



*Adaptation to climate change:
integrating reuse to cope with
droughts and water scarcity*

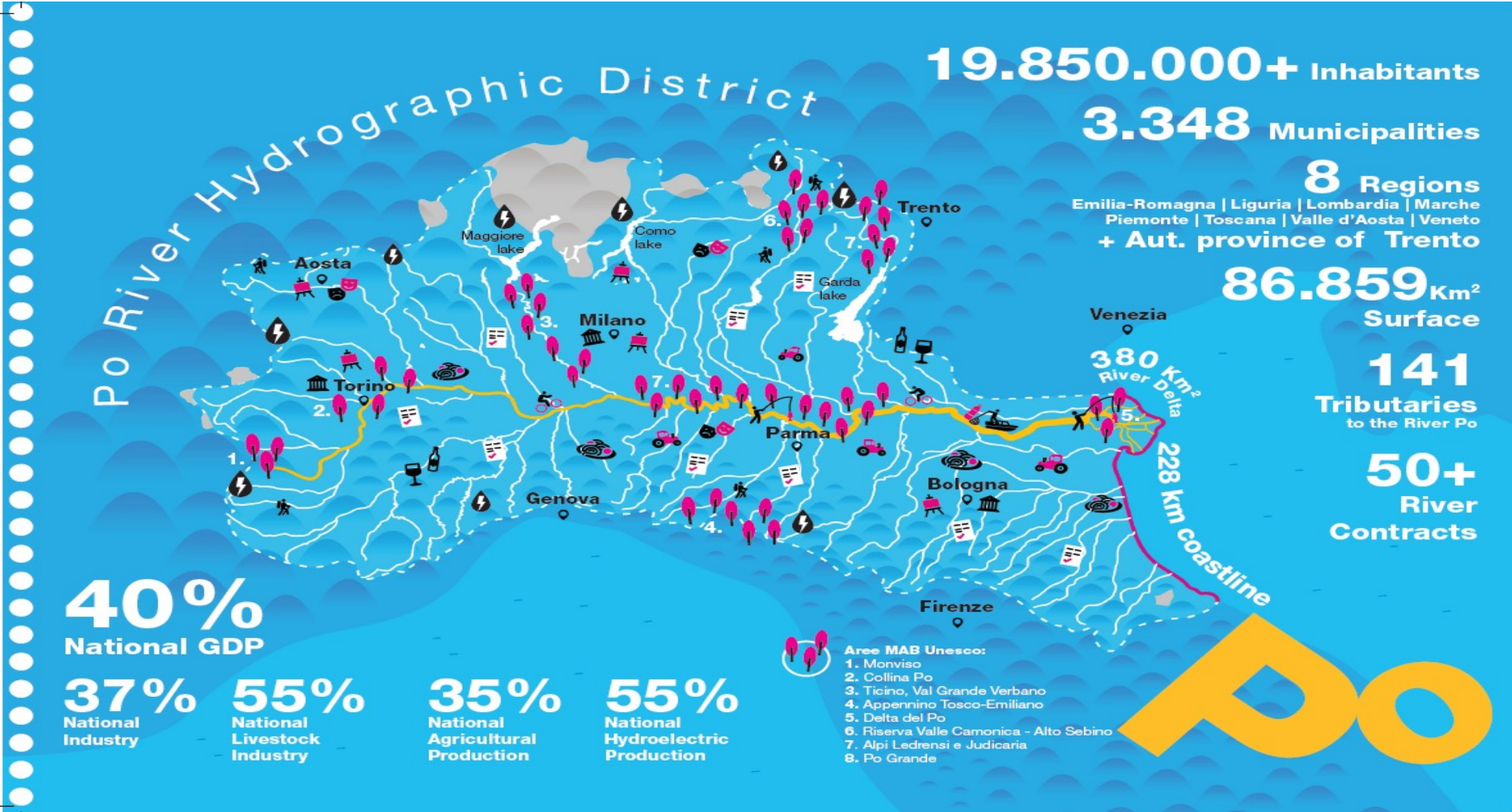
Alessandro Bratti

(Po River Basin)

Valencia Tuesday 17th October



**MINISTERIO
RA LA TRANSICIÓN
EL RETO DEMOGRÁFICO**



Po Basin District and Climate Change

Area extremely vulnerable to Climate Change

Based on global and *regional climate forecasting models*, the District is located in the climatic transition zone between the Mediterranean and Northern Europe, in which *uncertainty* about the *future climate* is *higher* than in other European areas.

The role of AdBPo – River Po Basin District Authority



River Basin Management Plan
Water Quality



Monitor, risk analysis, economic analysis, environmental status of water bodies, objectives and a programme of measures to reach these objectives



Water Balance Management Plan
Water Quantity



Identify common indicators to evaluate water balance. Modelling and forecasts



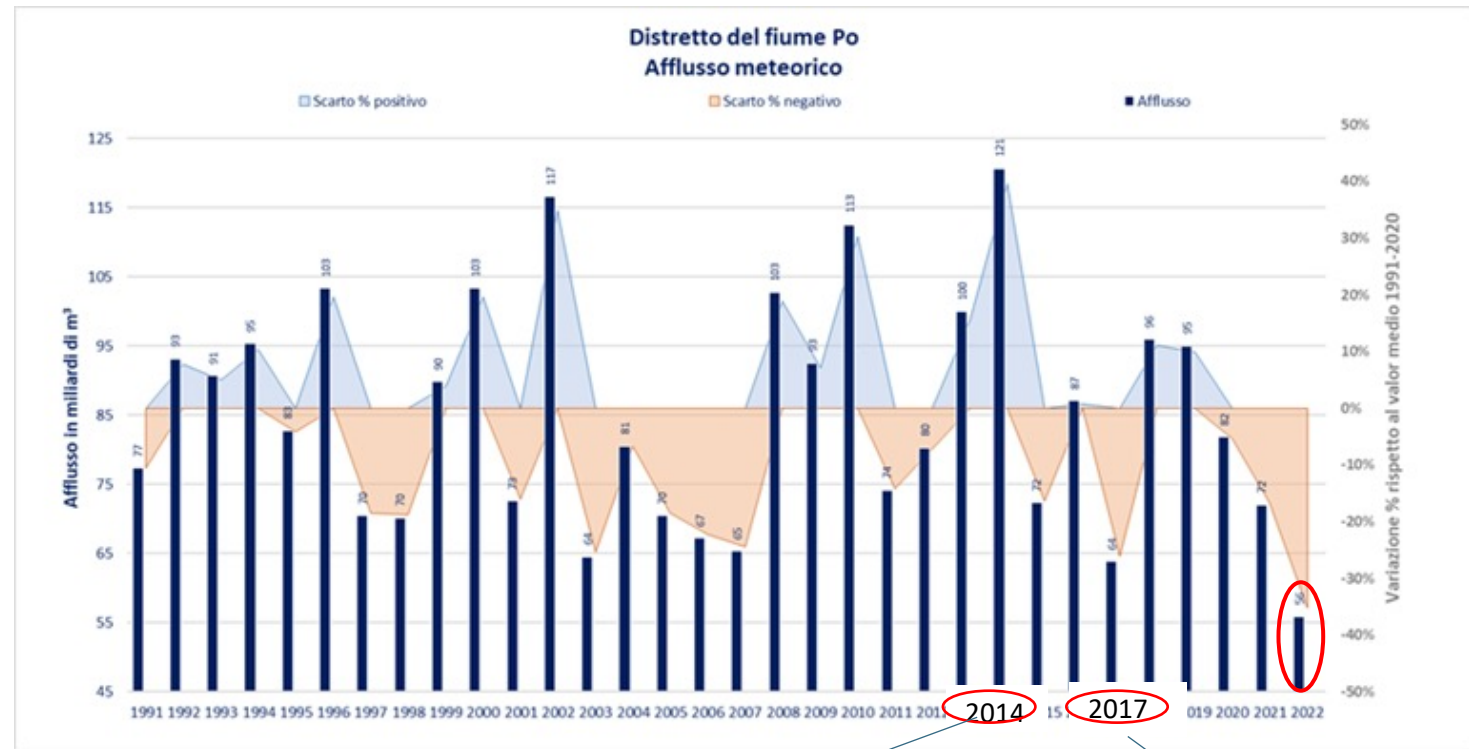
Flood Risk Management Plan
Hydrogeological Risk Mitigation



Past and future flood analysis, identification of areas at risk, prevention and mitigation measures

Drought and water scarcity: the role of climate change

Starting from the 2000s the hydroclimatic balance (i.e. the difference between precipitation and evapotranspiration) was strongly negative with an increase in the intensity of individual rainfall events but an overall reduction in the number of total events.



The **negative record** held since 2017 has been surpassed by the more recent **2022**, which recorded an average annual rainfall of only 644 mm with a total meteoric inflow of 56 bln m³.

Wettest year with a precipitation 1.389 mm and meteoric inflow of 121 mld m³

The driest year with an average annual precipitation of 735 mm and a total meteoric flow of 65 bln m³

Po River Basin District and the resource numbers

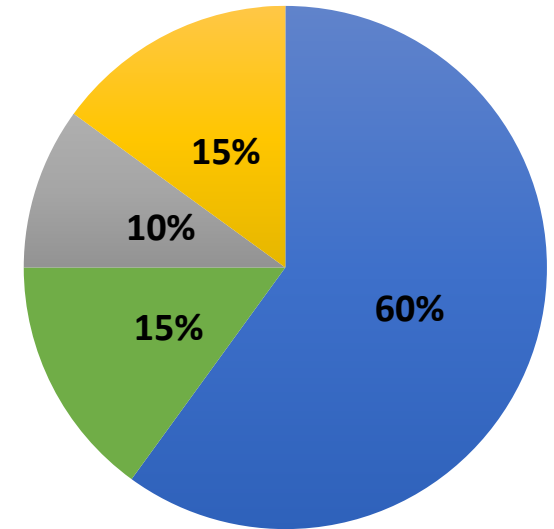
The overall demand for the various uses appears to be sustainable under conditions of normality and abundance, but the increasingly frequent and long-lasting drought periods observed in recent years have led to the emergence of major scarcity problems, especially in the irrigation sector.

Greater demand and less availability are thus making the management of water resources within the Po River District increasingly difficult.

- **12 BILLION m^3** IRRIGATION USE
- **3 BILLION m^3** CIVIL USE
- **2 BILLION m^3** INDUSTRIAL USE
- **3 BILLION m^3** OTHER USES (Energy production, shipping, etc.)



20 BILLION m^3 WATER WITHDRAWN FOR DIFFERENT USES



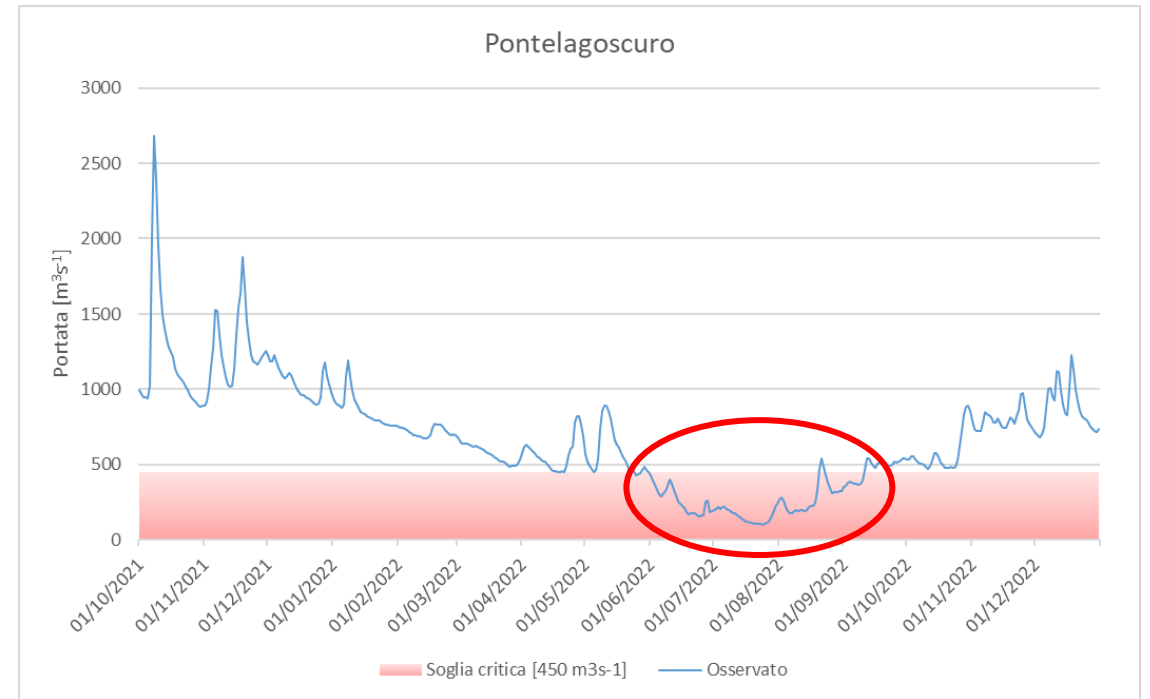
- IRRIGATION USE
- CIVIL USE
- INDUSTRIAL USE
- OTHER USES (Energy production, shipping, etc.)

Po River Basin District and the 2022 water crisis

Salt intrusion

The most critical condition of salt intrusion occurred during the month of *July*, when the flow rate in the Po at the Pontelagoscuro section was around $114 \text{ m}^3\text{s}^{-1}$, reaching maximum values of salt intrusion estimated up to about *40 km* from the mouth with high tide phenomena.

Representation of salt intrusion in the Po River Delta at high tide (in red) during July.



Daily flow rate trend in the Pontelagoscuro hydrometric section compared with the critical threshold for salt intrusion of $450 \text{ m}^3\text{s}^{-1}$.

What can we do to reduce water scarcity?

Promoting water stewardship

People are setting water-saving measures at home, school and work:



Shorter showers



Low-flow toilets



Rainwater collection



Greywater reuse



Leaks and water systems inefficiency reduction



Sustainable energy investment

Increasing water storage in reservoirs



- Expanding reservoir capacity allows the capture and storage of floodwater that otherwise would reach the ocean, getting salty and more difficult to treat i.e widen sections of channels: more than 4000 km channels in Delta area

Greywater reuse



- Application of European regulation on water reuse

Protecting wetlands



- Wetlands collect and purify water, but they are disappearing at an alarming rate.
- Conserving wetlands instead could have a major payoff.



Improving irrigation efficiency

- Switching from flood irrigation systems to sprinklers or drip irrigation systems.
- Better soil management practices such as no till or limited tillage and mulching can significantly reduce water usage.

Table – Main reuse plants active in the Po river district and quantity of reused water. The data refers to 2018 based on data processing by the REF Ricerche Laboratory (REF Ricerche acqua n° 158, September 2020).

Province or Region	Plant or Management	Use	m ³ /per year to reuse
Milano	Nosedo San Rocco	Irrigation	88.966.390
Lombardia	CAP Holding	Irrigation	69.268.550
	Morbasco	Irrigation	5.000.000
Torino	Castiglione Torinese Collegno Pinerolo Chieri Pianezza	Industrial	129.050
Reggio-Emilia	Mancasale	Irrigation	6.024.068
Bologna	Idar	Riequilibrio idrologico*	966.158
Carpi	Carpi (AIMAG)	Industrial	146.333
Po District			170.500.549

Reuse of wastewater: optimization of use and traceability of the resource

Mancasale wastewater treatment plant (WWTP), 2016 trial

1. ~63% of the outlet water of the WWTP was recovered and sent to indirect water reuse.
2. The project followed the water path in the secondary surface network up to the end user through the implementation of a communication and IT system, permitting to:
 - know in real time which water sources the irrigation district is served;
 - data recording of each irrigation intervention on each plot.
3. Dilution halves the phosphorus concentration and no difference has been noticed, between irrigation in the absence of treated water compared to the presence of treated water in variable proportions for land and plants.

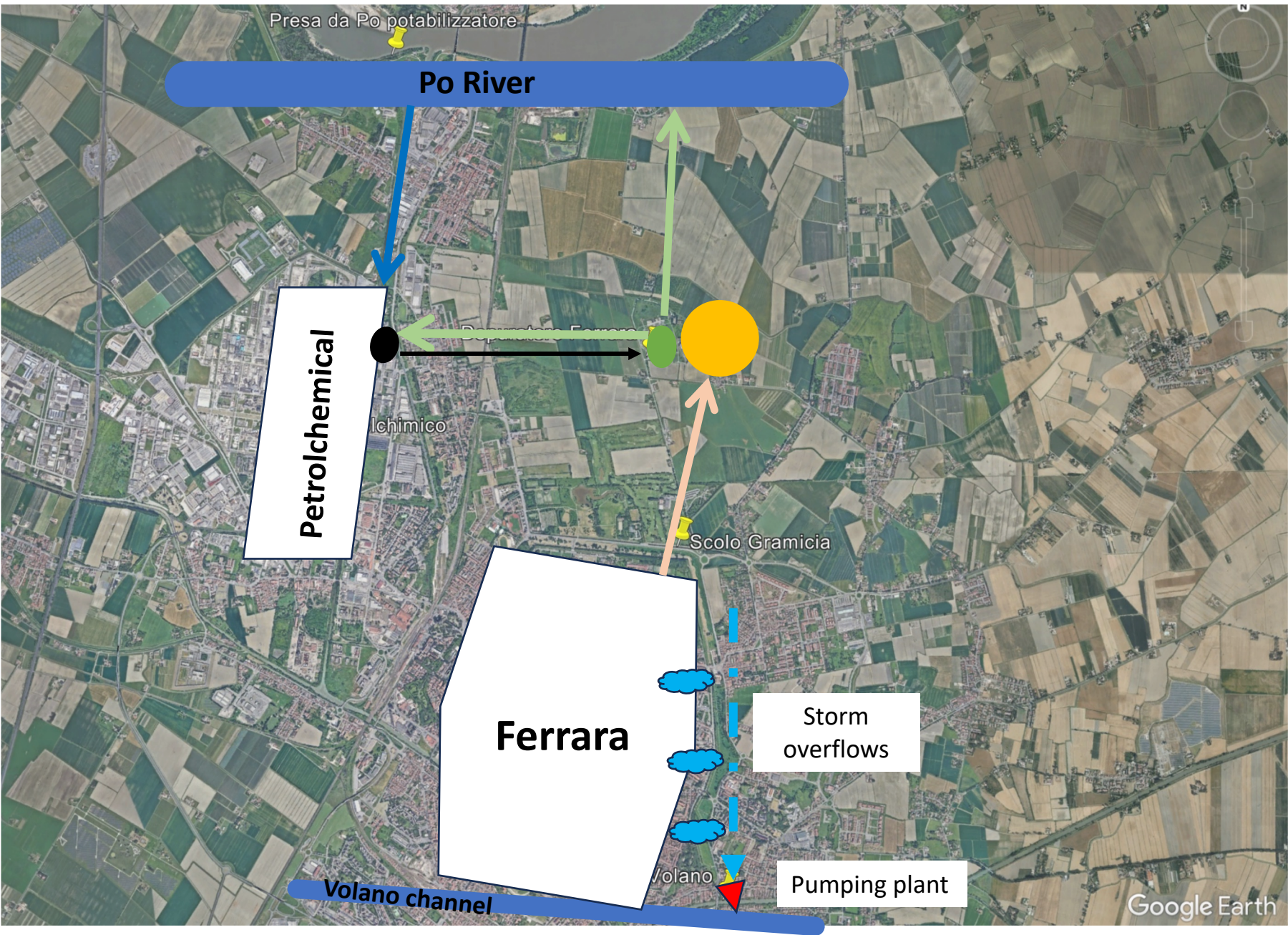


<https://www.greenweekfestival.it/iren/>






ReQpro project has promote **circular economy of water**, permitting to:

- increase the availability of water for irrigation;
- contain high-quality groundwater extraction;
- improve the state of surface waters;
- reduce energy costs for lifting system for surface waters.



Benefits

- Adaptation of sewage treatment plant to new directive proposal 91/271
- Significant reduction of the withdrawal for industrial use from Po River
- No wastewater discharge into Volano channel
- Risk reduction
- Underwall lifting only to serve the storm overflow
- Discharge into Po River at the point closest to the only to serve the storm water overflow

	Wastewater treatment plant
	Reclamation facility
	Osmosis system

*Thank for
your
attention*

