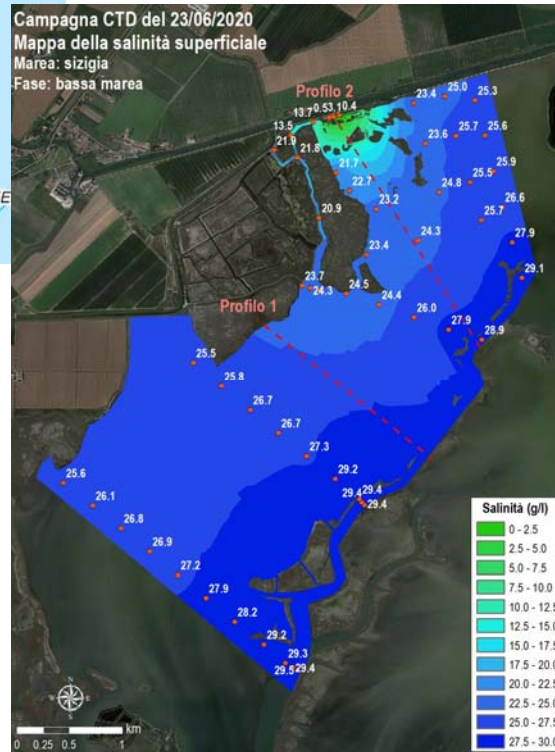
- WATER SALINITY: FROM >30 (ANNUAL MEAN) TO <5 PSU (5 ha); <15PSU (25 ha); <25PSU (70 ha);
- REED BED SURFACE FROM 30 TO 50 HA AT THE END OF THE PROJECT (60 ha 5 YEARS AFTER)

Configuration:  $Q = 1000 \text{ l/s}$





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.



## Expected results

- I) improve the Degree of Conservation of habitat 1150\* Coastal lagoons;
- II) improve the status of bird species of conservation interest (*Microcarbo pygmeus\**, *Botaurus stellaris\**, *Ardea purpurea*, *Ixobrychus minutus*, *Circus aeruginosus*, *C. cyaneus*, *Alcedo atthis*);
- III) increase the presence of the fish species of conservation (*Ninnigobius canestrinii*) and commercial interest.

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



✓ MONITORING OF HALOPHYTIC HABITATS AND HABITAT OF TARGET SPECIES



✓ MONITORING OF TARGET ORNITHIC SPECIES



✓ MONITORING OF TARGET FISH SPECIES





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[www.researchgate.net/project/Life-LAGOON-REFRESH](https://www.researchgate.net/project/Life-LAGOON-REFRESH)

Thank you

*Contact:*

*Rossella Boscolo Brusà*

*Andrea Bonometto*

Italian Institute for Environmental Protection and Research, ISPRA

Email [rossella.boscolo@isprambiente.it](mailto:rossella.boscolo@isprambiente.it)  
[andrea.bonometto@isprambiente.it](mailto:andrea.bonometto@isprambiente.it)  
[lagoonrefresh@isprambiente.it](mailto:lagoonrefresh@isprambiente.it)

Website [www.lifelagoonrefresh.eu](http://www.lifelagoonrefresh.eu)