



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

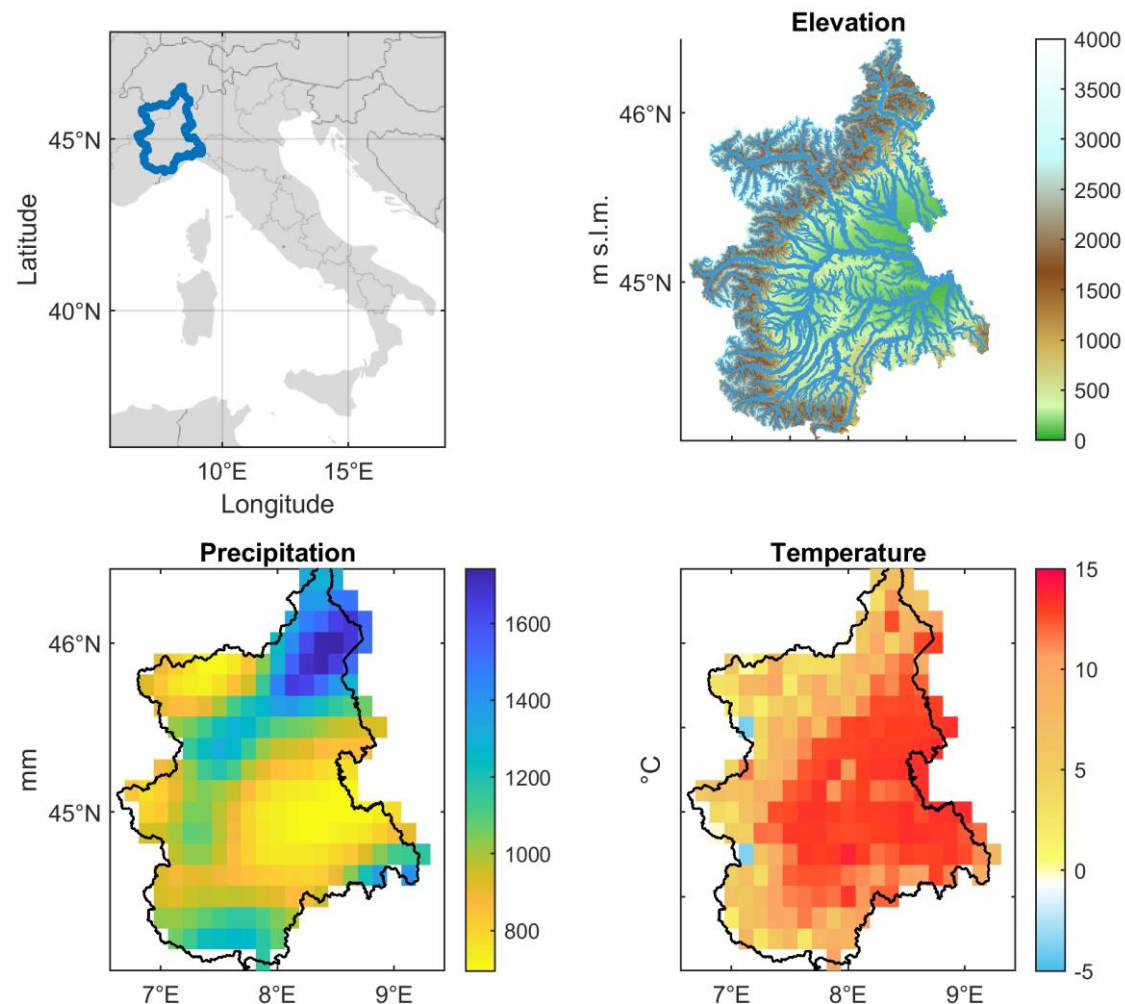
WATER RESOURCES IN AGRICULTURE: CURRENT ISSUES, CHALLENGES FOR THE FUTURE AND OPPORTUNITIES FROM THE "MOUNTRESILIENCE" PROJECT

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

Piemonte and the Alps

- Piemonte is surrounded by mountains (>30%) and, with VdA, it represents the head of the Po river basin
- Mountains capture and store large water volumes, in the form of rain and snow
- Hydrological regimes influenced by rainfall, snow dynamics, ice melt
- Water flows connect mountains and plains («water towers»)



credits: Mombrini et al. (2024, HESSD), accepted

Water infrastructures

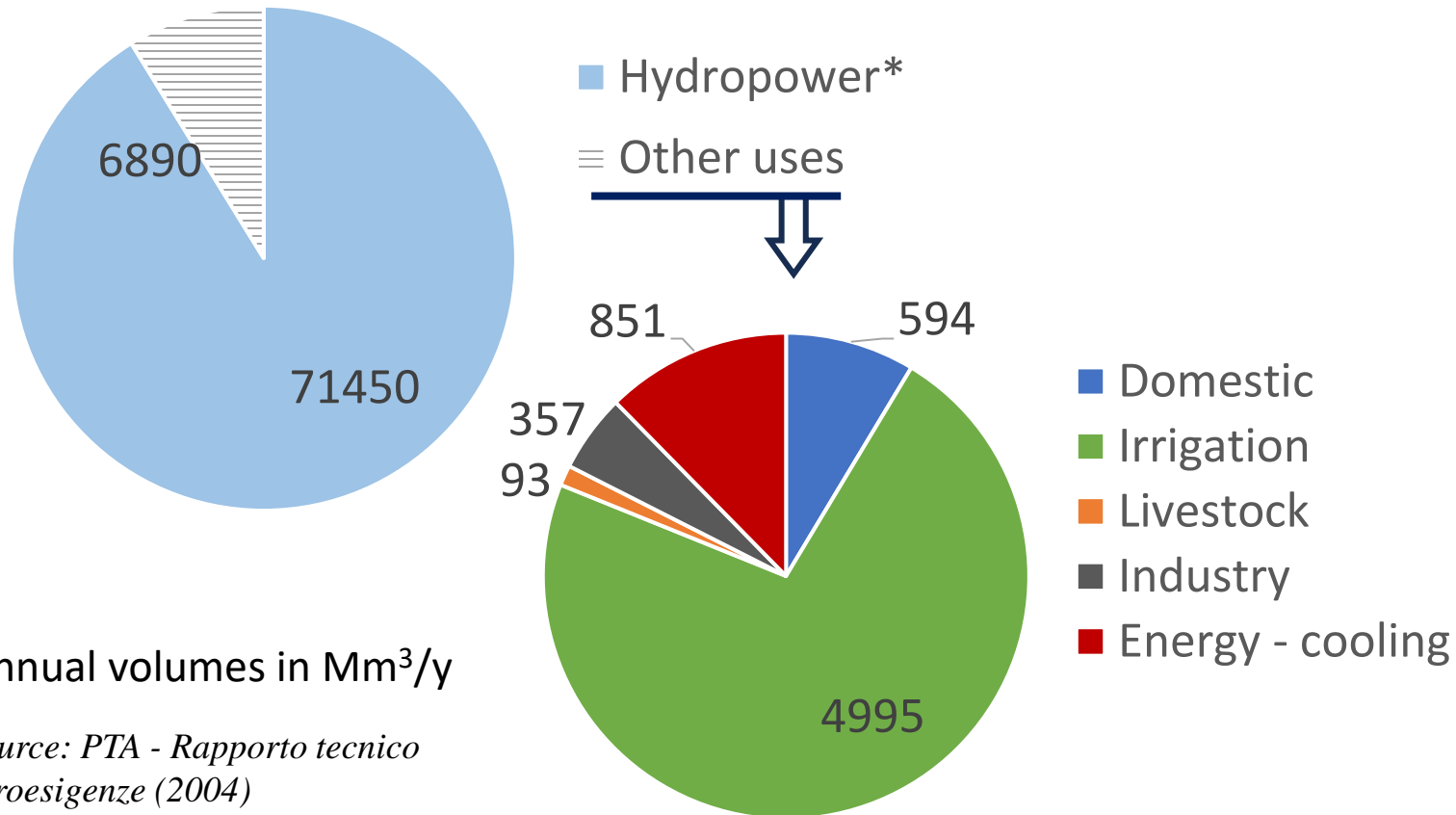


- Hystorical water abundance, favorable climate and good soil fertility led to development of agriculture (cereals, fruit trees, pastures)

- Irrigation infrastructures were also developped, the most famous one being the Canale Cavour (1866)
- Farmers formed *Consortia* to manage water for irrigation

Photo credits: L.Bourdon, AIOS

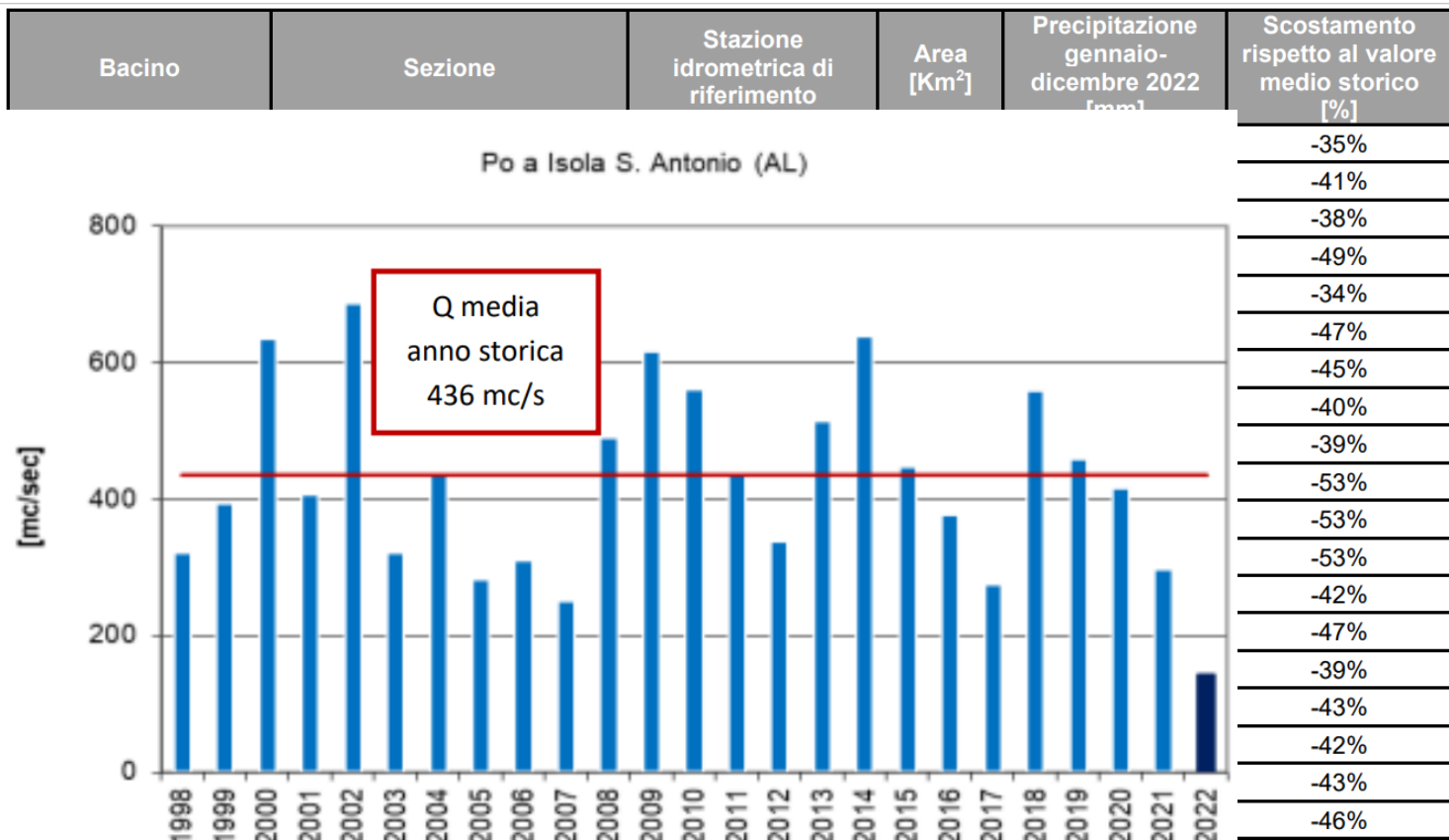
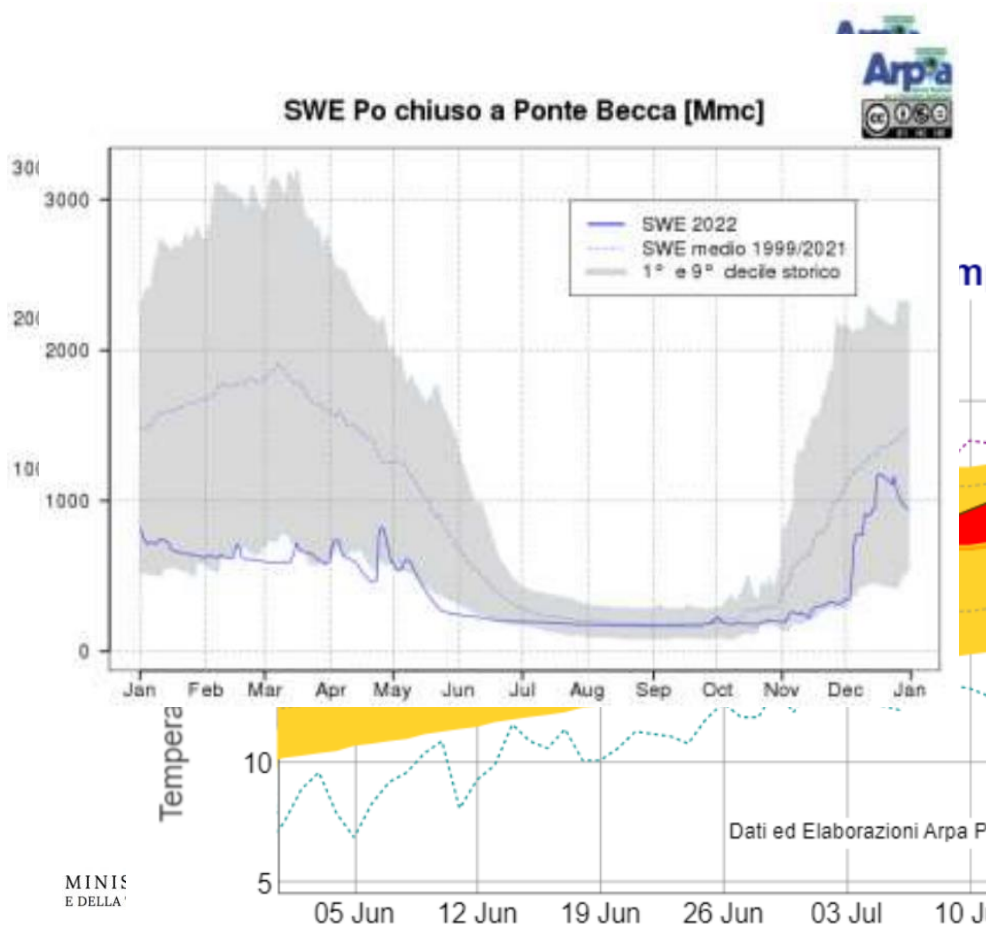
Water uses and requirements



- Strong competition for use of water
- Need to add up the environmental flow
- Temporal variability of water withdrawals, mostly for irrigation

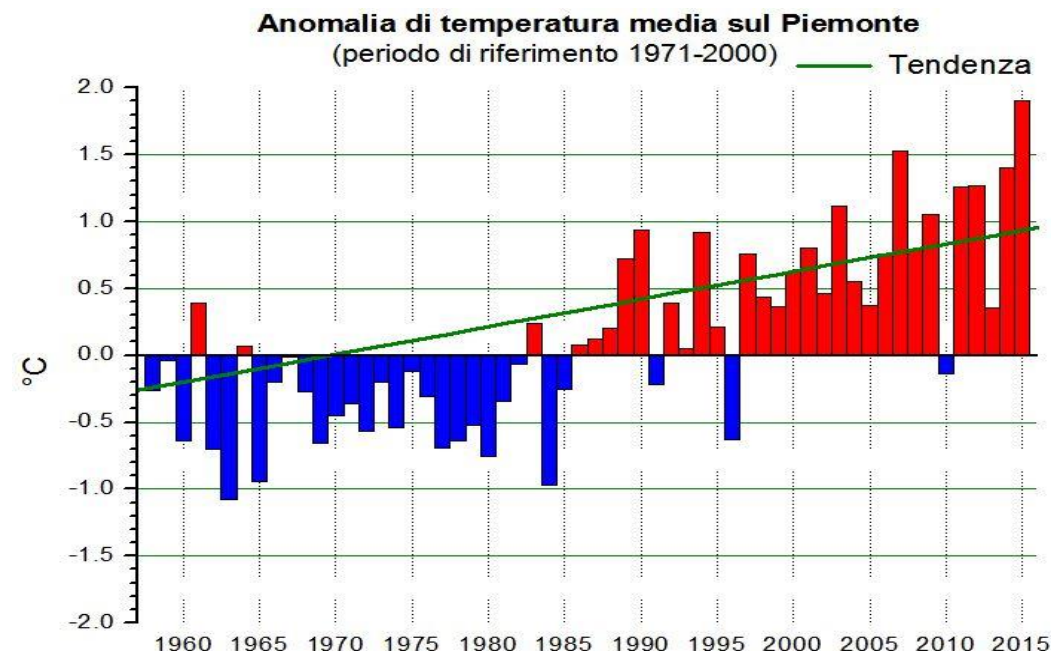
The 2022 drought

- Dry winter (no snow)
- Warm winter, hot summer
- Lack of precipitations (no rain)
- Extremely low flows

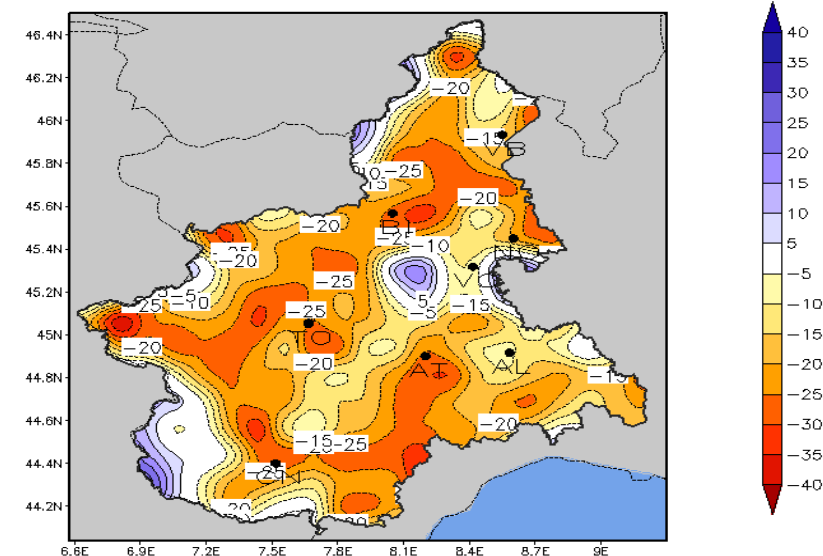


Climate change impacts

	Mountain	Lowland
TEMPERATURE - driven	<ul style="list-style-type: none"> - Decreased snowfalls - Ice melting - Permafrost degradation - Intensification of storms 	<ul style="list-style-type: none"> - Change in hydrological regimes (winter and summer) - Increase in ET - Changed conditions for crops - Heatwaves
PRECIPITATION - driven	<ul style="list-style-type: none"> - Increased duration of dry periods - Decreased water infiltration - Increased frequency of extreme rainfalls 	<ul style="list-style-type: none"> - Increased duration of dry periods - Less rainy days - Increase of frequency of extreme rainfalls - Lower soil moisture and groundwater recharge - Increase of crop water stress



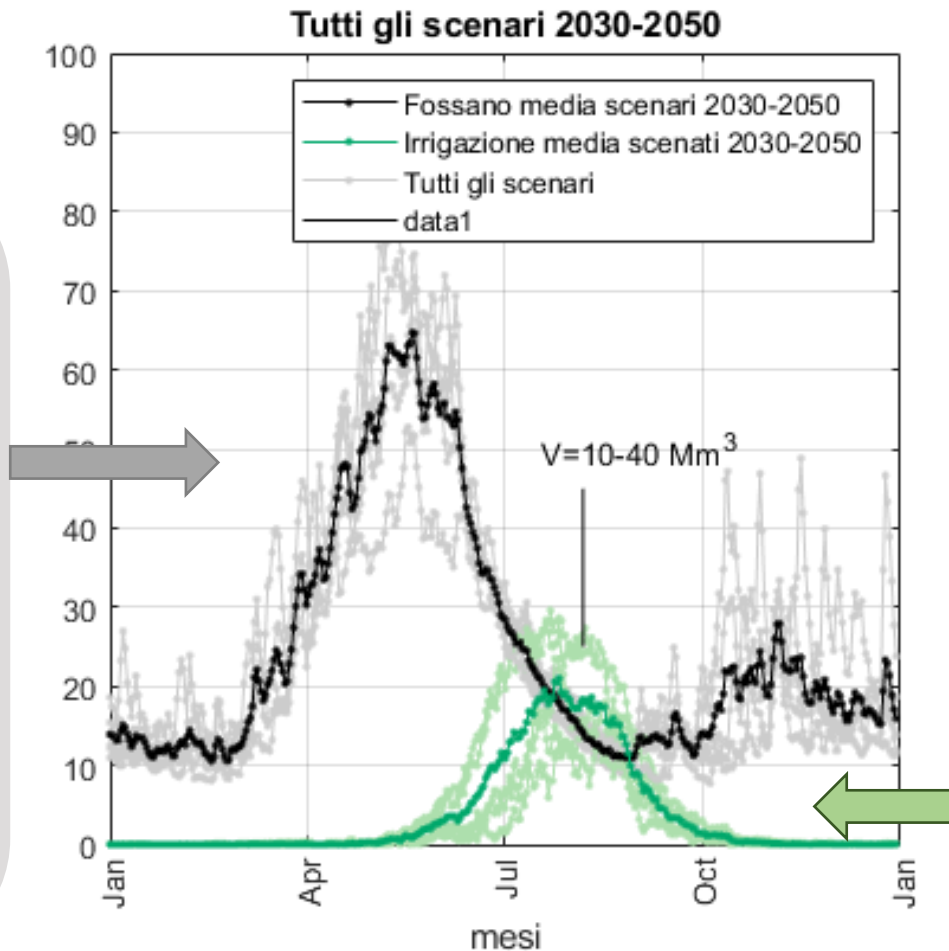
Differenza del numero medio di giorni piovosi
tra 2001-2015 e 1971-2000



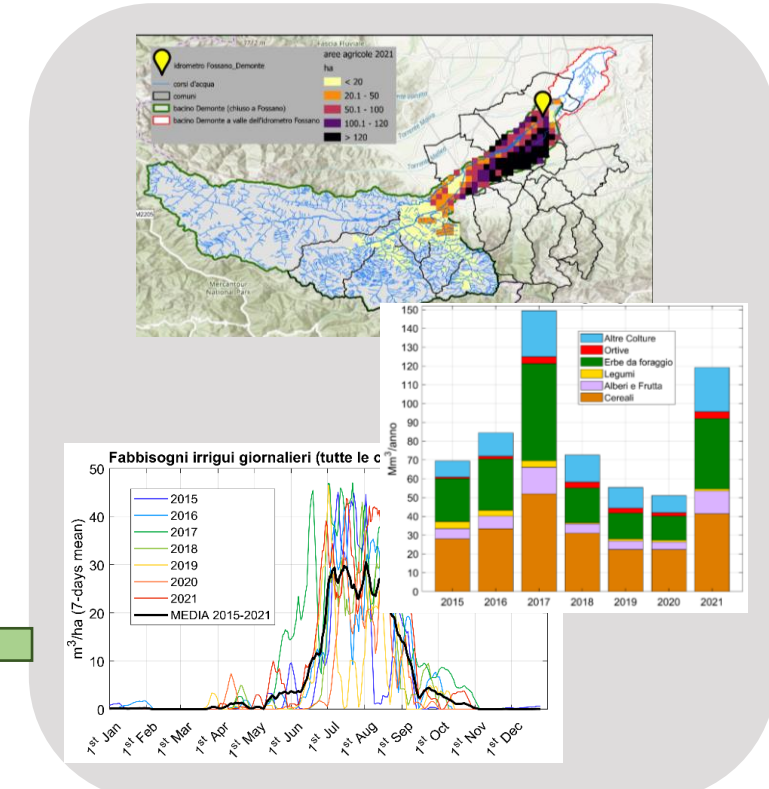
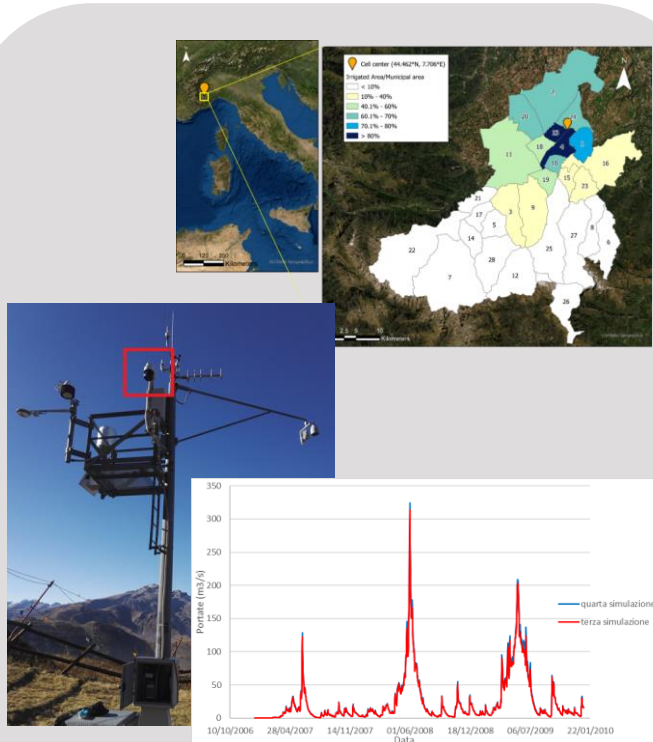
credits: ARPA Piemonte – Portale sul clima

Challenge

➔ Meeting **water availability** and **water requirements**



credits: D.Poggi et al. (2022), report PITER



Challenge options

WATER AVAILABILITY

Increasing storage capacity (large scale, small scale...)

Slow down the runoff

Increase infiltration (e.g., MAR)

Use of unconventional water resources

WATER USE

Increase irrigation efficiency

Reduce distribution losses
(pressure vs open channels)

Optimize water use (deficit irrigation)

...

Opportunities from MountResilience



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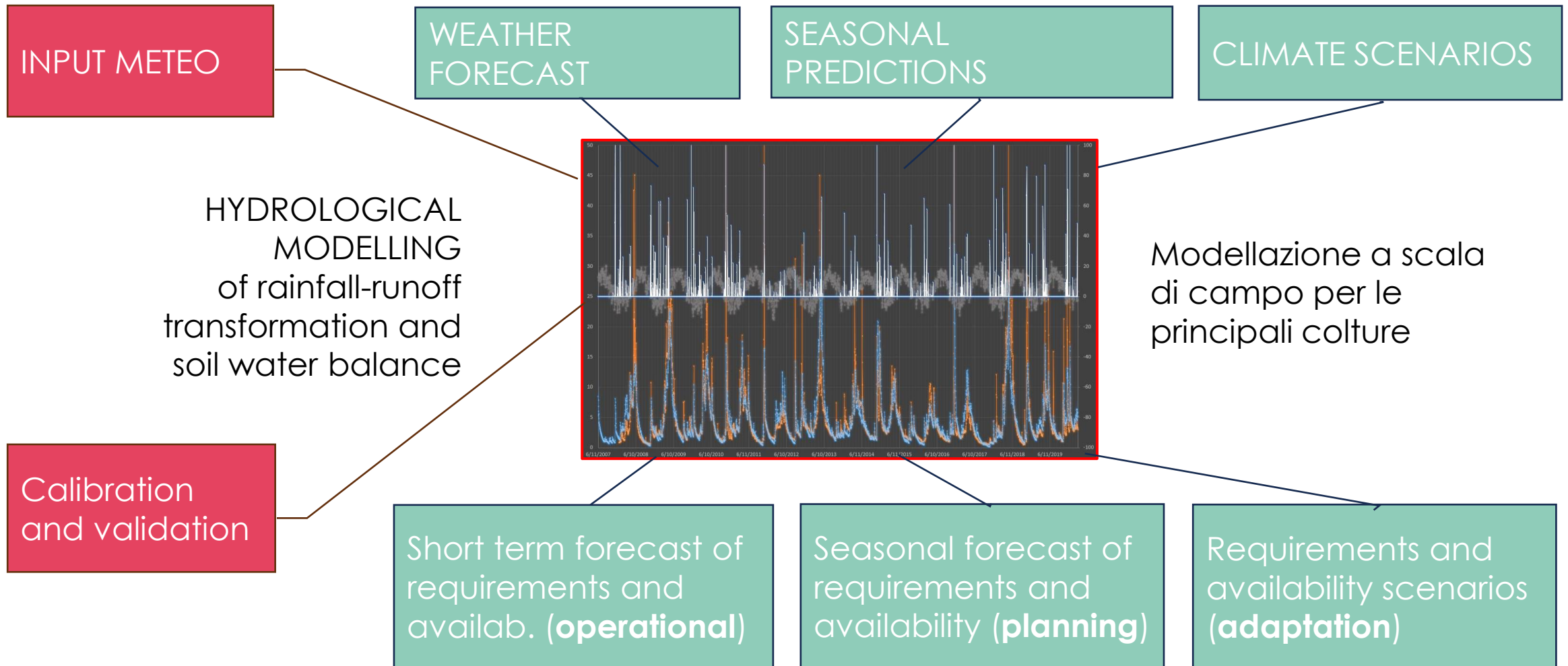


GOAL: to support the development of CC Adaptation solutions for water management through the creation of decision-support tools (DST) for farms and irrigation consortia and the definition of a regional strategy with stakeholder engagement.

- DST 1 - irrigation consortia level: a DS tool, based on hydrological modelling of catchments and irrigated areas to
 - **estimate water availability** in rivers and gw bodies;
 - mimic irrigation infrastructure functioning;
 - assess the impact of **climate scenarios**.
- DST 2 - farm level: a DS tools for farmers to quantify water use efficiency on the basis of locally collected data (soil, crop, meteo conditions...) and estimated variables (ET, percolation...)



MountResilience, DST 1



Other opportunities at local scale



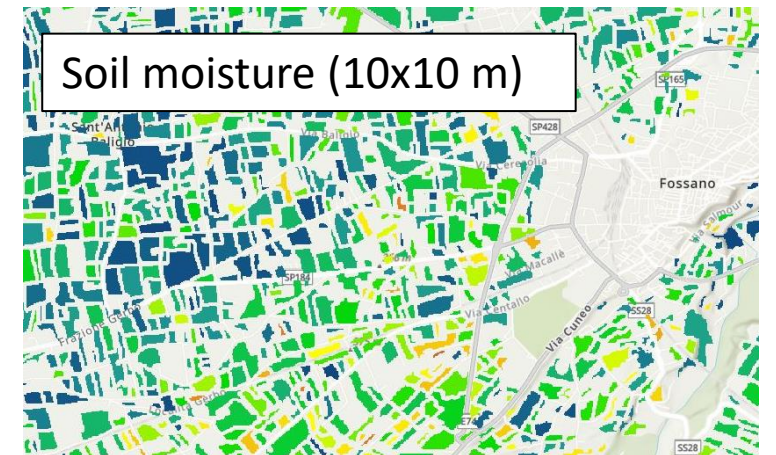
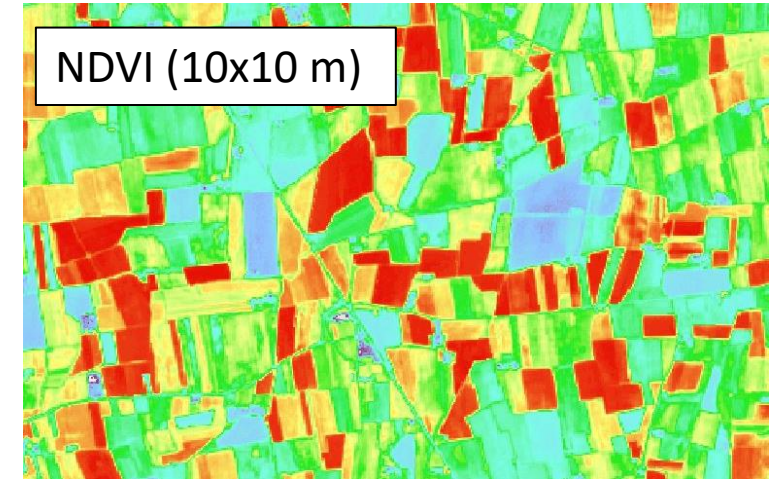
Autorità di Bacino
Distrettuale del Fiume Po



**LIFE
CLIMAX
PO**
Make the Change

Exploitation of satellite data MSI (Multispectral Instrument, e.g. Sentinel-2) and SAR (Synthetic Aperture Radar, e.g. Sentinel-1) for:

- Monitoring crop water stress
- Anticipation of irrigation requirements and yield losses
- Quantification of soil wetness
- Assessment of anomalies



credits: Rolle et al. (2022)

Roadmap for CC adaptation



- Increase knowledge and understanding
- Improve the quantitative monitoring
- Develop impact models
- Test adaptation solutions
- Consider transformative adaptation

... because the worse choice is not to choose,
and the worse action is indeed inaction!

Thanks for your attention!

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