

Sharing experience of Italy in coping water salinity in agriculture

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THE MAIN MEASURE ADOPTED TO COPE WATER SALINITY IN AGRICULTURE:

- 1. National Legislation to contrast saline intrusion**
- 2. Agriculture adaptation actions to water salinity**
- 3. Management Actions by Water Management Agencies (WMA) to contrast saline intrusion**

ITALIAN REGULATORY FRAMEWORK ON SALINIZATION OF WATER

- *Art. 56 of Legislative Decree n. 152 of the 3th of April 2006 (Environmental Code) that implemented the Water Framework Directive (WFD):* ➡ to contrast subsidence of the soils and of the ascent of the marine waters through the rivers and in the aquifer, to fight against desertification and to protect water from pollution
- *Legislative Decree n.30 of March 16th 2009, regarding the implementation of Directive 2006/118/EC on the protection of groundwater against pollution and deterioration:* ➡ defines specific measures to prevent and control pollution and the depletion and saline intrusion

ITALIAN REGULATORY FRAMEWORK ON SALINIZATION OF WATER

- *Directorial Decree n. 29 /STA/2017 of Ministry of Environment, Guidelines for ex ante environmental assessment of water derivations referring to environmental quality objectives of surface waters and groundwaters. Annex B: groundwaters bodies.*

It establishes the criteria to be used for the eligibility assessment of new withdrawals from groundwater bodies (or for modification of existing water concessions). One of the criteria is related to the risk of saline intrusion due to alteration of groundwater level from withdrawals

- *Ministry of Agriculture Decree July 31st 2015, Guidelines for quantification of volumes for irrigation*

It also sets a classification of measuring instruments for the quantification of water volumes, including strategic water meters, to measure the withdrawals and the refunds in the water bodies, aimed to control the equilibrium of the water balance during the water scarcity periods.

Monitoring of water level of water bodies contributes to respond at the problem of salinity intrusion. In fact a too low water flow does not guarantee a normal flow in the delta of rivers, causing the arise of saline wedge.

1. National Legislation to contrast saline intrusion



➤ At the level of territorial planning, the *River Basin District Management Plans RBDMPs* provide measures to mitigate the risk of the saline wedge arising such as:

- ✓ monitoring of water bodies
- ✓ salinity barriers to prevent saline intrusion
- ✓ maintenance of a minimum flow in water bodies, etc.

Source: CREA processing (2017)

Agronomic techniques

➤ Choice of crops to be irrigated

- ✓ leaching of the solutes in the deep layers can be facilitated by the breaking/removal of superficial layers of limited thickness
- ✓ rotation of non-irrigated crops with irrigated ones
- ✓ facilitate the drainage
- ✓ contribution of organic soil improvers (*compost*)
- ✓ alternating susceptible cultures with resistant crops to be irrigated with brackish water, at least after the germination-emergency phase
- ✓ adopt methods for submersion, for sliding and for sprinkling, by drop and lateral infiltration
- ✓ short irrigation shifts
- ✓ volumes of watering higher than necessary or “*Leaching requirement*”

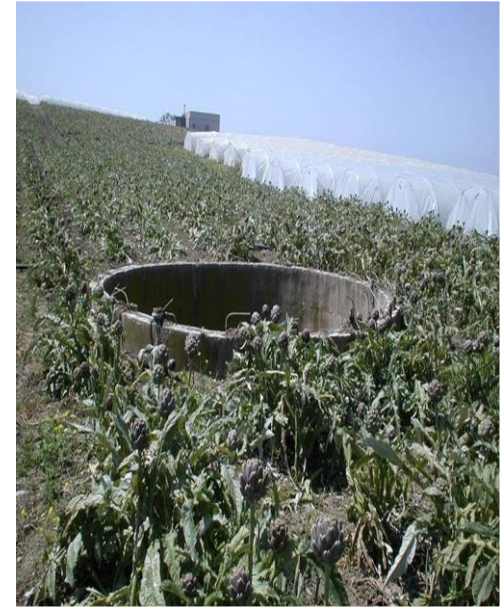
RIADE PROJECT IN SICILY (2004)



Rain water recovery from permanent greenhouse



Crop rotation under tunnel



Rotation of non-irrigated crops with irrigated ones - temporary tunnels

Subsidence and salinization are two faces of the same problem: excessive groundwater extraction along the costal area.

To mitigate the problem:

- Reduction of groundwater use increasing the surface water
- Control the groundwater pumping station
- Increase the wastewater reuse
- Increase the freshwater recharge in groundwater system
- Reduce the salt water intrusion with wetland and ditches
- Increase the efficiency of water use in agriculture and other sectors



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Salt groundwater intrusion area for groundwater pumping



Source : EEA (European Environmental), 2006

A CASE STUDY: EMILIA ROMAGNA REGION



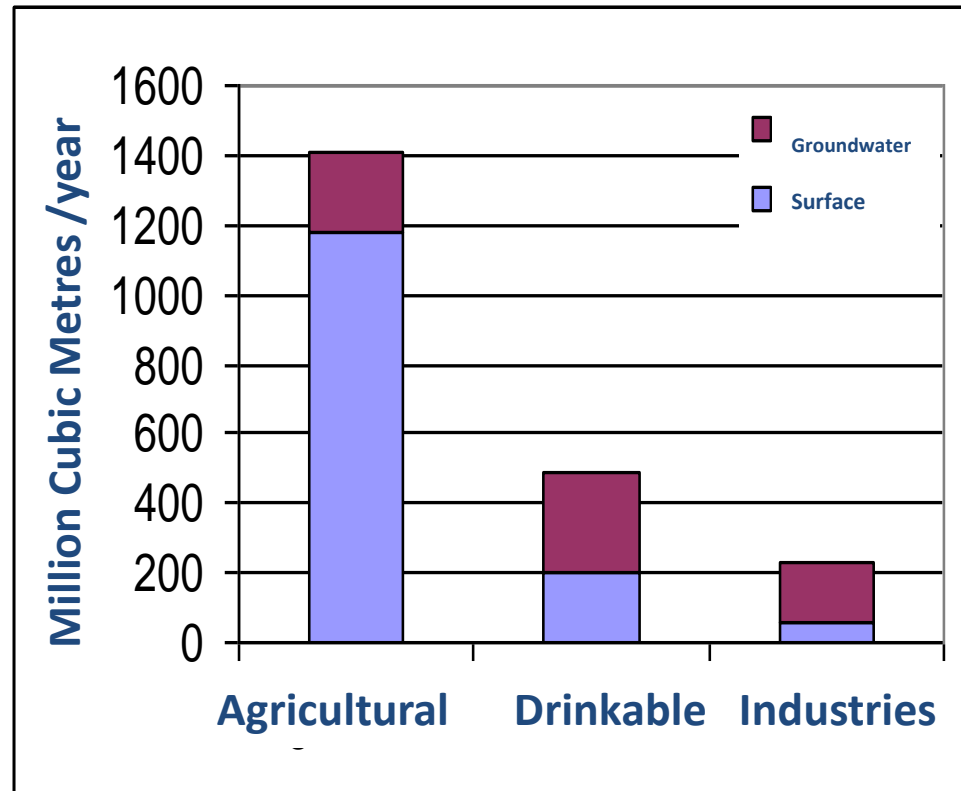
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WATER SOURCES

Surface water 68%

Groundwater 32%:

- Agricultural 16%
- Drinkable 60%
- Industries 74%

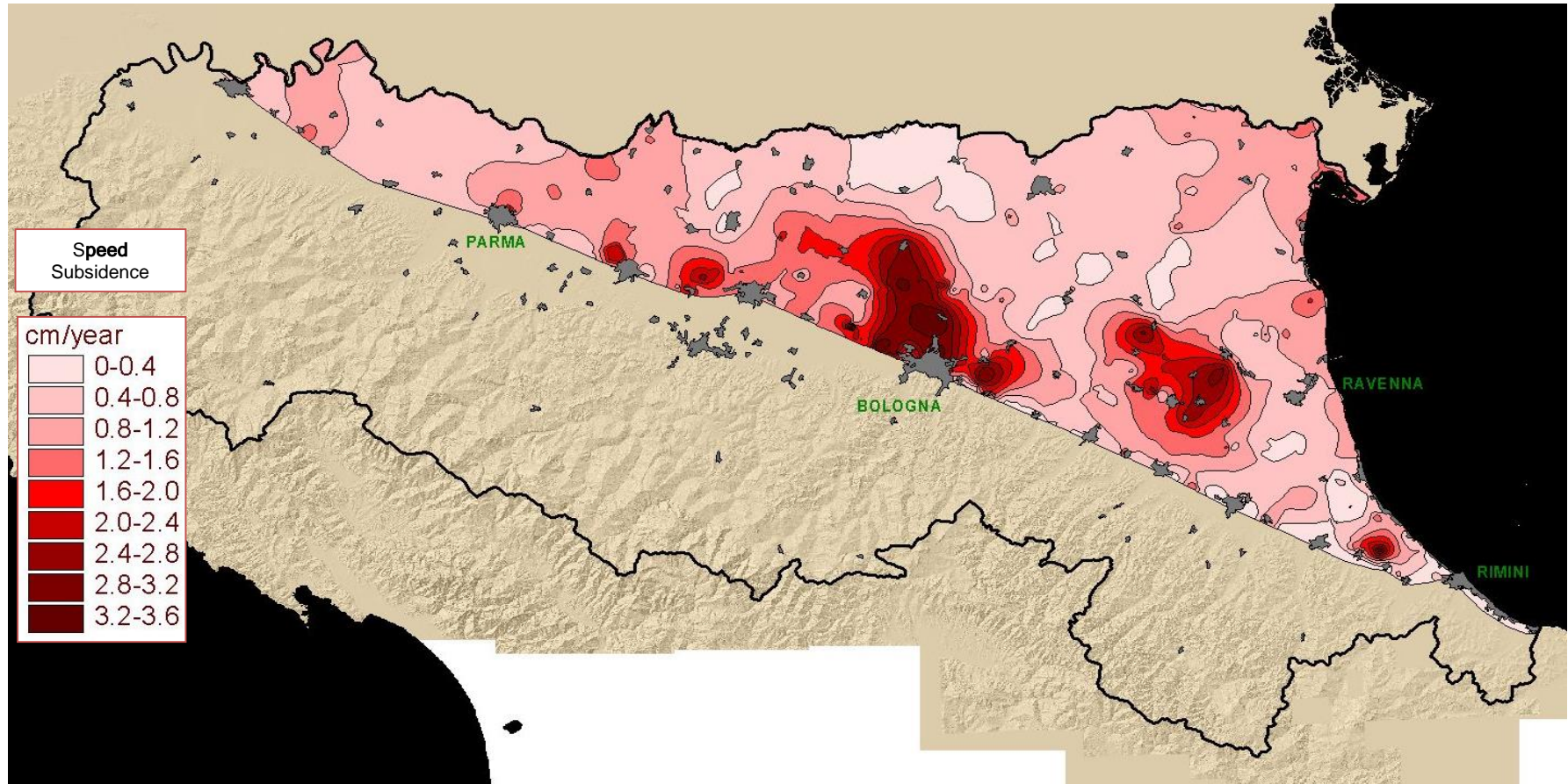


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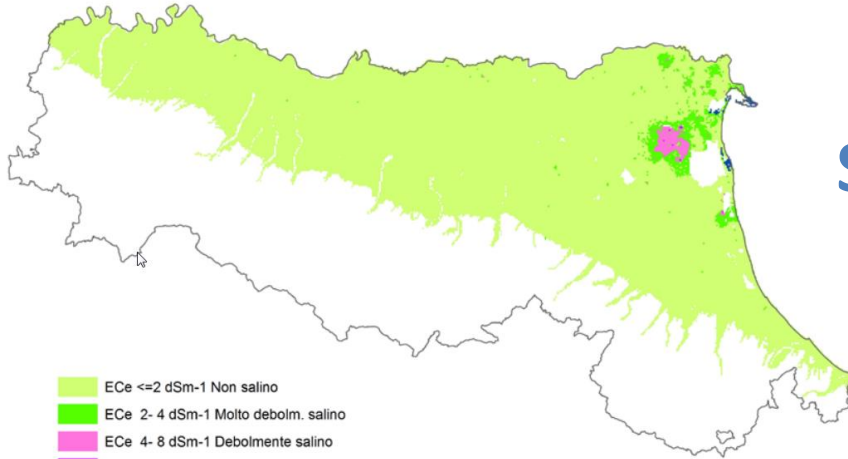
Subsidence is the most serious environmental problem in Emilia-Romagna. In the last 50 years, the area around Bologna has fallen by 6 meters. Severe sinking also in the Faenza and Iugheze with a speed between 2 and 3 cm / year.

THE PROCESS IS IN DECISION SLOW MOTION WHEN THE CER IS ENTERED INTO YEAR

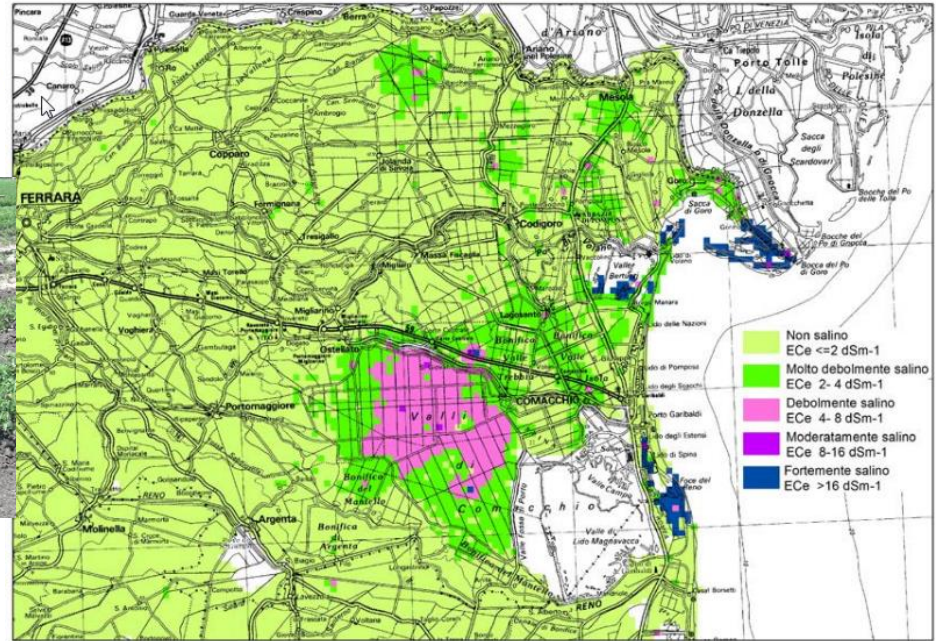
Soucre: ARPA-ER, 1999



Soil Salinity in Emilia-Romagna



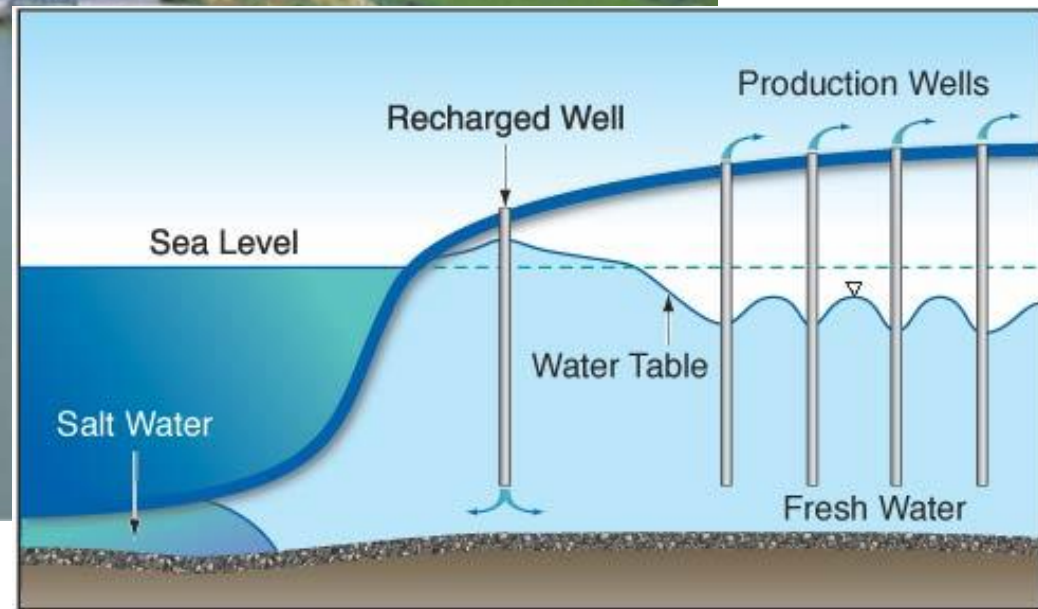
- ECe <=2 dSm-1 Non salino
- ECe 2-4 dSm-1 Molto debolm. salino
- ECe 4-8 dSm-1 Debolmente salino
- ECe 8-16 dSm-1 Moderatamente salino
- ECe >16 dSm-1 Fortemente salino



 **Canale Emiliano Romagnolo**

Source: Servizio Geologico Sismico e dei Suoli ER

In some coastal agricultural environments subject to salinization, irrigated water is conveyed in canals also to reduce the saline intrusion into the water table



Irrigation, shallow groundwater recharge and salinity control

- ✓ The control of water level in the ditches allows the recharge of shallow groundwater system. In low-lying area it decrease the reduction of freshwater lens during the summer period
- ✓ In the coastal territory a fraction of the water brought for irrigation is "lost" in the coastal wetlands, alleviating salinization and hindering the saline intrusion into the stratum.
- ✓ Irrigation protects the territory from drought and desertification, as an adaptation to climate change, improvement of the landscape



Environmental effects

Groundwater recharge - contrast to subsidence

Safeguard of public and private forest

Improvement of landscape with reduction of saline intrusion along coastline

Improving the water quality in natural and drainage network as natural wetland process

Improving aquatic ecosystem in channel with irrigation water

Support to wetlands

Reduction of subsidence with reduction of groundwater extraction

Use of irrigation network for transportation of water for industrial and drinkable water

Economical and social development of rural areas



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