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Centro Euro-Mediterraneo
sui Cambiamenti Climatici

WATER

Science for climate-smart governance

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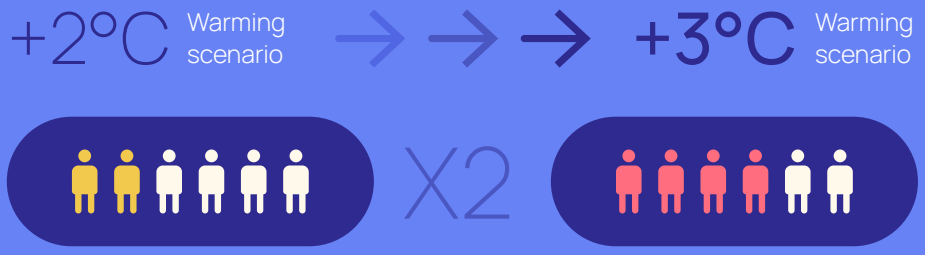
Water is the lifeblood of societies, but climate change is reshaping its availability, quality and management, affecting agriculture, economies and ecosystems. Through climate data, technology and integrated governance, CMCC research delivers science-based solutions for resilient water systems in the Mediterranean.

FUTURE RISKS FROM A THIRSTY ATMOSPHERE

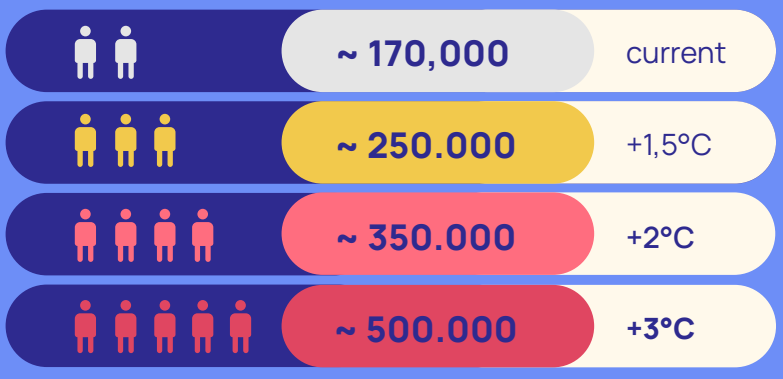
A changing climate creates a paradox where water-related risks swing between scarcity and excess. Projected climate scenarios show a future where **drought** and **floods** coexist and trigger one another, with real impacts on resources and society.

In southern Europe, more than a third of the **population will be exposed to water scarcity** under 2°C warming; this risk will double under 3°C warming



[1]

In 2100, the number of **people exposed annually to river flooding** (EU and UK) increases in the different climate scenarios, exceeding three times the current numbers in the scenario with the highest warming



[2] [3]

Smart adaptation **saves money** and **lives**

€ 7.7 bn per year

with adaptation

Costs of river flooding in the EU by 2050:

€ 18 bn per year

without adaptation

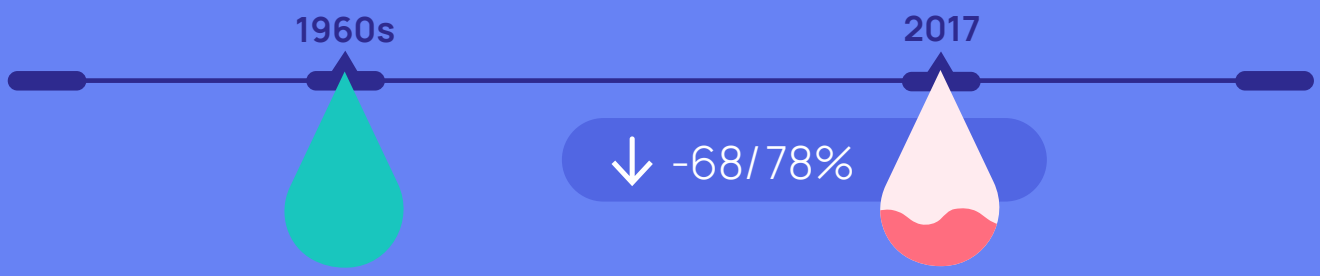
High emissions/fossil-fueled development

[4]

THE MEDITERRANEAN AREA
A CLIMATE AND WATER HOTSPOT

The Mediterranean region is warming **20% faster** than the global average. [5]

Renewable water availability per capita has declined:



[6]

People already suffering from **water scarcity** in the Mediterranean **180 M** [6]

Decrease in river low flows in Euro-Mediterranean areas
(France, Spain, Italy, Balkans, Greece) in different warming scenarios:

+1,5°C Warming Scenario

↓ -12%

+3°C Warming Scenario

↓↓ -35% [7]

AGRICULTURE IN THE MEDITERRANEAN AREA

is the main water consumer, with **80%** of water withdrawals.

[8]

Up to **+18%** irrigation demand by **2100**

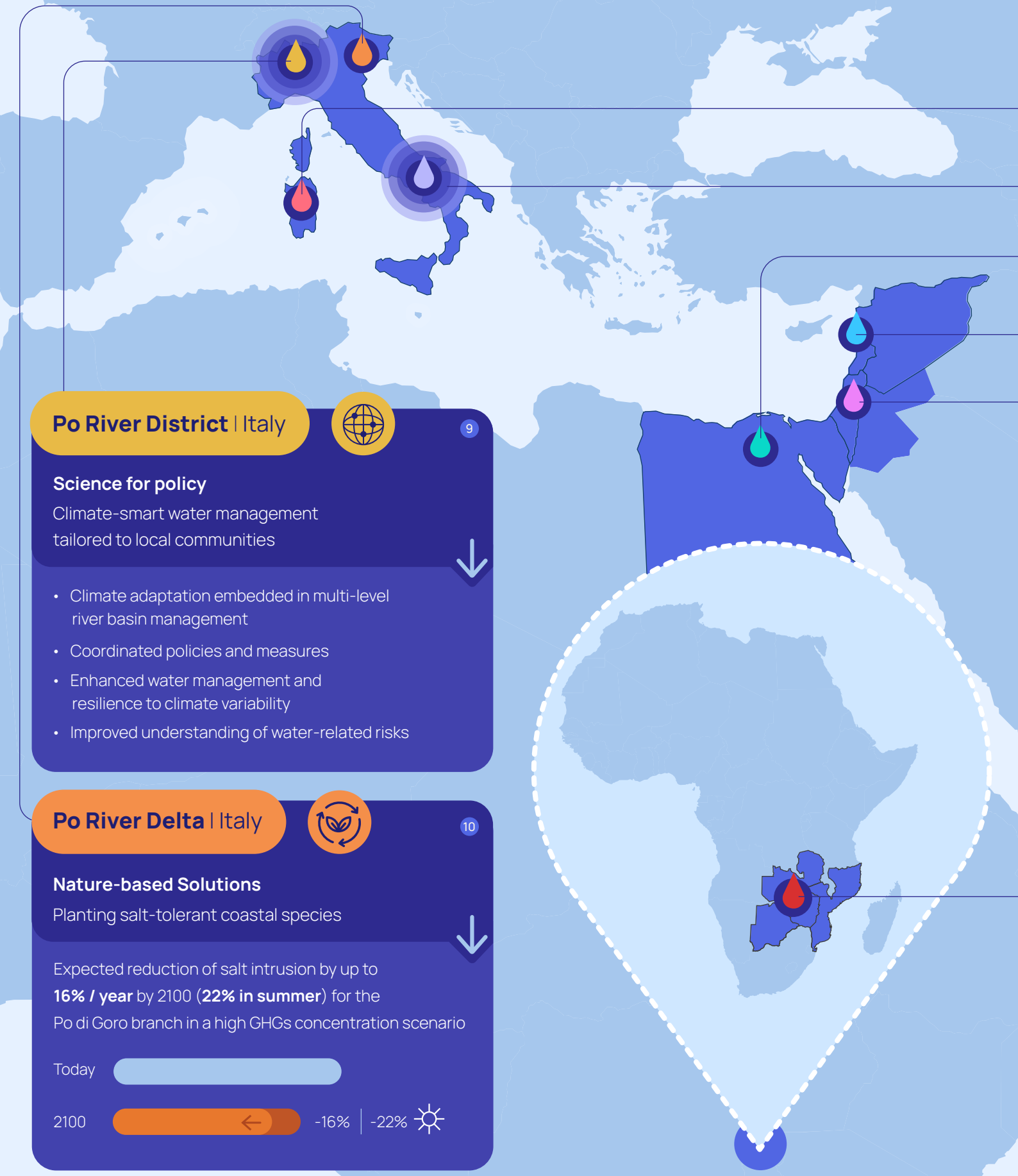
[6]

Up to **-17%** agricultural productivity in the **next decades**

+150 / 200% projected increase in the frequency of **agricultural droughts** in southern Mediterranean countries under **+2°C warming** [6]

FROM SCIENCE TO SOCIETY

CMCC turns science into actionable **solutions** with **positive impacts** on **Mediterranean communities**, **ecosystems**, **water systems** and **agriculture**.



Po River District | Italy

9

Science for policy

Climate-smart water management tailored to local communities

- Climate adaptation embedded in multi-level river basin management
- Coordinated policies and measures
- Enhanced water management and resilience to climate variability
- Improved understanding of water-related risks

Po River Delta | Italy

10

Nature-based Solutions

Planting salt-tolerant coastal species

Expected reduction of salt intrusion by up to **16% / year** by 2100 (**22% in summer**) for the Po di Goro branch in a high GHGs concentration scenario

Today

2100 -16% | -22%

Southern Apennines River Basin District | Italy

Science for policy

Interactive maps of key climate indicators with a focus on surface and groundwater resources and their future availability and demand

11 12 13 14

- Enabled evidence-based and risk-informed planning
- Enabled prioritization of adaptation interventions for integrated water services

Tirso Basin | Italy

15 16

Digitalization

Real-time data collection and dashboarding at farm and basin scales

Science for policy

Assessment of adaptation options at basin level

- **–25%** expected water shortage emergencies
- Expected crop yields increase by **5%**
- Long-term resilience planning

Nile Basin | Egypt

17 18

Technologies

Aquaponics, desalination, wastewater reuse

- Up to **88%** water savings with aquaponics
- Strengthened basin-wide resilience
- Reduced tensions over water use

Jordan Valley | Jordan

Digitalization

Web of Things platform for real-time data over different time horizons

Science for policy

Actionable knowledge to inform decisions

19 20

- **15/25%** water savings
- Expected **+40% / +50%** food production increase (moderate vs severe climate change scenario)

Bekaa Valley | Lebanon

21 22

Digitalization

Web of Things platform, real-time data, climate services to optimize irrigation in yields

- ↓ Reduced water use
- ↗ Improved crop yields
- ↑ More sustainable agriculture

Zambezi Watercorse | Southern Africa

17

Science for policy

Understanding of multi-sectoral dynamics driven by expanding irrigated agriculture

- Understanding of multisectoral dinamics of water-energy-food-ecosystem nexus, driven by expanding irrigated agriculture
- Science-based insights to promote climate justice and reduce local vulnerability in the Global South

Through its projects, CMCC operates at the interface of science and society, strengthening Mediterranean water resilience and enhancing societal value.

SHAPING CLIMATE-RESILIENT WATER SYSTEMS

A scientific and policy challenge.

FACING MULTI-RISK

Risks don't come in the singular. They are interconnected. They can trigger or amplify each other. Being able to anticipate how risks interact is essential in preventing and mitigating disasters. Together with a group of leading institutions across Europe, **CMCC is catalysing a paradigm shift in how risks are currently assessed and managed.** [23]

FROM

Addressing risks one by one

- Different hazards and risks are considered independent from each other
- Lack of a clear framework and guidelines
- Limited assessment of disaster risk management measures
- Poor understanding of dynamic feedbacks between hazard, exposure, and vulnerability

[24]

TO

Multi-hazard, multi-sector and systemic risk management

- Understanding of interlinkages between the different hazard and economic sectors
- Supporting sustainable and resilient economic systems
- Forward-looking disaster risk management pathways
- Better accounting for dynamic feedbacks between hazard, exposure, and vulnerability

[24]

WATER MANAGEMENT

Water systems are at the frontline of climate risk, especially in the water-scarce Mediterranean basin. **CMCC is navigating this complex framework integrating climate, ecosystems, energy and food systems in an interconnected approach**, strengthening security and resilience in sectors exposed to cascading and systemic impacts. [25] [26]

FROM

Reactive water management

TO

Predictive water management

Integrated science-based water governance helps decision-makers develop flexible strategies by using a nexus-based approach. [25] [27]

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