

# Climate change vulnerability and impacts assessment in a Mediterranean region for adaptation purposes

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Climate Change Adaptation is a priority for policy development, especially in Mediterranean region, which is recognized as an hot spot for negative effects due to climate change.

## NEEDS



## OBJECTIVES

- 1 Assess climate vulnerability and risk
- 2 Identify adaptation options
- 3 Include adaptation in regional plans and programs

## SARDINIA REGION



## SECTORS & RISKS



**Agriculture & Forest**



**Water system**

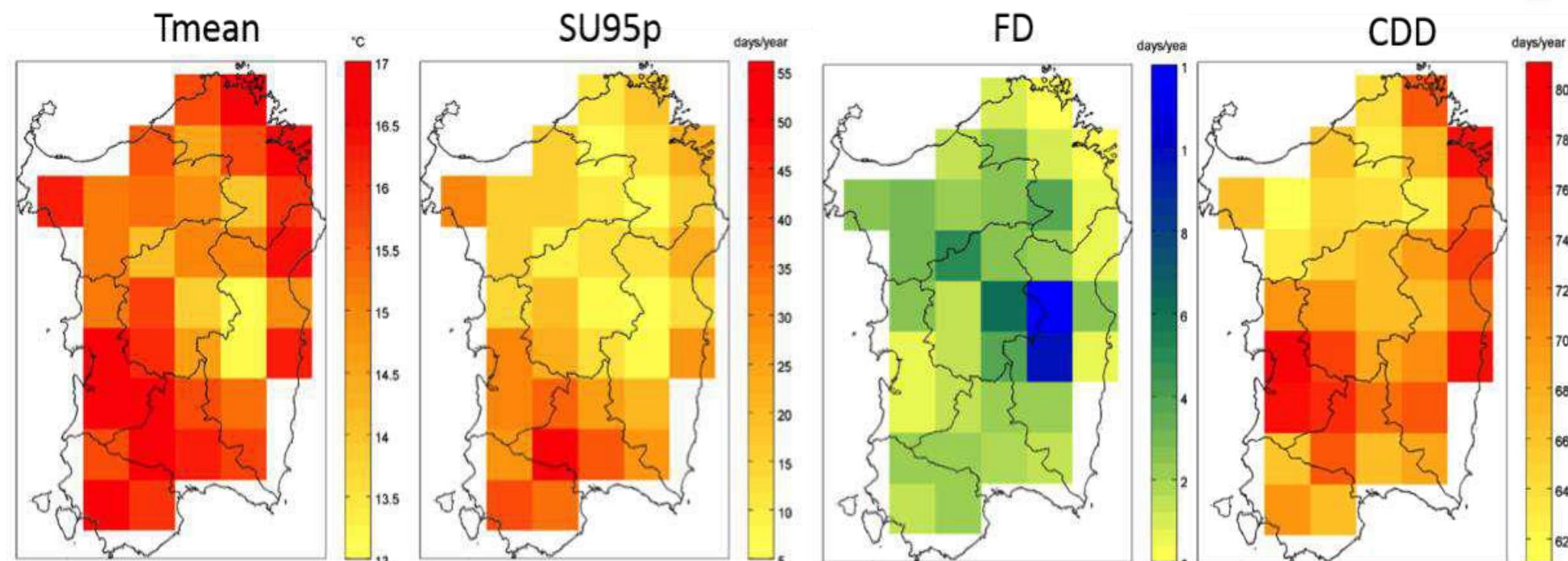


**Hydrogeological component**

- Reduction of crop yield
- Repercussions on animal welfare
- Forest fires
- Ecosystem function reduction
- Irrigation requirements for the agricultural sector
- Increased competition between sectors
- Floods in urban areas
- Landslides in urban areas

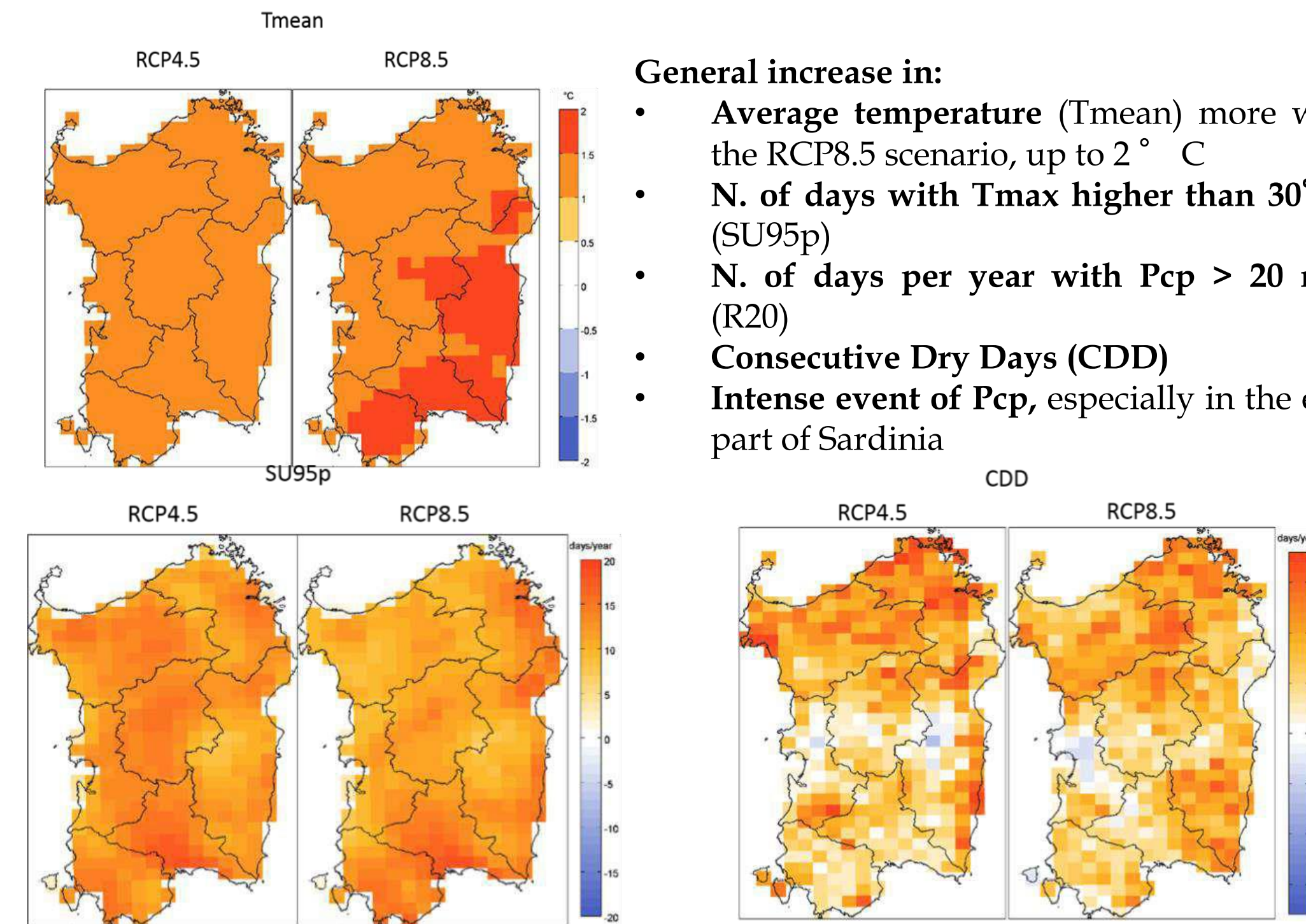
## CLIMATE ANALYSIS

Observations: 1981-2010 - Dataset E-OBS; 28 km x 28 km



Tmean: mean annual temperature (°C)  
SU95p = average number of days per year with daily Tmax > 30 °C  
FD = average number of days per year with daily Tmin < 0 °C  
CDD = max. number of consecutive days per year without precipitation

Projections: 2021-2050 - COSMO-CLM Regional model; 8 x 8 km



### General increase in:

- Average temperature (Tmean) more with the RCP8.5 scenario, up to 2 °C
- N. of days with Tmax higher than 30 °C (SU95p)
- N. of days per year with Pcp > 20 mm (R20)
- Consecutive Dry Days (CDD)
- Intense event of Pcp, especially in the east part of Sardinia

## VULNERABILITY & RISKS ANALYSIS

IPCC (2014) and impact chain approaches (GIZ, 2014, 2017)



### HAZARD

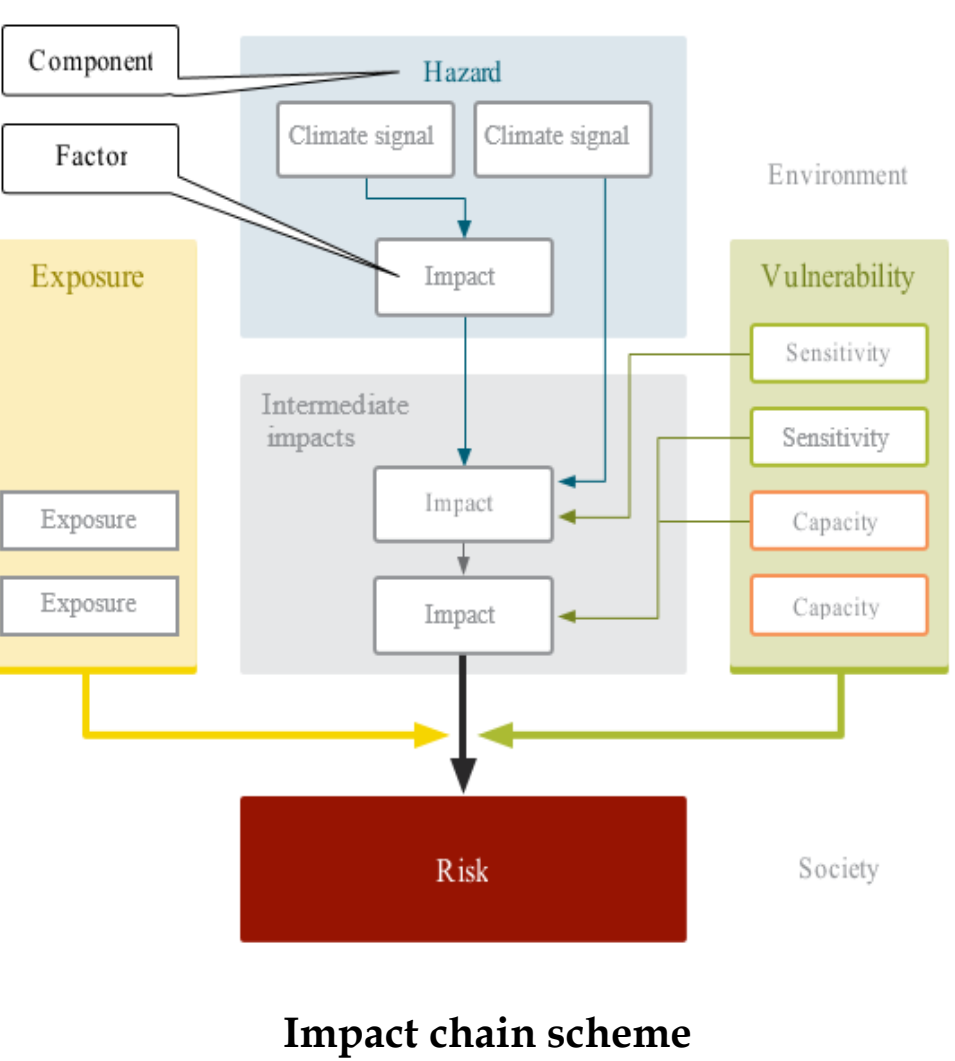
Climate-related physical events or trends or their physical impacts.

### EXPOSURE

Presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

### VULNERABILITY

Propensity or predisposition to be adversely affected. Vulnerability includes sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

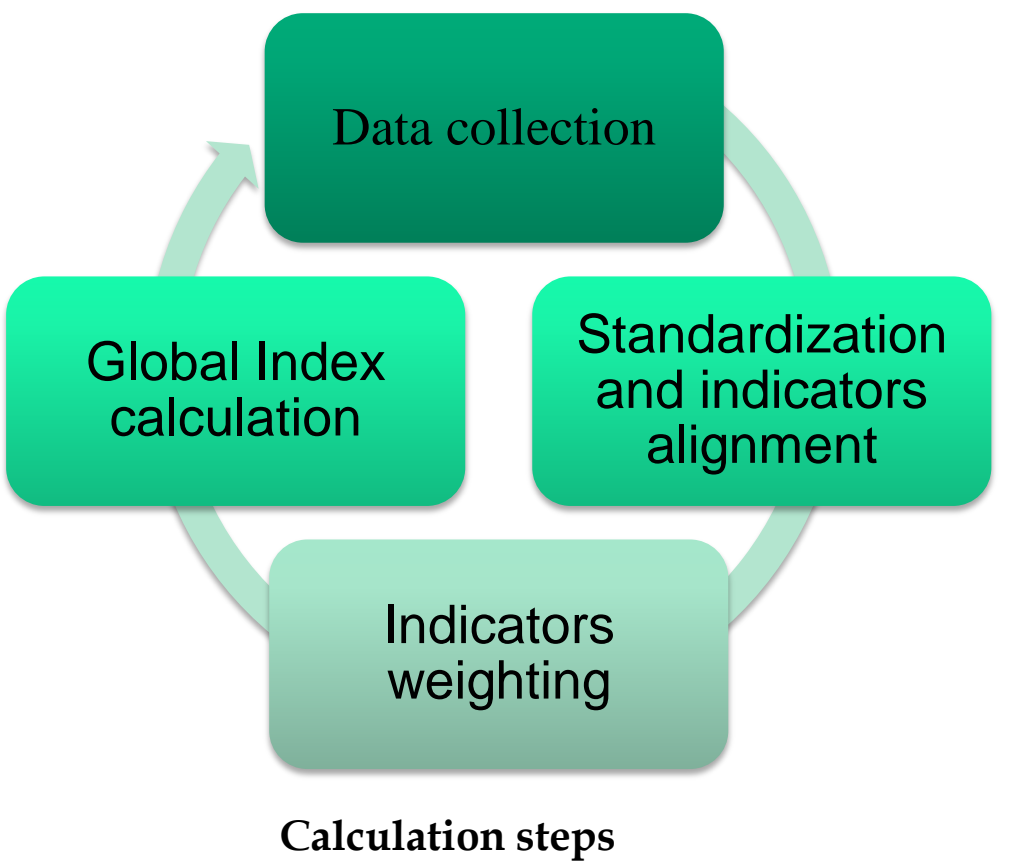


The analysis is based on indicators to be used as *proxy* to describe a phenomenon and/or specific characteristics of a system or a territory

- 1 Identify exposed people, goods and services
- 2 Evaluate system Sensitivity
- 3 Evaluate system Adaptive Capacity
- 4 Evaluate CC Vulnerability

Each indicator was classified in 5 classes:

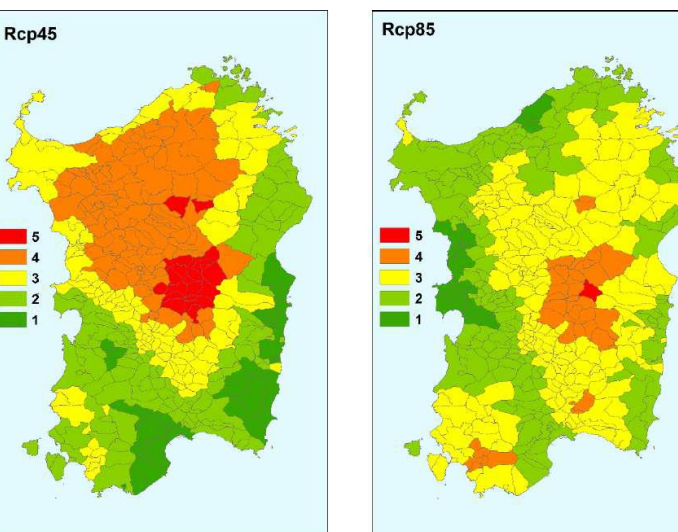
- Class 1 = Lower level (optimal conditions)
- Class 2 = Medium-low level
- Class 3 = Medium level
- Class 4 = High-medium level
- Class 5 = Higher level (critical conditions)



## RESULTS

### ON WATER RESOURCES

Change in Aridity Index = Climate hazards



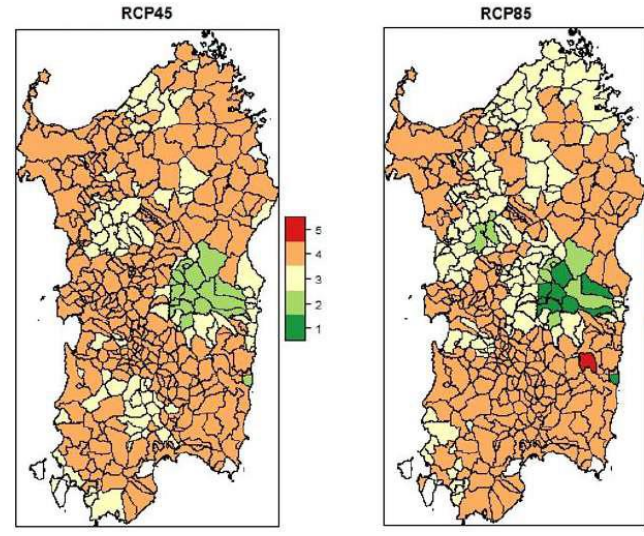
Higher risk classes in the RCP4.5 scenario, based on lower expected rainfall compared to the RCP8.5 scenario and in particular on central and inland areas of Sardinia and at higher altitudes

- Mainly influenced crops during spring growth periods (most consistent falls in precipitation), evergreens trees and annual crops
- Crops with a growing season in the summer are those with the least anomalies in irrigation requirements

### DROUGHT RISK

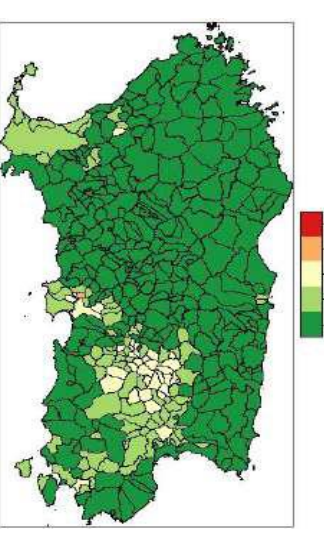
### ON CROP YIELD

#### Cereal yield decrease



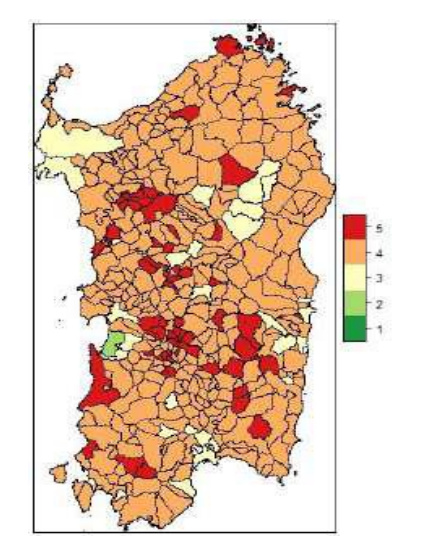
- Most of the regional territory in class 4
- With RCP 8.5 more common in class 3 due to future Pcp increase and increase in CO<sub>2</sub> that affects both photosynthesis of C3 crops (es. durum wheat), and the efficiency of water use by regulating the stomatal opening

#### Exposure



Campidano and Nurra plains are more exposed (more farms)

#### Adaptive Capacity



Average value in class 4 with medium-high criticality, especially for human and economic capital

Spring-summer and irrigated crops, such as maize, suffer greater negative impacts compared to autumn-winter crops in dry areas such as wheat

### FIRE RISK

Indicators for fire risk analysis:

Hazard	Exposure	Sensitivity	Adaptive Capacity
FWI = n. days above critical threshold to have an intense fire activity	Pop. density and Cows, sheep, and pigs (n. or %)	Flammability index (%)	GDP (€/capita)
	Farm density	Protection level of protected areas	% of people with a degree and a Master Degree
	Natural protected areas, forested areas, maquis areas (%)	Irrigated surface (%)	N. people employed in agriculture and silvicultural sectors
			N. Fire risk plans
			N. people employed in CFVA, fire fighters, FORESTAS

### FINAL REMARKS

The analysis:

- Improve the understanding of climate vulnerability and risk components (i.e. hazard, exposure, sensitivity, adaptation capacity) for Sardinia Region
- Provide useful information, at local scale, to identify adaptation objectives and options to face climate risk for specific sectors
- Represent the knowledge base to develop adaptation policies to climate change, for a correct land management and planning, aimed to both preserve and/or enhance local resources and to reduce the critical issues due to climate change

### ACKNOWLEDGEMENTS

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MASTER ADAPT Mainstreaming Experiences at Regional and local level for ADAPtation to climate change



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