



Project WSTORE2

Reconciling agriculture with environment through a new water governance in coastal and saline areas

surface waters

ground water

water pollution

PROJECT DESCRIPTION

The most recent studies on climate change believe that the area of the upper Adriatic will be characterized by an increase in average temperatures of the air and sea water, a decrease in precipitation, a greater frequency and intensity of extreme events as well as the rise of the sea level. The areas most vulnerable to these events will be the coastal areas that are exposed to the risk of **saltwater infiltration in coastal aquifers, saline wedge intrusion, loss of marine-coastal biodiversity** and of the **fertility of arable land**. Therefore it is expected that the excessive salinity will result in the loss of valuable natural areas, an impoverishment of agricultural activities and the loss of economic activities including tourism. Targeted interventions are therefore necessary to reduce these risks. In response to this problem, the **general goal of WSTORE2 was to implement and demonstrate the effectiveness of an automatic process of stormwater-excess management to optimize the conservation of the environment and the economic activities in coastal rural areas.**



OBJECTIVES

Specific goals of the project were:

- realization of an **automatic decision-making system for the management of rainwater** which allows, in real time, based on the variation of the chemical-physical parameters of the drainage network-water and groundwater (in particular the electrical conductivity correlated with salt contents), the accumulation of quality water (with reduced salt content) in a basin;
- creation of the **stored water distribution system** to favor supply of fresh water in uncultivated areas and efficient irrigation of the cultivated lands;
- development of an **optimized cultivation system** relying on the qualitative and quantitative characteristics of the water stored in the basin;
- promotion of a **participatory management of water** through direct involvement of the territory's stakeholders;
- **evaluation of the overall environmental and economic performance** of the proposed model and sharing of the achieved results with local stakeholders;
- **demonstration of the proposed model's validity** and promotion of the replicability in other national and European contexts.



The initiative has been realized on the territory of the **Vallevecchia farm** (the last not yet urbanized coastal site of the upper Adriatic) between the seaside resorts of Caorle and Bibione. The territory, after the reclamation, has preserved important naturalistic and environmental characteristics, in particular it's worth mentioning the presence of one of the major **coastal dune systems** of the Veneto region. Due to the presence of this particular habitat, Vallevecchia has been recognized **Special Protection Area** and **Site of Community Importance in the Natura 2000 Network**. The area (about 900 hectares), given its different uses for agricultural, environmental and tourism purposes, has constituted an ideal laboratory to verify the effectiveness of the proposed solutions.

PROJECT PHASES

The project was articulated in 4 main phases:

- **Preparation:** launch and management of the participatory process consisting of negotiation tables with local stakeholders, aimed at the identification of the best water management strategies.
- **Implementation:**
 - **Elaboration of the water management system's executive plan** for the realization of water distribution facilities and an automatic system to monitor water quality;
 - **Realization of the water management system** in accordance with the developed executive plan;
 - **Introduction of a multifunctional cultivation system** through the development and implementation of a specific multiannual cultivation plan for the coastal areas interested by increasing soil salinity and decreasing water availability;
 - **Management of the hydraulic flow regulation system** based on the data provided by the water quality monitoring system and the priorities established within the consultation tables;
 - **Benchmarking:** identification and evaluation of the success factors in the application of the multifunctional cultivation system and their transmission to the stakeholders.
- **Monitoring:**
 - **?Environmental impact monitoring aimed at quantifying the effects of the project activities on agricultural crops, soil, surface water, natural environment; as well as to assess the socio-economic effects;**
 - **Monitoring of the impact on the target audience** to assess the efficiency of dissemination actions on the 3 main target audiences of the project: **planners** (public entities with direct responsibility in the field of territorial planning and definition of territorial development strategies), **experts** (agronomists, naturalists, landscape architects, hydraulic engineers, etc.) and **citizens** (all those who are interested in the issues addressed by the project: teachers, students, tourists, etc.);
 - **Communication and dissemination actions** consisting of production of informative materials and specific activities for planners, experts and citizens (e.g guided tours, conferences and workshops) to share the proposed model and promote its replicability in other territories.

PROJECT RESULTS

WSTORE2 has contributed to the development of an automatic system to monitor and manage the **rainwater and drainage water of the Vallevecchia hydraulic network based on chemical-physical characteristics, above all its electrical conductivity, which is closely related to the salt content of water**. Given the main results of the project, as shown below, the case of Vallevecchia is presented as an example and can constitute a "pilot case" to be replicated at regional/ national level and even on a European scale.

In addition to having taken into consideration the technical aspects, the strategy for water use has been aligned with the aims of **local territorial development**, demonstrating its validity. The most relevant and innovative methodological aspect of the **water management system** is represented by the **fully automatic rainwater management** (on about 200 ha of the territory). Water is analyzed directly in the drainage channels, through devices for sending and receiving data via a telecontrol network (wi-fi) and electrical conductivity sensors, and if found suitable (low salt content) pumped and stored in a collection basin (160.000 m3) for later reuse. Availability of freshwater reservoir in the basin is the key technical element of the system, as it allows to maintain the natural areas and the use of fresh water for the agronomic purposes of the farm. **Structural interventions** were related to the installation of water transport pipelines; realization of automatically controlled gates based on monitoring data and made to move (closing or opening at different levels) on the basis of an algorithm in order to allow - in case of good quality water - storage in the accumulation basin (160.000 m3), or - in case of water with a high salt concentration - the removal from the



hydraulic network (lifting by water pump).

Description of the water management system and its effects on the agricultural activities, water, lands and fauna are reported in the [technical documentation](#).

Among the other results the following are to be mentioned:

- **Creation of two basins** for the collection of good quality water to be distributed in different periods of the year in the natural and cultivated areas and for the cleaning of soils affected by the capillary rising of saline wedge. The basins (one of small, and one of medium storage capacity) are connected to each other by a pumping station consisting of 3 pumps designed for a rapid uptake of medium-good quality rainwater circulating in the drainage network, when available (even for a few hours) during or after rainfalls. An additional pump (90 l/s) is used for the reverse operations of channeling fresh water stored in the basins towards cultivated and non-cultivated soils. Depending on the weather and soil conditions, this water can be used to wash the land itself, to create/ consolidate a freshwater aquifer above a saltwater aquifer, to revive water in the drainage network and irrigate natural areas and crops.
- **Broad involvement of local stakeholders** (about 200 people: farmers, environmentalists, local administrators, professionals, students, etc.) through 12 **discussion tables**, during which the technical contents of the project was presented and discussion was stimulated on the water use in coastal areas in relation to the climate change. The emerged opinions were in favor of adopting a shared strategy for water use, designating water resource for the implementation of sustainable agricultural practices, which ensures the maintenance of the territory's environmental quality and its attractiveness as a possible touristic destination. See more in [Water management in coastal areas: the point of view of civil society](#).
- **Improvement of the soil's fertility** that allowed: increase in the production and quality level of the **already cultivated dry farmed crops** (25% corn and 40 & soybean); **introduction of horticultural cash crops not practicable without irrigation systems** (no. of transplanted plants: 170 tomato plants, 200 lettuces, 120 zucchini, 96 onions, 120 melons, 32 watermelons. The transplanted species have well adapted to the growing environment); **introduction of second harvests of fall & winter crops**.
- **Accumulation of good and discreet quality water**. In two years of operation (2014-2015) the automatic water selection system allowed the accumulation (at least one full basin per year) of good to discreet quality water with an electrical conductivity between 2000 and 3000 $\mu\text{S}/\text{cm}$ (high quality water has $<1000 \mu\text{S}/\text{cm}$ conductivity). The system has also demonstrated excellent reaction time in activating any moment, 24 hours a day, when water deriving from rainfalls even of short duration but of great intensity (e.g summer storms) can be collected, and which would have been lost in absence of the automatic system implemented within the project.
- **Positive effects on biodiversity**. After the introduction of the new water management system, the presence of species that till that moment had been present only in a sporadic manner was consolidated, thus further characterizing the specificity of the ecosystem of coastal wetlands. Additionally there has been a significant presence of **green and diversified areas** even in periods of drought. Concerning birdlife, **113 bird species** have been observed against the initial 86 (19 of which are included in Annex I of Directive 2009/147 "Birds"). Of particular interest was the relief of the presence of the **Savi's Warbler** (uncommon species). In other points, near the phytodepuration areas, a substantial homogeneity with a percentage of aquatic species between 35% and 38% has been recorded. The accumulation basin has proved to be important for different species of Anatidae, both surface (Mallard, Widgeon, Shoveler and Garganey Teal) and depth (Ferroginous Duck and Common Pochard). In addition, 5 species of amphibians (common toad, green frog, agile frog, Italian tree frog, European pond turtle) and 6 of reptiles (western green lizard, common wall lizard, dice snake, ringed snake, Western whip snake, European asp) have been observed.
- **Increased awareness among stakeholders on issues related to climate change in coastal areas and management of these areas**, as a result of – among others – implementation of 4 workshops, 2 conferences, 10 visits to the Vallecchia demonstrative farm, a [Project video](#) (illustrating the history of the Project and the characteristics of the company, the functioning of the innovative system, as well as the environmental and socio-economic effects) and informative and technical material.

Further useful documentation:

- [Technical document for experts](#): describes the Vallecchia site and functioning of the water management system;
- The first [Public Report](#) (on the monitoring of crops, soil, environmental impact and socio-economic effects), created as instrument for the evaluation of the project's effectiveness;
- Report on [Multifunctional crops system](#): highlights the results of the first year of the experimentation concerning the ability of different horticultural species to adapt to saline soils;
- [Report on nutrients](#): collects data on nutrients concentration as well as the volume of rainwater, water runoff and chemical-



physical parameters;

- Report on [Fauna monitoring](#): highlights the positive effects on biodiversity obtained with the adoption of new forms of water governance, conciliating agriculture and environment, in particular in terms of increase in species linked to agricultural areas that benefit from the presence of basins, ditches or canals in which there is temporary or permanent presence of fresh or less saline water.



Acronym
WSTORE2

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Reference Programme
[LIFE](#)

Beneficiary Coordinator
Veneto Agricoltura

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EU contribution
686.210

Call Year
2011

Start Year
2012

End Year
2015

Beneficiary headquarters

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Region
Veneto

Description

Regione Veneto