

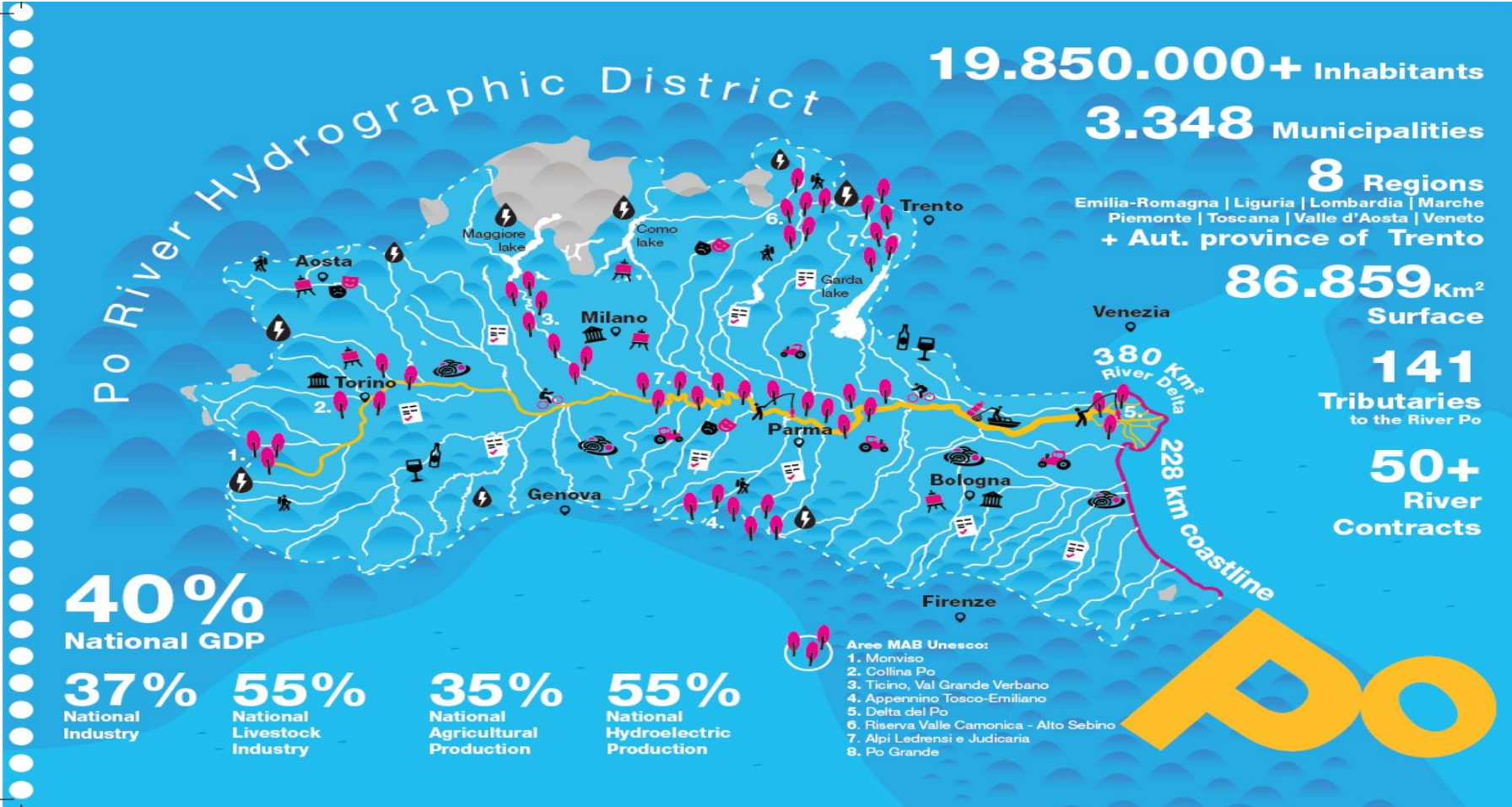


WHO NEEDS WATER? Managing drought in Alps. Climate change and Alpine water resource to be preserved

Po river in a climate changing condition

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TORINO, 24 aprile 2024 Palazzo della Regione Piemonte Piazza Piemonte 1



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

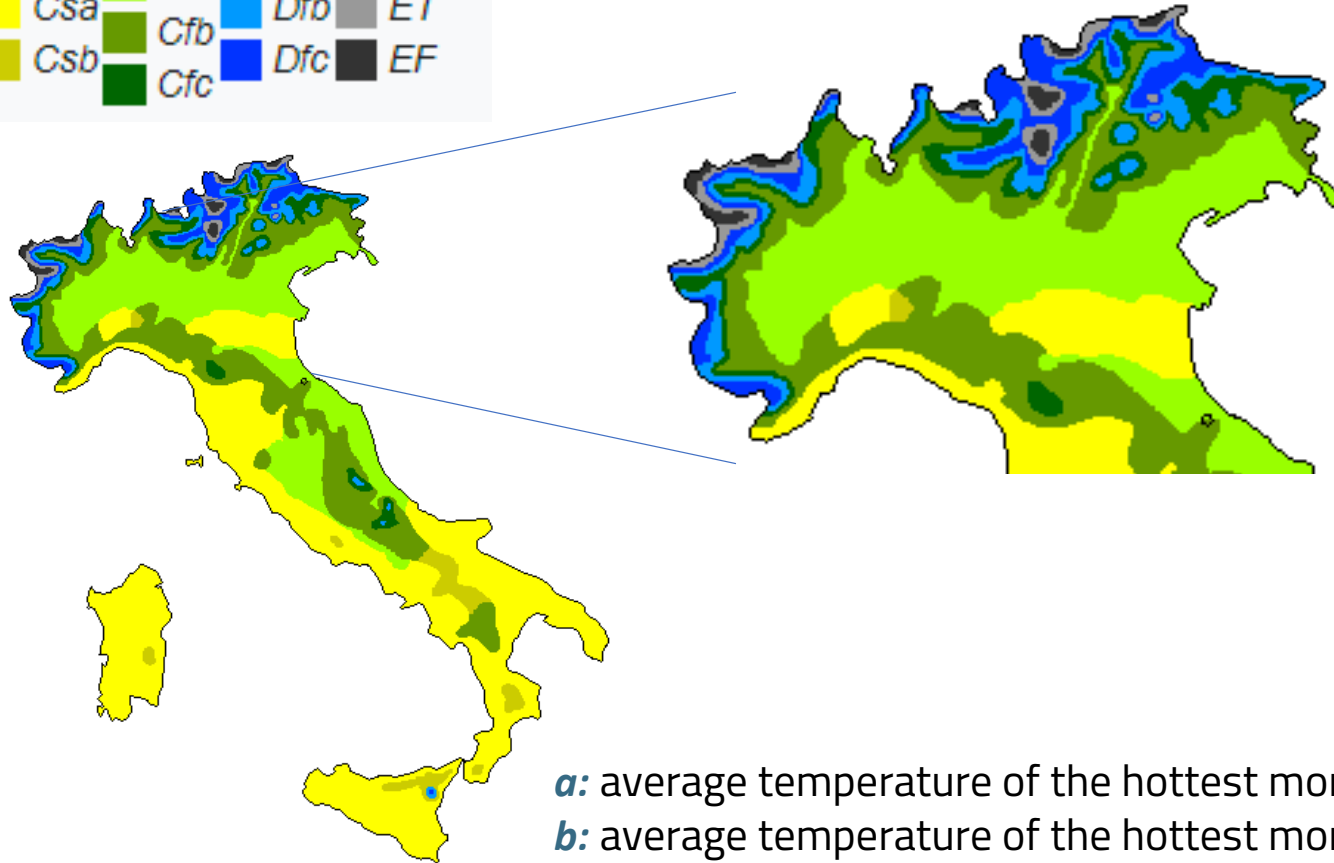
Identify common indicators to evaluate water balance. Modelling and forecasts



Flood Risk Management Plan
Hydrogeological Risk Mitigation

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

The climate in northern Italy



Where:

Cs: temperate climates with dry summer; at least one winter month has at least three times the rainfall of the driest summer month, which must be less than 30 mm.

Cf: temperate climates with humid summer.

Df: cold climates with wet winters

ET: tundra climates

EF: climates of perennial frost

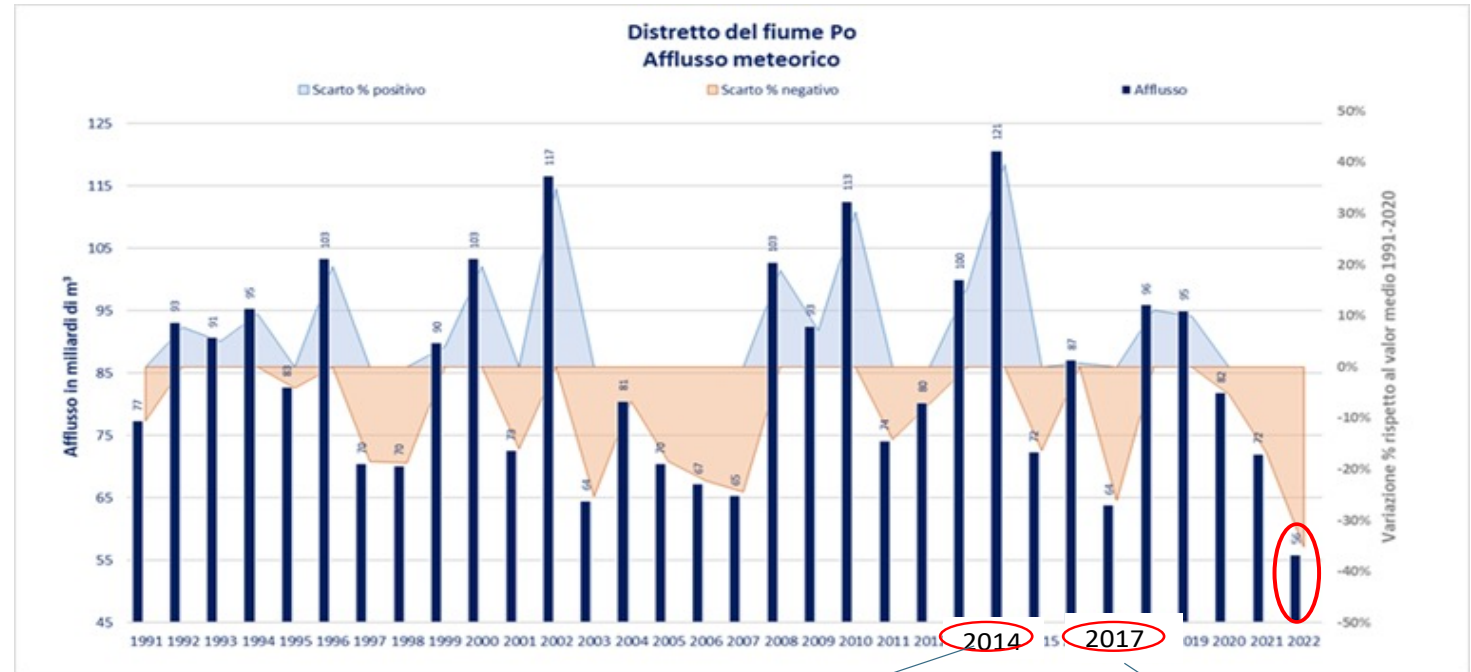
a: average temperature of the hottest month above 22°C

b: average temperature of the hottest month below 22 °C; at least 4 months above 10 °C

c: 1 to 3 months above 10°C; coldest month above -38°C.

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.



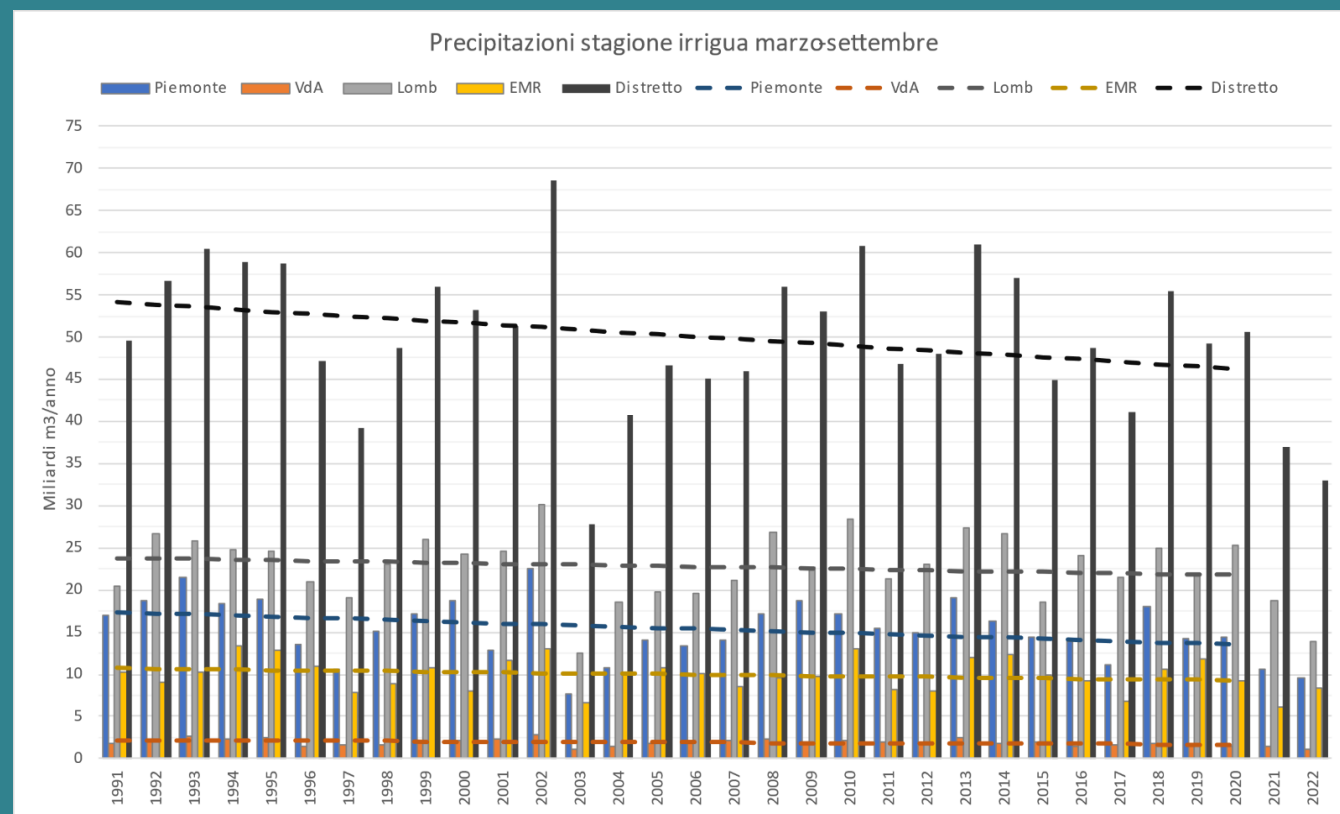
The **negative record** held since 2017 has been surpassed by the more recent **2022**, which recorded an average annual rainfall of only 644 mm with a total meteoric inflow of 56 bln m³.

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

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

Water availability in the District

The average annual precipitation on the Po river hydrographic district, in the reference period 1991-2020, was approximately 990 mm. Considering the extension of the District, the average annual inflow volume was approximately 86 billion m³. Of these, approximately 48 billion m³ are transported towards the sea by the Po river while the remaining 38 billion m³ represent the sum of the volumes evaporated, infiltrated and used by vegetation activity.



Po River Basin District and the resource numbers

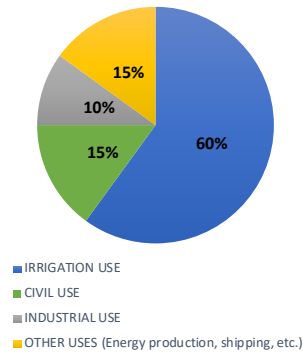
The overall demand for the various uses appears to be sustainable under conditions of normality and abundance, but the increasingly frequent and long-lasting drought periods observed in recent years have led to the emergence of major scarcity problems, especially in the irrigation sector.

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

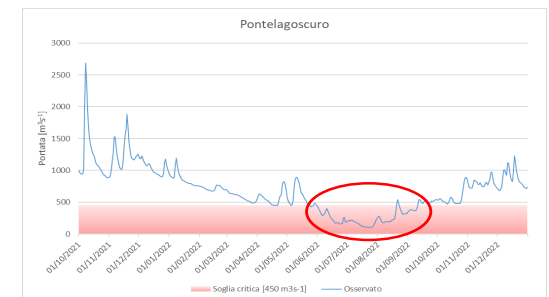
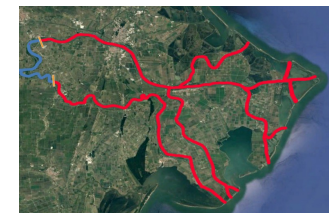


Po River Basin District and the 2022 water crisis

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



Seawater desalination

- New technologies convert seawater into freshwater that is suitable for drinking, cooking, bathing and more.

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

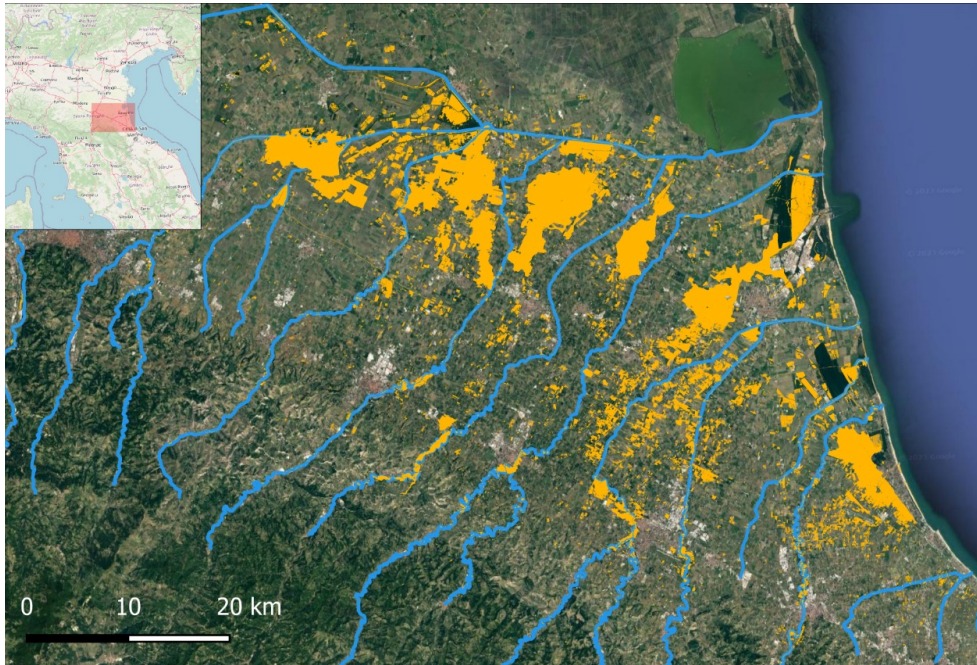
- Switching from flood irrigation systems to sprinklers or drip irrigation systems.
- Better soil management practices such as no till or limited tillage and mulching can significantly reduce water usage.

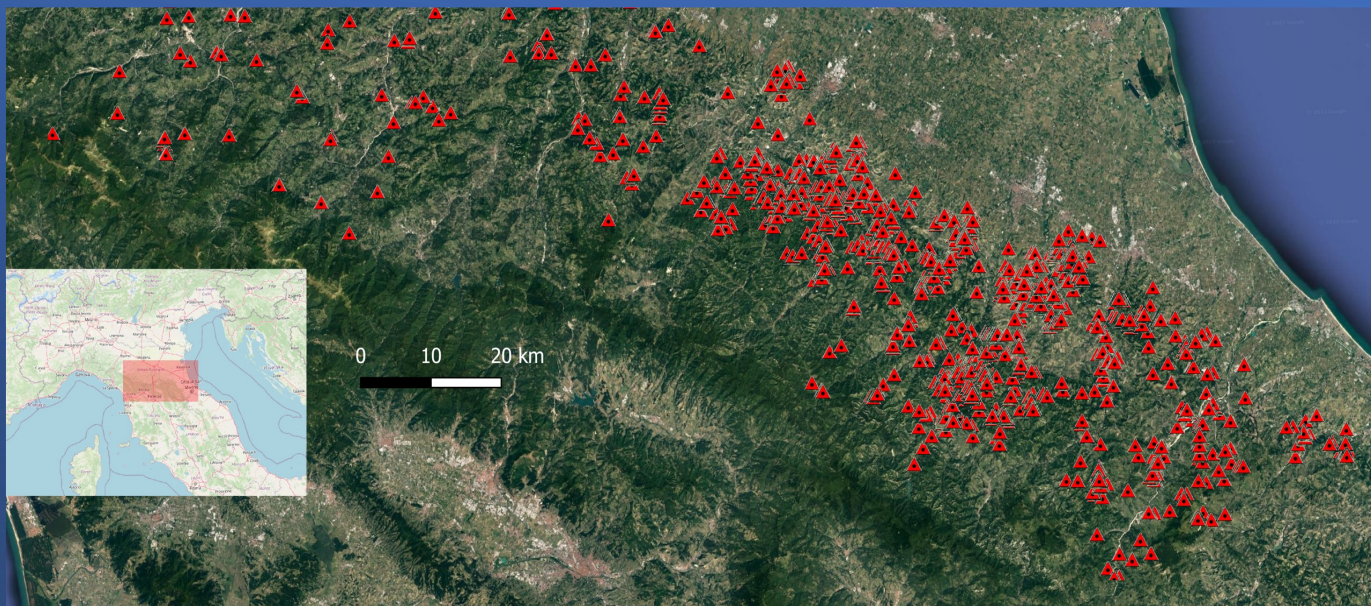
Recent flood events in Romagna (May 2023)

The rainfall events of 1-3 May and 16-17 May together accounted for **50% of the average annual rainfall** in the Emilia-Romagna region.

The rainfall event affected the entire river network, both natural and artificial, causing the **flooding of 23 rivers**.

Widespread flooding has occurred in the area between Bologna and Rimini, with **levee breaches** and widespread **slope instability** throughout the hilly and mountainous area (>80,000 landslides).





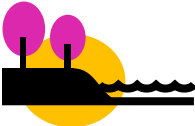
The rainfall events triggered widespread instability of the slopes throughout the hilly and mountainous area (>80,000 landslides), from the province of Reggio Emilia and in particular throughout Romagna

FRMP – Plan measures typologies

Measures to adapt to climate change and win-win



Sediments management
(General Sediment Management Programme)



Vegetation management in the riverbed and floodplain areas



Return of naturalness to watercourses to improve the natural lamination of floods



Relocations
Adjustment of bridges



Monitoring and control of levee vulnerability



Assessment of residual risk in fascia C, flood forecasting, warning and emergency management



Levee relocation



Improvement of the outflow capacity and flood plains by lowering the flood plains



Controlled flooding

Grey measures



Adjustment and completion of levee systems and expansion tanks

Early warning system

*Thank for
your
attention*

