

# CLIMAAX Community of practice

## *Agricultural Drought Risk Assessment: Learning from regions*

**April 16, 2026**  
10:30-12 CET



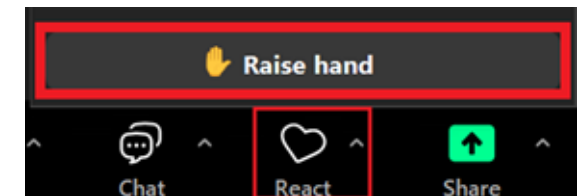
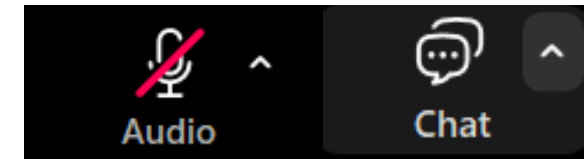
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climate ready regions

# HOUSEKEEPING

- Please note that the meeting is being **recorded**.
- Please, keep your **mic off**.
- Feel free to post your **questions in the chat** (bottom of the screen) or raise your hand to talk



# MEETING AGENDA

- ✓ 10:30-10:35 **Welcome & introduction to the webinar**
- ✓ 10:35-10:45 **Introduction to the *Agriculture Drought workflow***
  - Speaker: Antonio Trabucco and Andrea Rivosecchi (CMCC)
- ✓ 10:45-11:30 **Regional experience**
  - Şanlıurfa Metropolitan Municipality, Turkey - Speakers: Mehmet Demir, Tamer Atalay, and Hakan Duman
  - Unione dei Comuni della Valcerrina, Italy - Speakers: Enrico Lucca, Maroussia Terrana
  - Autonomous Province of Vojvodina, Serbia - Speaker: *Teodora Subotić*
- ✓ 11:30-11:50 **Panel discussion and Q&A**
  - Moderators: Fulvio Biddau, Maria Katherina Dal Barco and Majid Niazkar (CMCC)
- ✓ 11:50-12:00 **Closing remarks**



# NEW HAZARD- AND WORKFLOW-FOCUSED SERIES





## Moving forward in CLIMAAX CoP from:

- **Thematic webinars** and workshops connecting science, policy and practice to support CRAs using the CLIMAAX Framework and Toolbox
- **Demo & co-design sessions** for refining and fostering usability of CLIMAAX outcomes

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# **INTRODUCTION TO AGRICULTURAL DROUGHT WORKFLOW**



**Antonio Trabucco**  
(CMCC)



**Andrea Rivosecchi**  
(CMCC)

# Agricultural Drought workflow

*Community of Practice webinar*

**Andrea Rivosecchi, CMCC**  
**Antonio Trabucco, CMCC**

16 April 2026



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# Agricultural Drought

FAO defines it as “**insufficient soil moisture** to meet the needs of a particular **crop** at a particular time”.

Frequency and intensity will increase in Europe:

**Southern Europe** → more intense and prolonged drought periods creating water allocation conflicts between sectors.

**⚠ Water scarcity during droughts**

**Central and Northern Europe** → reduced precipitation rates hindering rainfed agricultural production.

**⚠ Absence of irrigation infrastructure**



# Contents

- Introduction to Agricultural Droughts
- Aim and Set up of the workflows
- Risk Assessment Methodology
- Hazard Workflow
- Risk Workflow



# Aim and Set-up

## AIM

Estimate potential agricultural revenue losses from water scarcity.

➡ Loss = irrigated vs rainfed revenue ('lost-opportunity cost').

## SET-UP

Workflows run at NUTS2 level and focus on crops cultivated across Europe. Input datasets are customisable and adaptable to the users' local needs.

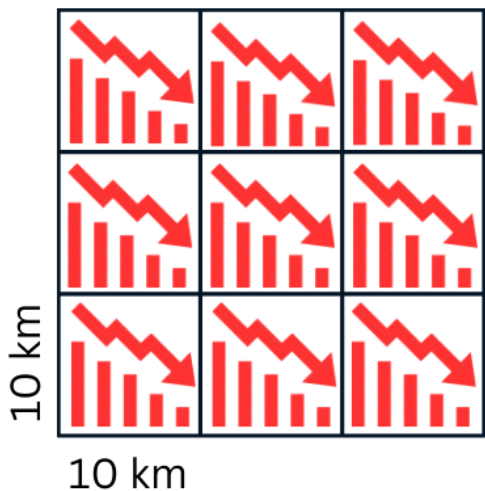


# Risk Assessment Methodology

## HAZARD WORKFLOW

**HAZARD** — **EXPOSURE** — **VULNERABILITY** → **RISK**

Yield reduction



# Hazard workflow

## 1<sup>st</sup> step:

**Calculation of reference crop evapotranspiration (ET<sub>0</sub>) using Penman-Monteith equation**

➡ Fully-irrigated evapotranspiration of idealised crop given climate conditions and elevation

➡ Data: Climate and elevation

## 2<sup>nd</sup> step:

**Calculation of crop specific (ET<sub>c</sub>) and actual evapotranspiration (ETA) given local conditions**

➡ For studied crop: ETC = maximum evap., ETA= actual evap. under rainfed conditions

➡ Data: Precipitation, soil available water capacity, crop parameters

## 3<sup>rd</sup> step:

**Calculation of potential yield reduction from evapotranspiration deficit**

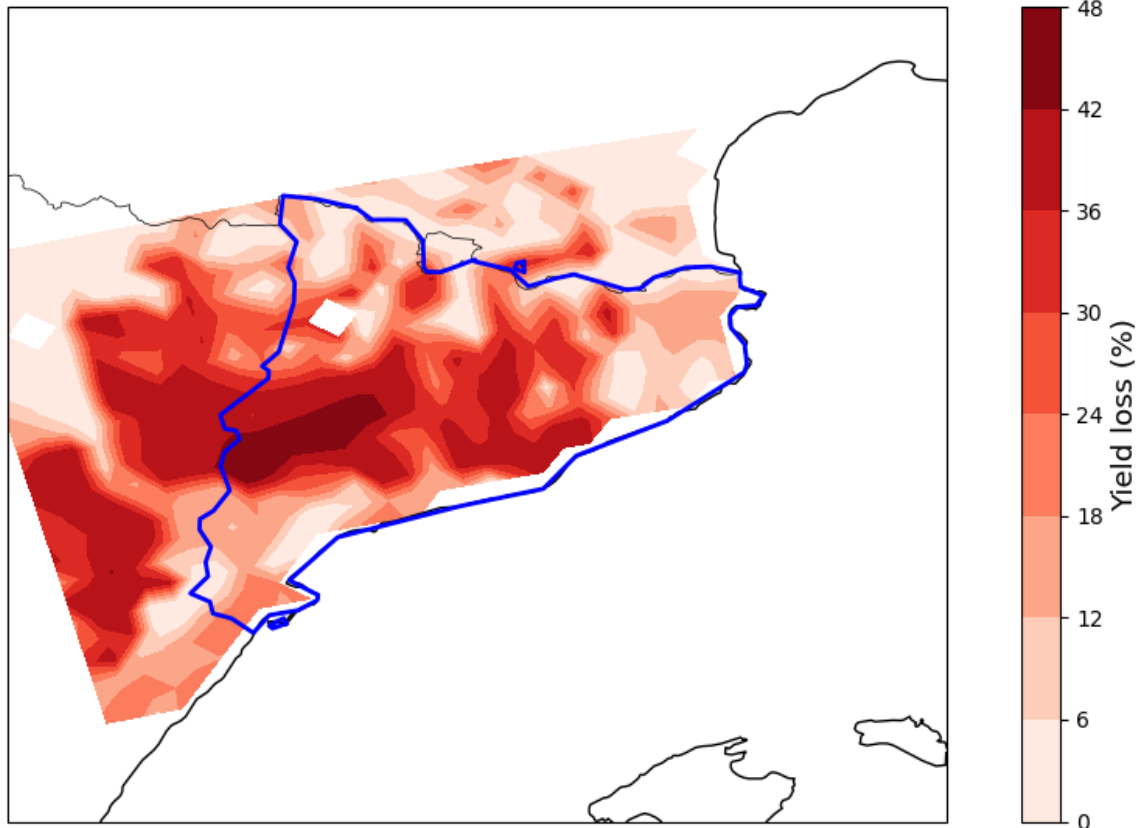
➡ Yield response to water deficit (Doorenbos et al., 1979)



# Example output

## Wheat yield loss from precipitation deficit

Cataluña rcp26 2046-2050 mpi-smhi



+ summary netcdf file with all the results

Identify areas prone to highest **hydro-climatic stress**



Guide **adaptation** and/or future cropland expansion towards a more **cost-effective** use of resources



# Risk workflow

## 1<sup>st</sup> step:

### Calculation of current revenue (EUR) per ton of crop

- ➡ Crop production in region (ton) \* value of production (EUR/ton)
- ➡ Value of production from FAO GAEZ (staple version) or EUROSTAT (non-staple version).

## 2<sup>nd</sup> step:

### Calculate revenue loss per grid cell

- ➡ Rev loss = current rev (EUR) \* yield loss (% , from Hazard)

## 3<sup>rd</sup> step:

### Integrate irrigation availability to map vulnerability

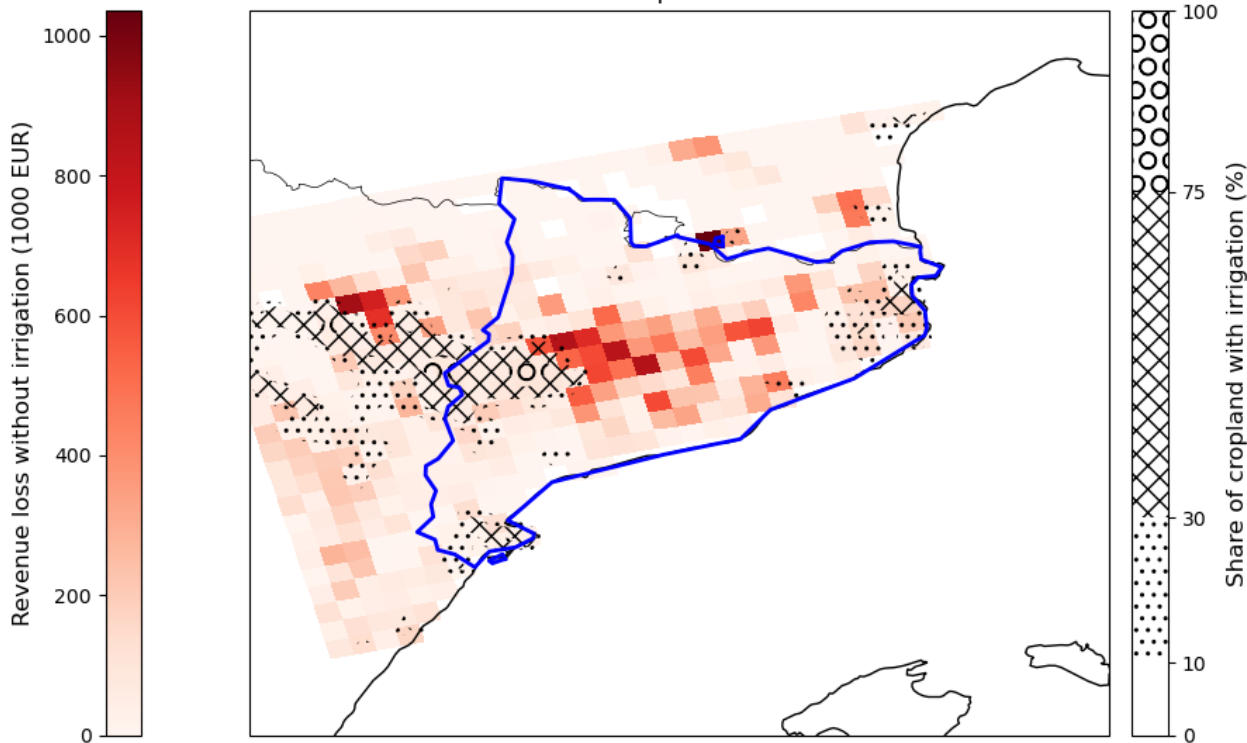
- ➡ % of cropland with irrigation infrastructure currently available



# Example output

WHEA revenue loss from precipitation deficit

Cataluña rcp26 2046-2050



Identify areas suffering the highest **lost opportunity cost** and **vulnerability**



Estimate **benefits** of investing in irrigation expansion for drought **adaptation**





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[www.climaax.eu](http://www.climaax.eu)

*Thanks for your attention!*



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# REGIONAL EXPERIENCES

Autonomous Province of Vojvodina



**Teodora  
Subotić**

Şanlıurfa Metropolitan Municipality



**Mehmet  
Demir**



**Tame  
r  
Atalay**

Unione dei Comuni della Valcerrina



**Enrico  
Lucca**



**Maroussia  
Terrana**



**Hakan  
Duman**

# Agricultural Drought Risk Assessment in Şanlıurfa: *Adapting CLIMAAX Workflows with Regional Data*

CLIMAAX CoP Webinar – Learning from Regional Implementation

M. Demir, H. Duman, T. Atalay  
Climate Change and Zero Waste Department

Şanlıurfa Metropolitan Municipality  
Online (Zoom), 16 April 2026



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## Who are we?

### Sanliurfa Metropolitan Municipality- City Profile

- Population : 2.300.000 inhabitants (2025)
- Area : 19.220 km<sup>2</sup>
- Land Cover : 65% Cropland, 1% Forestland
- Urban Greenland : 4,3 m<sup>2</sup>/cap (One of the lowest in Türkiye)
- Climate : Csa ( Dry and very hot summer)
- GDP : <4.500 €/year ( Main sector is Agriculture)
- Average Age : 21.1 (The youngest ave. pop. of Türkiye)

### CLIMAAX- CRAS Project Team Profile

- Project manager : SMM Climate Change&Zero Waste Dept. Dir. (Env. Eng)
- Project Coordinator: E.E Eng. (PMI)
- Technical Lead : Env. Eng. (Atalay Climate Consulting)
- Team Members : 3 Env. Eng; 1 GIS Expert, 1 Python Developer



## Who are we?



## Şanlıurfa: From Deep History to Today's Climate Challenge

- Göbekli Tepe (Şanlıurfa) – one of the oldest ritual sites ( $\approx 11-12$ k years).
- Upper Mesopotamia, between the Euphrates & Tigris – people lived here for millennia thanks to water and fertile land.
- In recent decades (especially the last 10–20 years), the effects we feel from heat and drought are more visible, and awareness is higher.

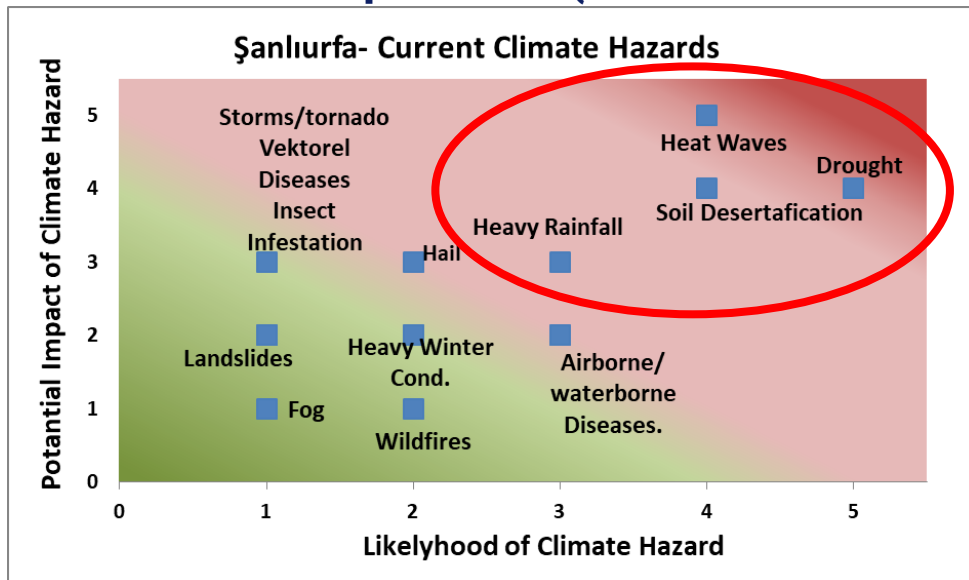


## Past Activities

- **Commitment** to GCoM: «Net-Zero and Climate Resilient Şanlıurfa by 2050»
- **GHG Inventory** by means of GPC/CIRIS ( 2018-2025)
- **Qualitative Risk and Vulnerability Assessment**
  - Survey #1 Hazard Assessment
  - Survey #2: Vulnerable Sectors
  - Survey #3: Adaptive Capacity
- Quantitative Risk Assessment by means of **CLIMAAX**
- **Stakeholder Engagement** Meetings
- **Climate Change Action Plan**
  - SECAP2022, SECAP2024Rev
  - CDP Reporting (CDP Score: A-)
- P2R Project Beneficiary



# Climate Risk Exploration (Qualitative Assessment)



(Survey #1 Hazard Assessment)

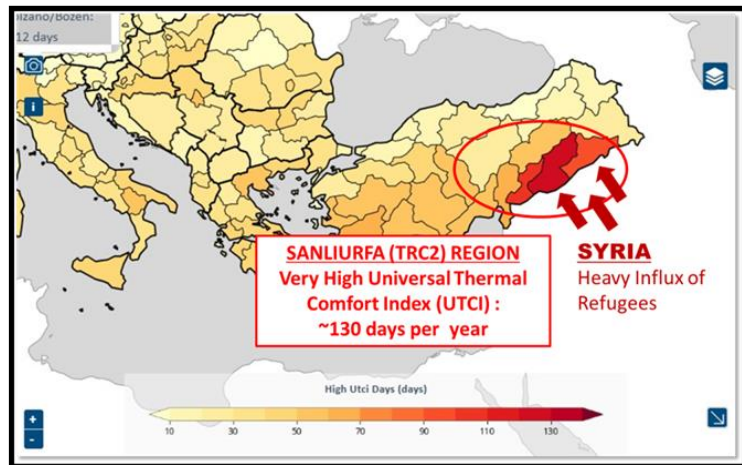
- #1 : Heatwaves
- #2 : Agricultural Drought
- #3 : Soil Salination/Desertification
- #4 : Heavy Rainfall and Surface Floods

Climate Hazards	Current Impact	Severity (m: 1-5)	Probability (p: 1-5)	Risk (m x p)
• Heavy Rainfalls and Floods	Currently affecting the city	3 - Moderate	3 - Moderate	(9) Significant/Moderate
• Heatwaves	Currently affecting the city	4 - High	5 - Very high	(20) Very Serious/High
• Drought	Currently affecting the city	5 - Very high	4 - High	(20) Very Serious/High
• .....				

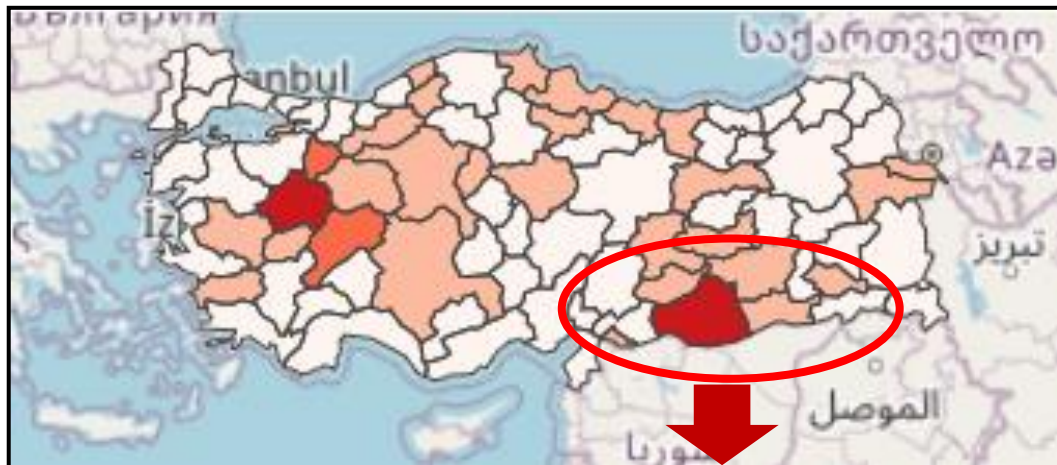


# Climate Risk Exploration (Qualitative Assessment)

## Extreme Heat Waves



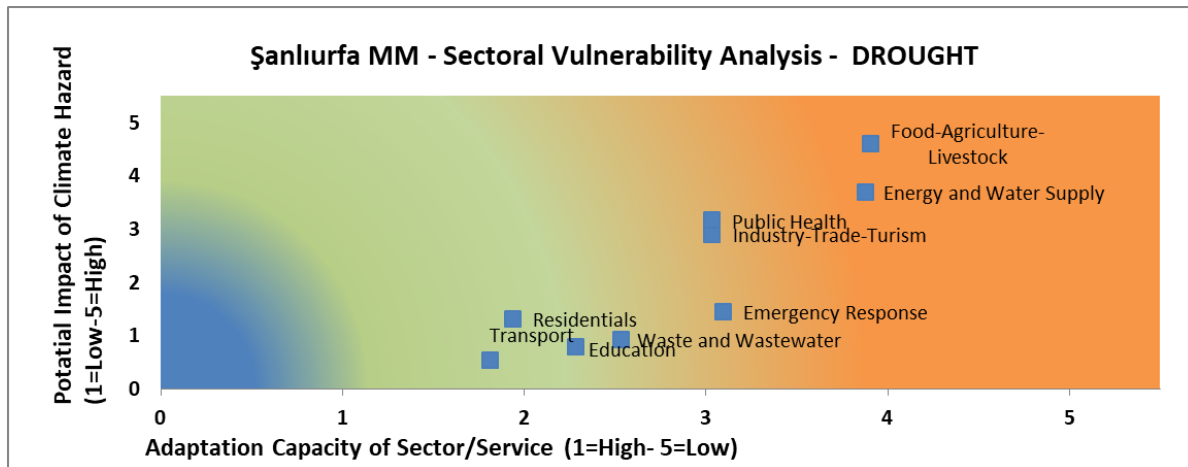
## High (Relative) Drought Risk



**RISK = 4 / 5**



# Climate Risk Exploration (Qualitative Assessment)



Survey #2: Vulnerable Sectors  
Survey #3: Adaptive Capacity

Climate Hazards	Most Affected 5 Sector	Potential Impact on Sector PI1 - PI5 (Low-High)	Adaptive Capacity AC1 - AC5 ( High-Low )
<b>Drought</b>	Food-Agriculture-Livestock	PI1 - Very Low: Sector/Service is Not Affected.	AC1 - Very High: No Improvement Needed for Adaptation.
	Energy and Water Supply	PI2 - Low: Sector/Service May interrupt Temporarily	AC2 - High: Additional Improvement May Be Necessary.
	Public Health	PI3 - Medium: Sector/Service Shows Tendency to Deteriorate	AC3 - Medium: Additional Investment Required for Adaptation.
	Industry-Trade-Tourism	PI4 - High: Sector/Service Disrupt.	AC4 - Very Low: High Investment Required for Adaptation.
	Emergency Response	PI5 - Very High: Collapse. Unmanageable	AC5 - None: Very High Investment Required for Adaptation



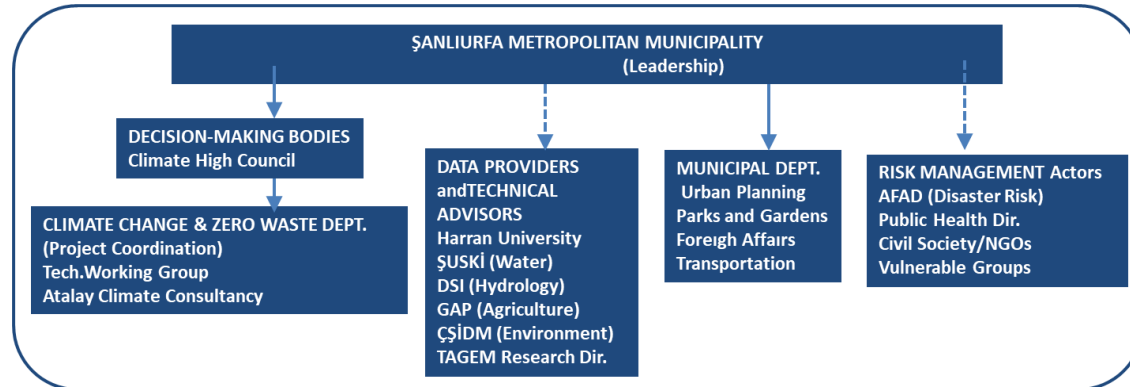
# Climate Risk Management - Engagement, Governance, Institutional set up

## Advantages:

- Top management committment
- Implemented « Sustainable Energy and Climate Action Plan-SECAP»
- Annual Climate Risk Management review and response trough CDP

## Challanges:

- High Risk, Limited Capacity
- New climate organizations
- Fragmented risk ownership
- Need for structured, comparable methodology

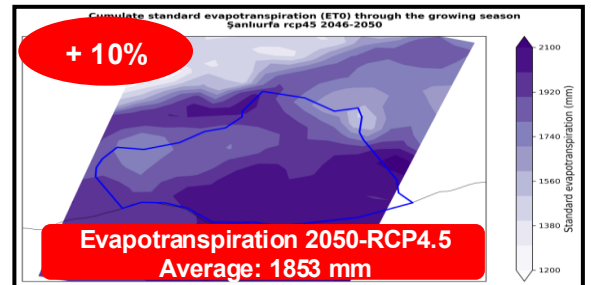
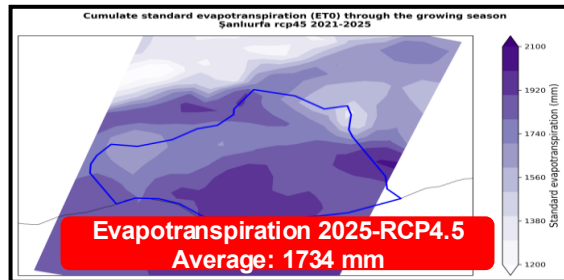
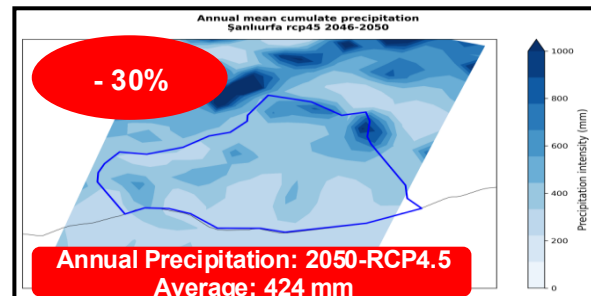
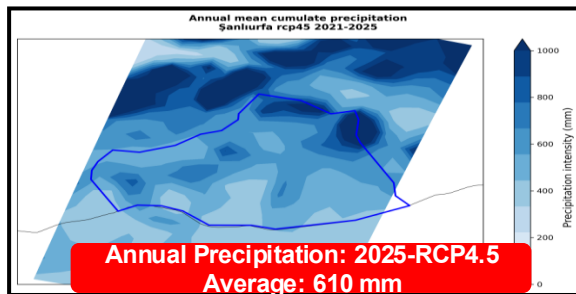


# Drought Risk Analysis – Regional Interventions in CLIMAAX Workflows

## 1. Comperable Hazard and Risk Analysis: For RCP4.5 /RCP 8.5 scenario covering the temporal periods of both 2021-2025 and 2041–2045 for comparison

- RCP 4.5 vs RCP 8.5
- 2021-2025 vs 2041–2045
- Winter Crops vs Summer Crops

Lower Precipitapn +  
Higher Evapotranspiration =  
Higher artificial irrigation needs



## Drought Risk Analysis – Regional Interventions in CLIMAAX workflows

**2. Modified «Regional\_Crop\_Table»** The regional main crops of the TRC21 region (Cotton, Maize, Wheat, Pistachios, Lentil, and Chickpea) parameterized in the regional crop coefficients instead of FAO's more general insufficient crop table

FAO Code	Crop	Clim	Kc_in	Kc_mid	Kc_end	lgp_f1	lgp_f2	lgp_f3	lgp_f4	Season start	Season End	RD1	RD2	DF	Type	Ky
111	wheat	Regional	0.66	1.14	0.26	0.137	0.522	0.183	0.137	286	139	0.2	1.25	0.55	1	1
112	maize	Regional	0.29	1.25	0.37	0.177	0.25	0.339	0.234	141	281	0.2	1	0.55	1	1.25
9211	Cotton	Regional	0.32	1.25	0.62	0.166	0.274	0.31	0.25	120	301	0.2	1.35	0.65	1	0.85
365	Pistachio	Regional	0.4	1.1	0.45	0.089	0.292	0.354	0.266	71	297	1.25	1.25	0.4	0	0.85
201	Lentil	Regional	0.67	1.09	0.31	0.143	0.524	0.19	0.143	310	155	0.2	0.7	0.5	1	1
191	Chickpea	Regional	0.86	0.97	0.34	0.193	0.387	0.29	0.129	317	107	0.2	0.8	0.5	1	0.6

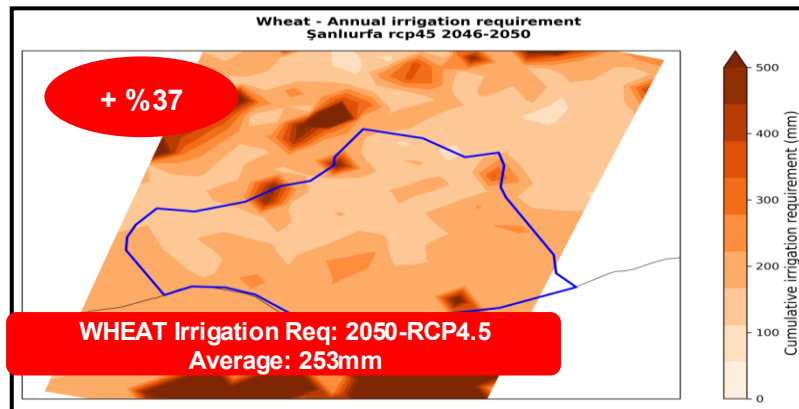
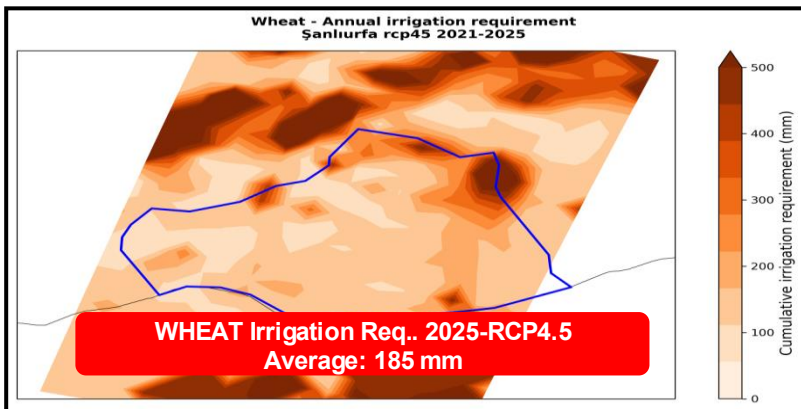
Source: The Ministry of Agriculture and Forestry- Turkish Agricultural Research Center (TAGEM)

<https://www.tarimorman.gov.tr/TAGEM/Belgeler/yayin/Tu%CC%88rkiyede%20Sulanan%20Bitkilerin%20Bitki%20Su%20Tu%CC%88ketimleri.pdf>



## Drought Risk Analysis – Regional Interventions in CLIMAAX workflows

3. **Visualization of regional irrigation water needs:** Besides, yield loss maps, artificial irrigation requirements for current and future temporal periods were also visualised.



# Drought Risk Analysis – Regional Interventions in CLIMAAX workflows

## 4. Comparison of winter and summer crops with respect to change in yield loss and irrigation requirements between current and near future:

### Relative change in current and near future

#### Winter Crops:

Rainfed dependent

35-40% more irrigation water req.

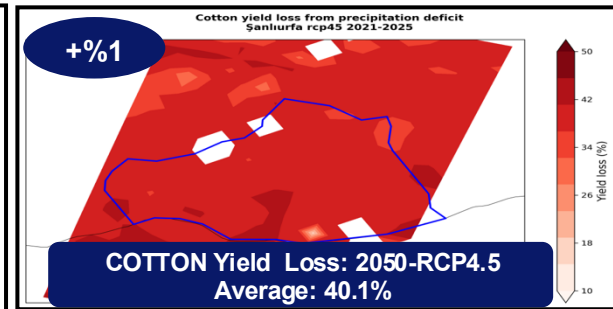
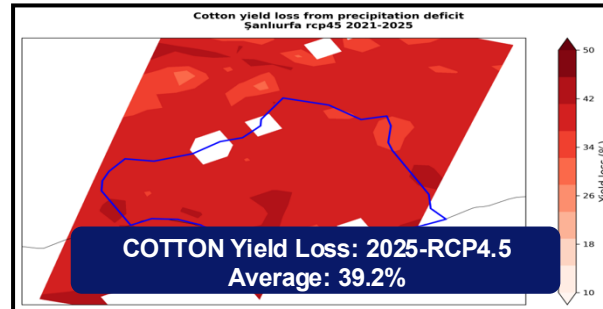
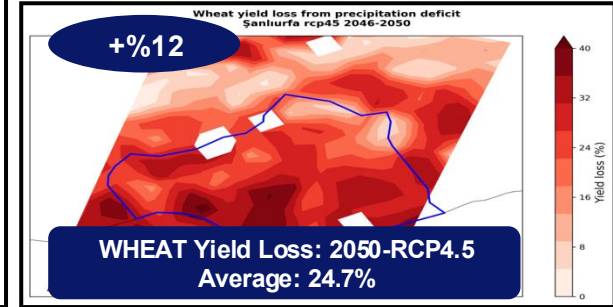
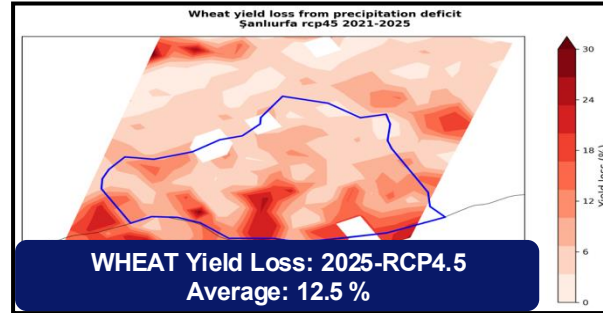
10-15% Increase in yield loss

#### Summer Crops:

Artificial irrigation dependent

The same irrigation water req.

1% increase in yield loss



# Drought Risk Analysis – Regional Interventions in CLIMAAX workflows

## 5. Integration of local crop productions and local unit prices instead of rough mapSPAM and GAEZ Aggregated values:

	Crop_ID	WHEA	MAIZ	COTT	LENT	CHIC
<b>Regional_Unit_Prices.csv</b>	Unit_Price_USD_per_ton	343	288	789	738	1018

$$\text{Revenue Loss} = \text{Yield\_Loss\_perc} * \text{Regional\_crop\_productions\_2024} * \text{Regional\_unit\_price}$$

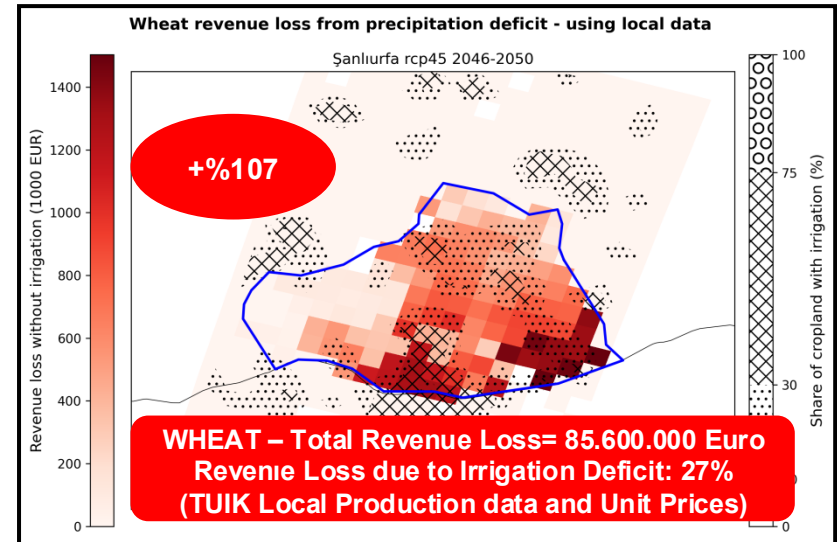
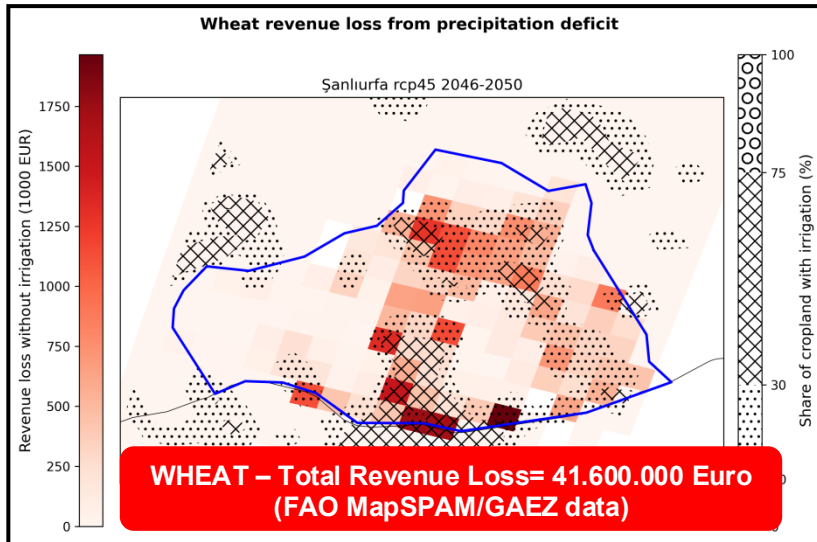
Yearly «Regional\_Crop\_Productions» data sets were downloaded from Turkish Statistical Agency (TurkStat-TÜİK) in district basis.

FAO's Crop\_mapSPAM.tif files were modified and replaced into workflow.



# Drought Risk Analysis – Regional Interventions in CLIMAAX workflows

## 5. Integration of local 2024 crop productions and local unit prices instead of rough mapSPAM and GAEZ Aggregated values:



# Risk evaluation and management

“CLIMAAX enabled us to move from analysis to action.”

## Lessons Learned :

- High resolution local data is critical for correct analysis.
- Global tools need continual improvements and adaptation for regional needs.
- Institutional coordination is essential especially for risk ownership

## Next Steps:

- Integration into adaptation planning
- Revision of existing SECAP (Sustainable Energy and Climate Action Plan)
- Link to investment planning (Pathways to Resilience - P2R)
- Continued stakeholder engagement





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*Thanks*



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# Implementing the Drought Risk Workflow in Valcerrina

Enrico Lucca, TR2  
Maroussia Terrana, TR2  
Fabio Olivero, Unione dei Comuni della Valcerrina

16/04/2026



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# Who are we?



## LEADING INSTITUTION COORDINATOR

**Coordinates project – drives stakeholder involvement.**

- Technical officers from the 13 municipalities.
- Lead technical analysis towards civil protection and urban planning needs
- Provide guidance and expertise in project execution
- Ensure alignment with local needs and overarching goals for sustainability.



## GEOSPATIAL SERVICES PROVIDER

**Supports CRA – WebGIS platform development.**

- Geospatial analysis
- Gather and interpret data crucial for understanding land use patterns and environmental impacts in Valcerrina.

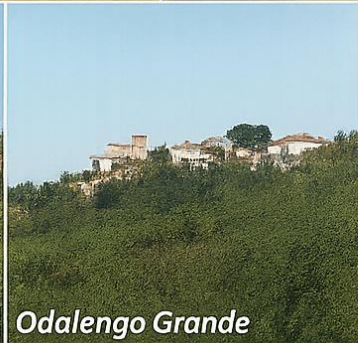


## AI & ENVIRONMENTAL DATA

**Environmental data analysis – CRA & monitoring technologies.**

- Artificial intelligence and data management
- Deliver solutions for data processing and analysis to enhance project outcomes and decision-making processes.





# Valcerrina regional profile and context

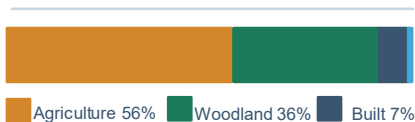
**13**  
member  
municipalities

**~ 7500**  
total population

**162 km<sup>2</sup>**  
territorial area

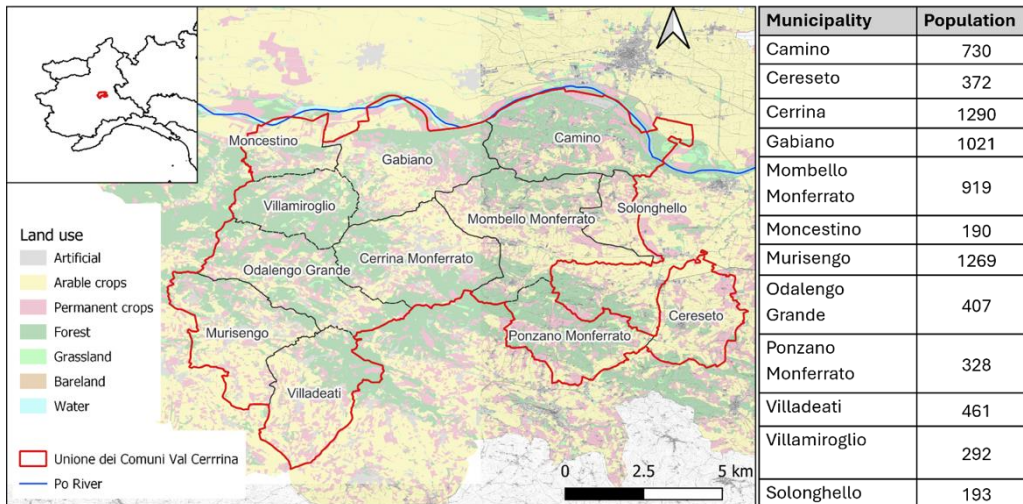
**100-400m**  
elevation a.s.l.

## LAND USE



## KEY ECONOMY

Agriculture & agri-food (viticulture & hazelnut), Agri-tourism ·



*Location: SE Piedmont, Northern Italy · Between Po plain and Monferrato hills · Part of Langhe-Roero-Monferrato UNESCO site*

## DEMOGRAPHIC & SOCIO-ECONOMIC CONTEXT

~25% of population over 65 · Land abandonment · Low population density · High agri-food sector dependence · Limited irrigation infrastructure



# Valcerrina climate-related hazard

River Po – July 2025



River Po – April 2025



36% of land is forested



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# Valcerrina climate risk preparedness

Italy



National Plan for  
Climate Adaptation - 2025



Piedmont Region



STRATEGIA REGIONALE  
SUL CAMBIAMENTO  
CLIMATICO DEL PIEMONTE  
- 1° stralcio -



CIVAL

Municipalities



Civil Protection  
Service

Hydrological Risk Plan

Forest Fires Risk Plan

X Drought Risk Plan



Municipal Civil  
Protection Plans  
(developed collectively  
for the Union)



# CIVAL Climate

July 2025

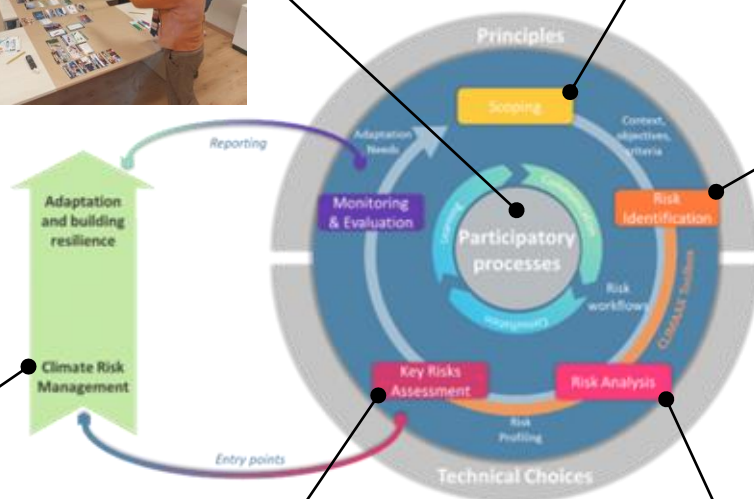


January 2026



# Management Framework

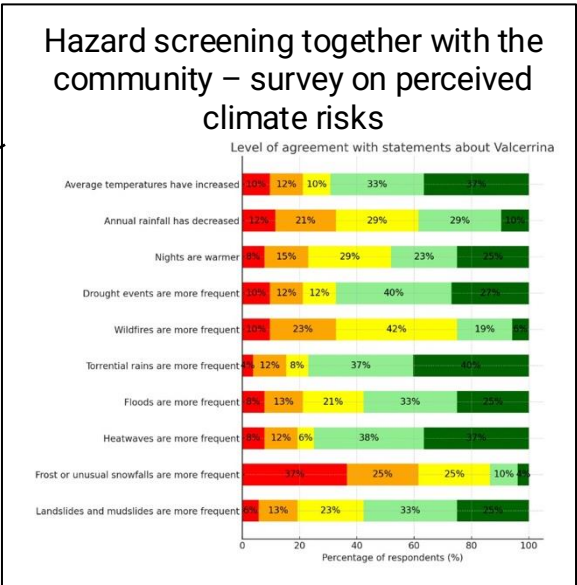
- Context and objectives defined
- Stakeholders mapped



Explore integration of CRA results in Municipal Civil Protection Plans

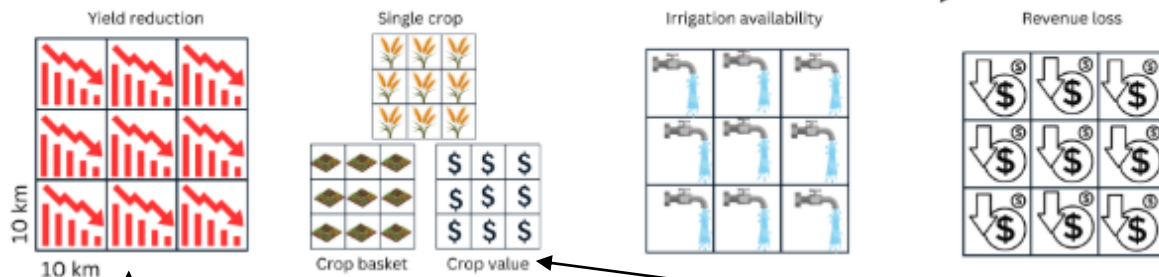
Participatory assessment of severity, urgency and capacity at end of Phase I and Phase II

- 3 workflows selected in Phase I
- 2 prioritised and expanded in Phase II



# Drought Risk Analysis – refining to local context

HAZARD — EXPOSURE — VULNERABILITY → RISK



Local soil maps

Local crops and crop growth parameters

Municipality and parcel level crop distribution

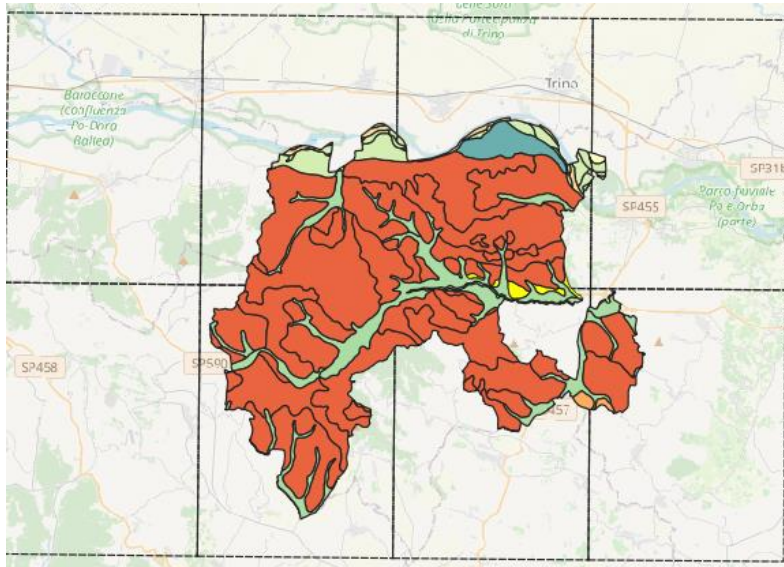
Sub-regional average crop yield (q/ha)

Regional crop price (€/q)

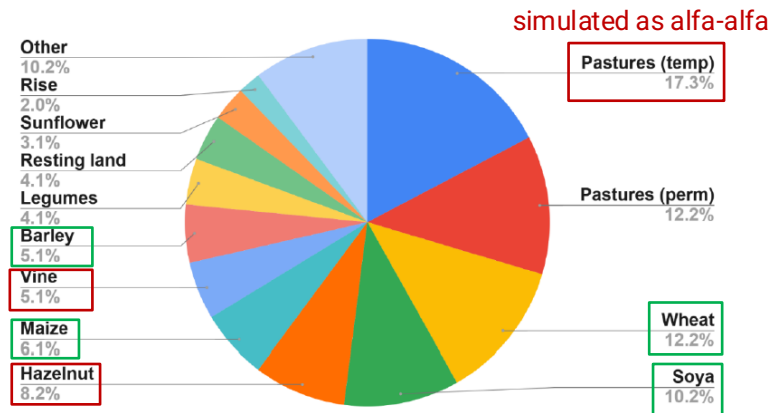


# Drought Risk Analysis – refining to local context

## Local soil maps



## Local crops and characteristics



- Crops already in crop table but parameters adjusted
- New crop introduced

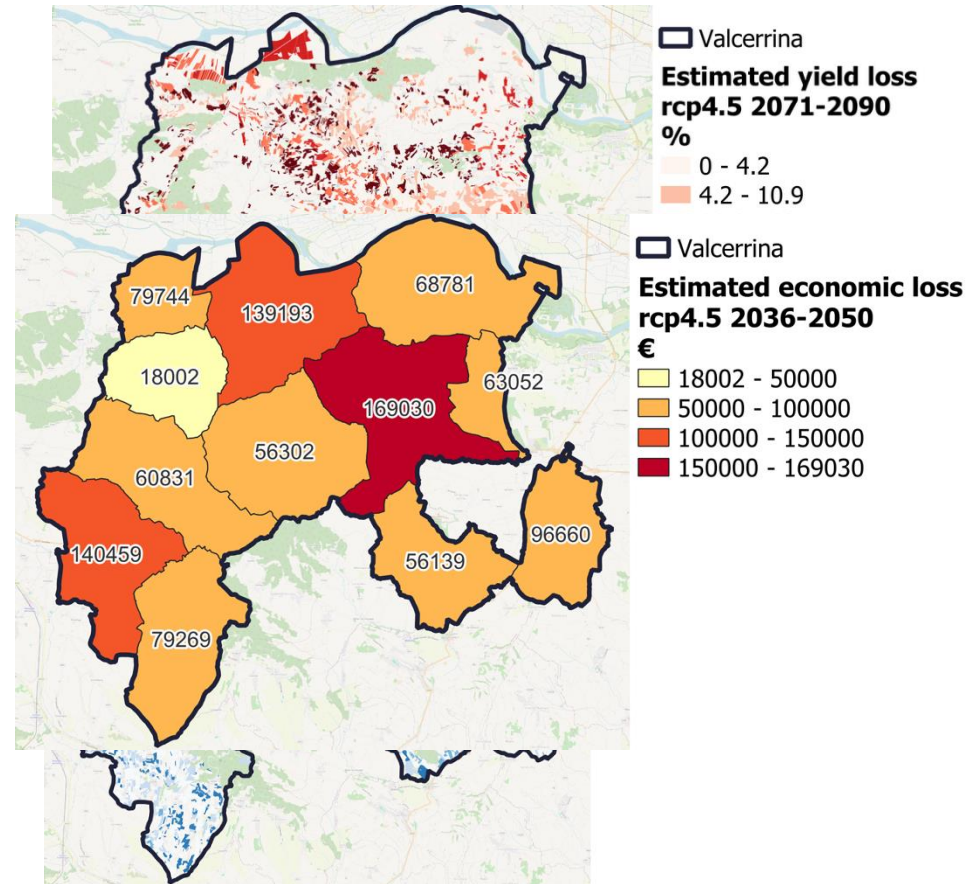
**Alfa-alfa:** five growing cycles simulated in a year



# Drought Risk Analysis – results

2 spatial scales for the representation of results:

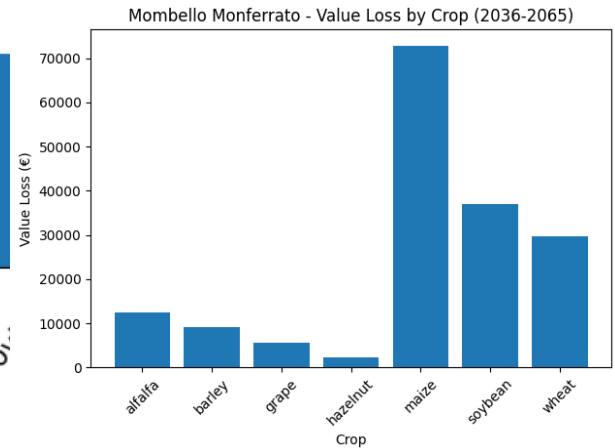
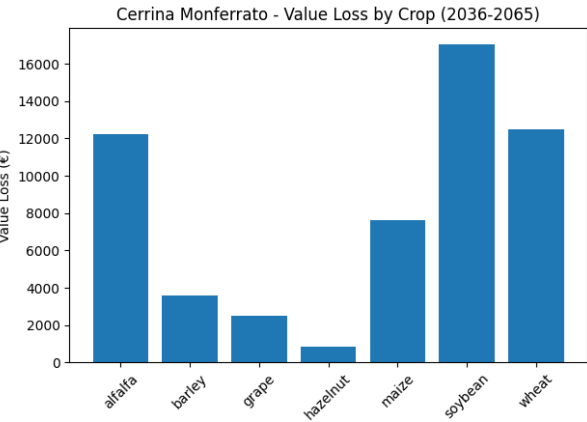
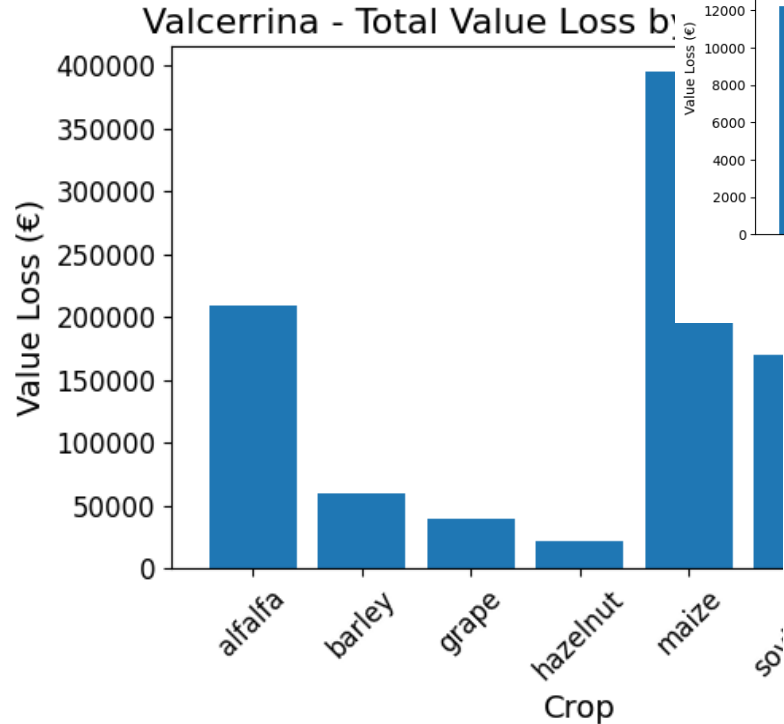
- **Parcel scale** showing spatial variation of estimated yield reduction and max. daily irrigation deficit
- **Municipality scale** indicating estimated economic loss



# Drought Risk Analysis – results

**2036 – 2065**  
**€ 1 027 462**

**2071 – 2090**  
**€ 1 020 654**



# Risk evaluation and management – next steps

**Review of the Key Risk Assessment**

3° workshop end of April 2026

**WebGIS platform and  
integration into Municipal  
Protection Plans**

**Exploring adaptation  
options**

Risk Workflow	Severity		Urgency	Capacity	Risk Priority
	C	F		Resilience/ CRM	
River flooding	Orange	Orange	Orange	Orange	Moderate
Drought	Orange	Red	Red	Red	High
Fire	Yellow	Orange	Orange	Yellow	Low

- Provide local authorities with a tool to visualise climate risk data
- Explore how results can feed into a Union-level drought management plan and an irrigation feasibility study
- Assess adaptation options: cropping pattern, irrigation infrastructure, agricultural practices



## Risk evaluation and management – lessons learnt

- The flexibility of the drought risk workflow allows integration of local data and the use of the single building «blocks»
- Estimates of seasonal irrigation requirement could inform infrastructure planning and cost-benefit analysis
- **Next step:** integration of the results into formal decision-making processes. Guidance from the consortium on the governance of climate risks?





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*Thanks*



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# UPCOMING EVENTS

- **14 May 2026 10.30 CET**  
*Relative drought*

COMMUNITY OF PRACTICE  
**CLIMAAX**  
climate ready regions

**RELATIVE  
DROUGHT  
RISK ASSESSMENT**

**LEARNING FROM REGIONS**

 **EU MISSIONS**  
ADAPTATION TO CLIMATE CHANGE

# TRANSCEND 3RD WEBSTIVAL (APRIL 27-29)

Enabling Transformation through Financial, Technical and Institutional Adaptation



**TRANSCEND 3RD WEBSTIVAL**  
27, 28, 29 April 2026  
all times are CEST

Enabling Transformation through Financial, Technical and Institutional Adaptation



**27 APRIL 2026**

- 10:00 Day 1 Opening
- 10:05 Keynote on Funding Bankable Projects - Q&A
- 10:40 Participant Feedback
- 10:50 Living Lab Panel Discussion
- 11:20 Reflections on Financial Adaptation Opportunities

**28 APRIL 2026**

- 15:00 Day 2 Opening
- 15:05 Keynote on Institutional Transformation - Q&A
- 15:40 Participant Feedback
- 15:50 Living Lab Panel Discussion
- 16:20 Reflections on Institutional Adaptation Opportunities

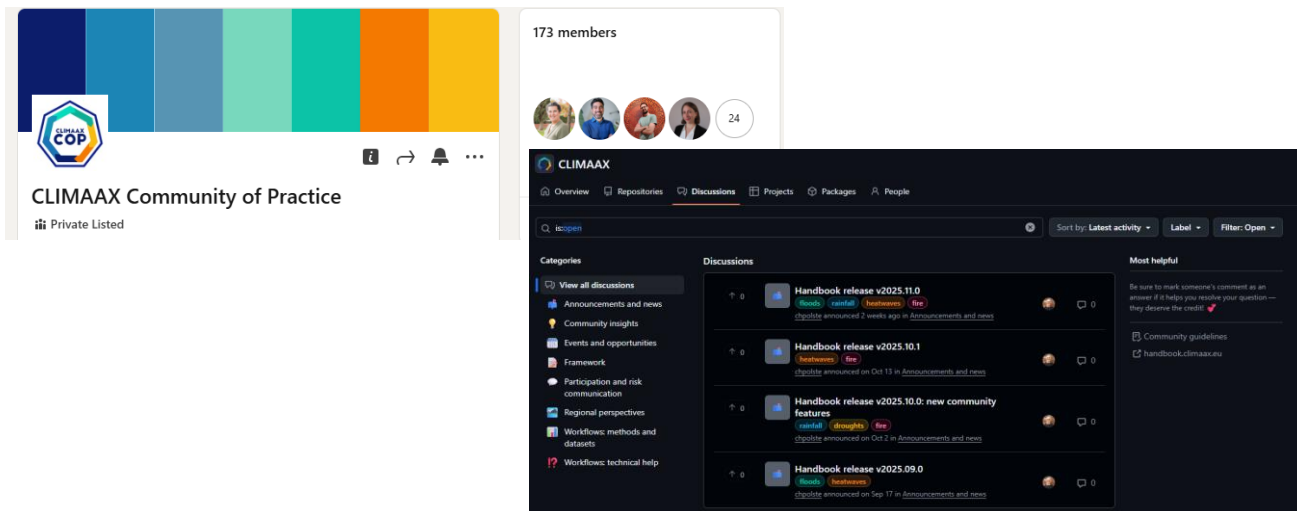
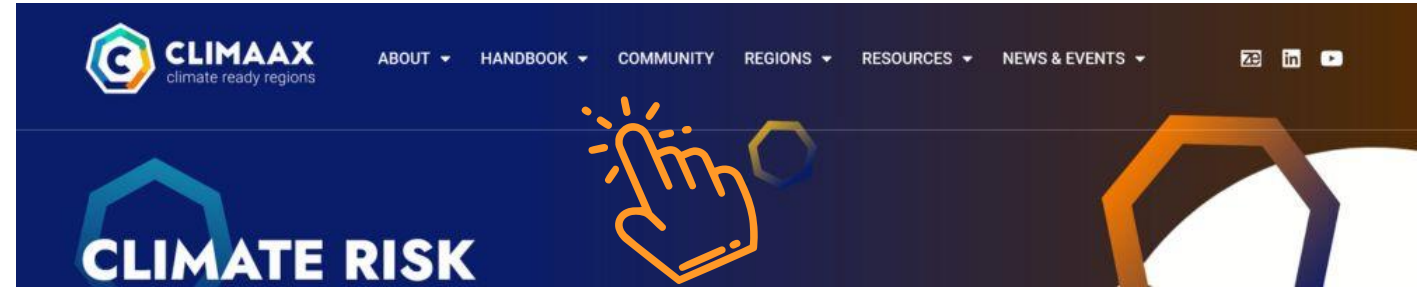
**29 APRIL 2026**

- 15:00 Day 3 Opening
- 15:05 Keynote on Technical Transformation - Q&A
- 15:40 Participant Feedback
- 15:50 Living Lab Panel Discussion
- 16:20 Reflections on Technical Adaptation Opportunities and Webstival Closing



# HOW TO ENGAGE IN THE COMMUNITY OF PRACTICE

- Join our LinkedIn group and community forum
- Take our surveys
- Subscribe to the CoP to receive communication of further updates  
<https://www.climaax.eu/community-of-practice/>



!! SCAN THIS !!



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Thank you and see you  
next time!

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