

Preparing for water resilience in the mountains

From awareness to action



#WaterWiseEU



Agenda

Setting the scene | From peaks to valley: understanding regions' contributions to water resilience

The role of the regions in achieving water resilience in Europe

The challenge of raising awareness of water management in Europe's mountains

Mountain areas: Europe's water towers

Sharing experiences | From challenges to action: how to ensure water resilience in the mountains?

Assessing future resources to plan for resilience – the PIRAGUA experience

Raising awareness of the natural water resources of the mountains - a LEADER approach

Measuring and adapting water use in mountain areas in the face of climate change – the MountResilience ambitions



Speakers

Moderator



Marie LAURENT

EU Projects manager and developer, Euromontana

Session 1



Florian MARIN

Member of the European Economic and Social Committee, co-rapporteur for the EESC opinion "A call for an EU Blue Deal"



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Commissioner of the Vosges massif, French National Agency for Territorial Cohesion (ANCT)



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Session 2



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Research Scientist, Consejo Superior de Investigaciones Cientificas (CSIC)



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Manager of the Local Action Group The Heart of Slovenia



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MountResilience Regional demonstrator in Piemonte region





A CALL FOR AN

**EU
Blue
Deal**

**The role of the regions in achieving
water resilience in Europe**



Marin Florian

25.06.2024



Context

- Increasing water challenges around the world and also in Europe;
- The water dimension in EU policies is sometimes neglected, often fragmented and is not yet fit to address the challenges ahead.
- The EU is failing to secure access to water and sanitation in Europe, recognized as a human right by the UN in 2010
 - 9.8 million people in the European Union do not have access to safely managed drinking water on their premises,
 - Water leakage rates in some EU countries reach up to 50 per cent.
 - 60% of European cities have already experienced water scarcity.
- A change of scale is urgently needed





Part of our history

Part of our heritage

Part of our culture

Precondition for surviving

A source of life

A bridge between centuries

A bridge between generations

Multilateral values of water

Civilization has been built near water from the beginning of humanity

A source of wealth and added value

An instrument of peace

A common good

Business opportunity enabler

Raw material

We are searching for water on other planets but we are incapable of using properly the water resources which we have on Earth.





Population Growth generates heightened water demand for drinking, sanitation, agriculture and industry.

Climate Change is modifying precipitation patterns, leading to increased frequency and severity of droughts in certain regions, alongside intensified rainfall in others, disrupting the natural water cycle.

Water Pollution from industrial activities, agricultural runoff, improper waste disposal, and other sources contaminates both surface water and groundwater, compromising the availability of clean and safe water.

Water challenges

Inefficient Water Management generates water scarcity due to deficient infrastructure, ineffective water usage practices, wasteful irrigation methods, leaky water supply systems, the absence of adequate water conservation measures etc.

Over-Extraction of Groundwater for agriculture, industry and domestic use is depleting underground aquifers at a faster rate than their natural recharge.

Economic and Political Factors – inadequate governance, socio-economic disparities, conflicts over water resources, insufficient investments etc.





The future of water

.....inclusive, well-regulated, transparent, highly digitalised, resilient, sustainable, predictable and secure ensuring complementarity across industrial sectors and actors, putting people first, protecting life and generating added value through a tailored approach in a sustainable and fair ecosystem.

.....sectorial, territorial customised and place based and taking into account the river basin approach





The Green Deal Industrial Plan is mentioning water only twice

You can not make deal without taking into account the most critical resources – water, soil, air

Net Zero Industry Act is not mentioning water

Green Deal is not enough

Blue Deal is going beyond sectorial approaches

Why do we need a Blue Deal?

Blue Deal – a synergy between Green Deal and SDGs

Multilevel and multistakeholder approach





What we are proposing

Towards **reducing, recovering, reusing and recycling** water supporting the industries and households and facilitating access to water for everyone, especially vulnerable groups.

Prices should be **fair, synergic with current and future societal, climate and industrial challenges, and transparent concerning their structure, considering long-term water security, integrating the 'polluter pays principle' and guaranteeing affordability** for vulnerable groups.

A concrete sectorial action plan, based on gradual targets for each industry, is needed to support industries in becoming water efficient.

In the water crisis, **humans and their basic human needs must be a priority** over water use for industry, tourism and agriculture.





What we are proposing

Blue Transition Fund, to form a single EU access point for water investments, **covering the transition towards sustainable water infrastructure and management**, uptake of water-efficient technologies, jobs and skills, and **reducing inequalities** concerning access to high-quality and affordable water and sanitation.

Water-poor regions and water intensive industries should be a priority and support the **EU 2050 targets and SDGs**.

Full complementarity with the Just Transition Fund.



What we are proposing

The governance model should be based on **hierarchical responsibilities** which are capable of administering the **different water interests** of the Member States, capable of **solving water conflicts, reducing incompatibilities, approaching complementarity between urban and rural differences and increasing monitoring capacities.**

The water governance model should be based on a **partnership between territories** and different stakeholders, with the participation of the civil society, **inclusive, political and technical, democratic, capable of promoting tailored approaches** based on local structures organised and represented at the national and EU level.

Water conditionalities for the sustainable use of water should be a criterion in all the EU funds distributed to the Member States, including CAP funds.





What we are proposing

Water should be defined as **a strategic priority in the 2028-2034 programming** period and financing instruments should take into account the river basin approach – ITI for water.

A **long-term investment plan** which quantifies specific demographic trends and initiatives in other sectors, such as urban planning, land use or agriculture. Specific attention and financing should be directed towards cross-border water projects.

Transparent, easy to access, interoperable, publicly available and reliable data, collected from the company level up the product chain

Substituting the use of **drinking water with non-conventional water sources should become the norm** (for example, whenever possible, watering gardens, washing cars, etc. with collected rainwater)





What we are proposing

Developing **climate scenarios**, defining critical water resources and water allocation regimes to ensure proper conditions for biodiversity and supporting life and industry.

Water design products label for products similar to eco-design and a **common definition of low water impact products or services** should be delivered at the EU level.

Just Water Partnerships for improving investments, access to water, and sustainability of water usage between various communities could be transferred to different industries to ensure complementarity between various production processes.

Collaborative business models alongside shared management and loyal competition between industries.





Principle 1:
The new European water policy must be aligned with all other EU policies, as has been the case with the EU Green Deal. Policies and actions under the Blue Deal must be based on up-to-date, accurate, transparent, comparable, easily accessible and reliable water data.

Principle 2:
The restoration and protection of ecosystems, wetlands and biodiversity should form an essential part of the Blue Deal.

Principle 3:
The European Union must adopt a human rights-based approach to water and fight water poverty, in line with Principle 20 of the European Pillar of Social Rights. The right to a healthy environment should also be recognised as a fundamental human right.

Principle 4:
Water, Sanitation and Hygiene (WASH) services must be sustainable, equitable, of high quality and affordable for all. In the event of a water crisis, citizens and their basic needs must have priority.

Principle 5:
All water users should be encouraged to adopt solutions and practices supporting the sustainable use and consumption of water.

Principle 6:
The EU must support the development of technologies enabling water efficiency, recycling and pollution reduction as well as their incremental uptake by agriculture, industry and households.

Principle 7:
Water losses due to leaks in networks and waste of water by agriculture, industry, households and all other users need to be significantly reduced.

Principle 8:
Agriculture is both a major cause and a victim of water scarcity. The EU must ensure, through a strategic plan, access to sufficient quality water and its sustainable management in agriculture to enable adequate and sustainable food production in the EU.

Principle 9:
Given the link between energy, water and critical raw materials, water should be seen as a fundamental element of the EU's industrial strategy.

Principle 10:
A sectoral industrial approach is needed as different industries have different water needs and opportunities regarding water efficiency. The no-harm principle has to be combined with a right for economic activities to consume water.

Principle 11:
The availability of skilled and specialised workers must be ensured and the competitiveness of European companies must be preserved.

Principle 12:
A comprehensive EU water policy must be accompanied by an equally ambitious financing plan. Water prices, costs and taxes must be fair and transparent and prices be based on the principle of full cost recovery.

Principle 13:
The EU should increase its efforts on blue diplomacy and water should be integrated into the EU's foreign policy and external relations, including neighbourhood, trade and development policies. One of the main strategic objectives of blue diplomacy should be to upgrade the UN treaty framework on all water-related issues, and swiftly implement international agreements.

Principle 14:
It is imperative to develop international policies to promote the sparing and efficient use of water in all sectors of the economy and society, to reduce the pollution of ground waters and surface waters, as well as to restore polluted and degraded waters.

Principle 15:
The EU Blue Deal requires adequate governance of freshwater resources, including groundwater. The EESC calls for a river basin approach involving all relevant stakeholders. Existing cross-border river basin cooperation initiatives should be deepened, developed and adequately financed.



- 1 There is a need for a **common approach to understanding water poverty at EU level**. The EU needs to develop **common guidelines to monitor access to quality and affordable water and sanitation services (WSS)** as well as to map the state of play and to regularly follow developments.
- 2 **An EU advisory stakeholder platform, jointly set up by the EESC and other EU institutions**, should be established to: share best practices, develop specific standards on water quality and use in agriculture and industry, contribute to a regular update of Blue Deal action plans, and promote partnerships and the circular economy.
- 3 There is need for **systematic collection of transparent, comparable, easily accessible and reliable data on current state-of-play and long-term trends at EU level** with regard to: water supplies, access to water and sanitation, the state of water infrastructures, surface and groundwater abstractions and water use in industrial, agricultural and household processes.
- 4 **Each Member State's water infrastructure and water resources need to be immediately and thoroughly assessed** in order to identify urgent investment needs. Consistent legislation should be put in place across all Member States to establish a **sustainable water storage mechanism during wet periods**.
- 5 **The development of water and sanitation infrastructure should be financed, particularly in socially disadvantaged urban and rural neighbourhoods**. This could be done for instance in the context of the urban renovation wave.
- 6 Prices must take account of long-term water security, incorporate the 'polluter pays' principle and **ensure universal access and affordable prices, particularly for vulnerable groups**. A **common approach at EU level to a fair design of water prices** should be established. Water tariffs could contain price signals to ensure more sustainable consumption.
- 7 **Awareness-raising campaigns and specific actions to promote understanding of the value of water and change long-term behaviour** must be launched in all Member States.
- 8 A **water consumption label** for products, in addition to the existing EU energy label, should be introduced to raise consumer awareness. Consumers must be incentivised to calculate their **water footprint**.
- 9 Incentives should be put in place for a **transition to a circular water economy and supporting water reuse for all types of users**. Replacing the use of drinking water with non-conventional water sources should become the norm where possible.
- 10 Over the next two years, **the EU's industrial strategy and its transition path documents need to be reviewed to include water-related industrial challenges and opportunities**, with a special focus on water-intensive industries and supporting the adoption of water-efficient technologies.
- 11 The EU should accelerate its efforts to create a **Knowledge Innovation Community for water** within the European Institute of Technology (EIT) and step up the "five missions" approach.
- 12 **All schemes of the Common Agricultural Policy should encourage sustainable and efficient water management** and integrate indicators in each Member State in order to monitor progress in water management. Dedicated support must be provided to ensure a substantiable transition in the agri-food sector and its adaptation to climate change.
- 13 **EU agricultural and industrial policies must integrate measures fostering the reduction, reuse and recycling of water and the reduction of water pollution**, through the adoption of good practices, training and new technological solutions, for a water smart society.
- 14 **The sustainable use of water and water conditionality should be criteria in all EU funds**, in order to avoid supporting projects that run counter to the objectives of the Water Framework Directive and the new EU Blue Deal.
- 15 In addition to national funds, a **Blue Transition Fund** must be set up at EU level as a **single EU access point** for water investments and combining **public investment with innovative financing**.
- 16 The Blue Transition Fund will support **resilient infrastructure and sustainable water management, research and the uptake of water-efficient technologies**. It will fund investments in **working conditions, quality jobs and training** as well as measures to **reduce inequalities** in access to affordable and quality water and sanitation services.
- 17 Water investments should be given **special treatment within the Stability and Growth Pact**.
- 18 The recently agreed **UN High Seas Treaty** should be swiftly implemented.
- 19 In external relations, the EU should facilitate sustainable water and wastewater management through **cooperation in the fields of infrastructure, technologies and expertise as part of economic partnerships and development cooperation**. The Global Gateway is an excellent tool in that respect.
- 20 A **European Water Centre with an international dimension** should be set up to support Member States and other countries in the European Neighbourhood and beyond to address water-related issues. This centre should present examples of outstanding collaboration and propose policy recommendations to advance the policy objectives of the Blue Deal.
- 21 A **dedicated EU Commissioner** should be in charge of the water portfolio.



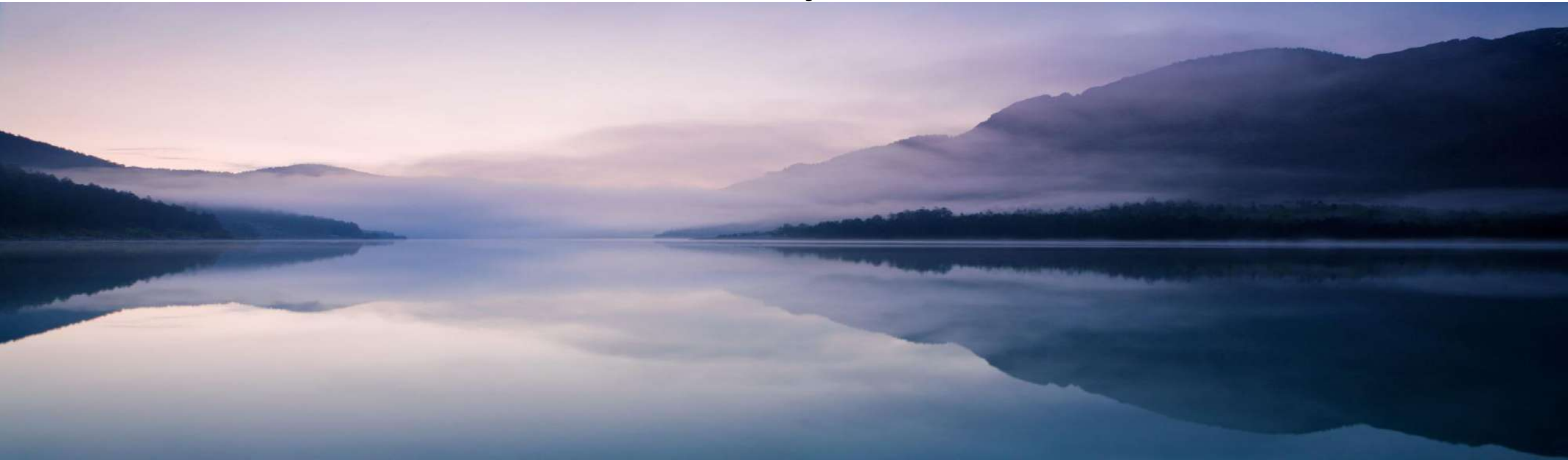
The way ahead

- EESC is fully committed to delivering on this topic, which is of vital importance to our citizens and society
- A unprecedented amount of interest from **stakeholders** and **organised civil society** as a whole towards the initiative
- Water will be an important topic in the run up to the European Elections
- Further **EESC opinions, events and follow-up actions** on the Blue Deal in 2024



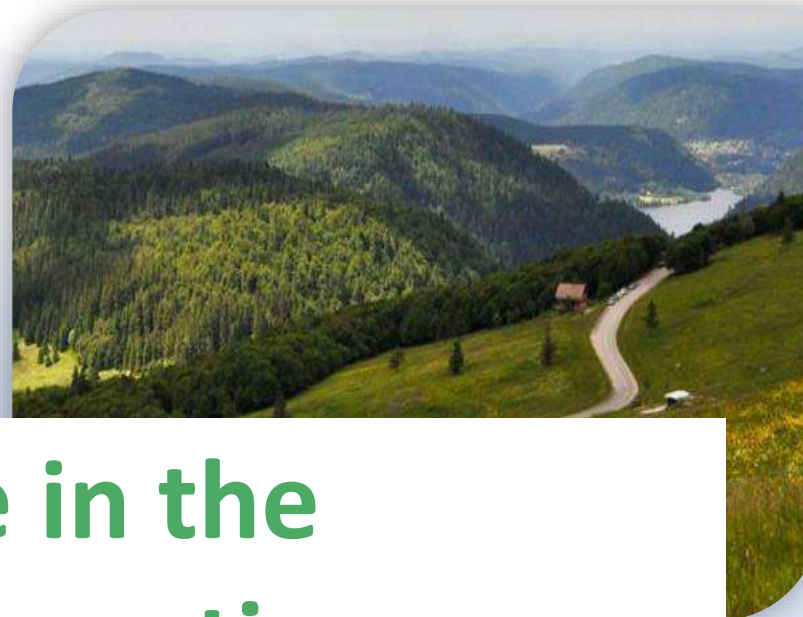
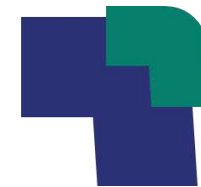


Thank you!





Commissariat à l'aménagement
du massif des Vosges



Preparing for water resilience in the mountains: from awareness to action

25 June 2024



PATRICIA ANDRIOT

development commissioner

Vosges Mountain

French National Agency for Territorial Cohesion (ANCT)

*Study “Crossed perspectives on rural and mountain
development”*



In France : a law for mountains since 1985

Since 1985, supplemented by a new law in 2016, a **“Mountain Law”** define a specific framework on the development and protection of mountain areas

- The Mountain Law:
 - **defines the concept of a "massif"**, a **territory that transcends administrative boundaries** to form a coherent whole encompassing both mountain areas and outlying piedmont territories.
 - **Provides resources** : a Commissioner for the planning, development and protection of each massif. An inter-regional body reporting to the prefect coordinating the massif and the ANCT, the Commissariat de Massif implements the massif's planning, development and protection policy.,
 - **Mains aims for this policy are :**
 - ✓ revitalising and developing the massif: funding projects
 - ✓ Animation of a cooperative governance between local authorities, State, stakeholders about economy, tourism, agricultural, environmental fields.
 - ✓ Managing subjects to specific challenges and constraints of climate, slope or altitude, and transition

CONTEXT of the study : Crossed perspectives on rural and mountain development

A study led by the French National Agency for Territorial Cohesion in 2023

- Exploring public policies for rural and mountain areas in Europe to Cross perspectives on rural and mountain development
- 5 Expert organisations to explore different ways, one day in sept 2023 to cross eyes and discuss first results at European level
- 3 pillars for this study
 - First, to measure what part of European funds in rural development in France
 - Second, to understand how other European Union Member States (Germany, Spain, Poland, Estonia, Ireland and France) are tackling rural issues.
 - Third, to focus on **mountain areas and the impact of climate change and try to see How should tourist flows and water resources be managed? How other mountain EU states are implementing policies about this ?**
- Study funded by EARDF, via the French National Rural Network



MASSIF DES VOSGES
MONTAGNE BUISSONNIÈRE



agence nationale
de la cohésion
des territoires

A 6 months- study



©D. Chavanat/Shift project

From 2 to 3 interviews/country

Study available : [Climate change adaptation in mountain areas: new Euromontana study out! – Euromontana](#)

6 mountainous countries, “sentinels” of climate change



6 countries of different sizes but with mountainous features

AT 9,1 millions inhab. (2022)



60% of the country covered by mountains

ES 47,6 millions inhab. (2022)



50% of the country covered by mountains

FR 68 millions inhab. (2022)



25% of the country covered by mountains

IT 58,8 millions inhab. (2022)



18% of the country is covered by the Alps

RO 19 millions inhab. (2022)



31% of the country covered by mountains

SI 2,1 millions inhab. (2022)



34% of the country covered by the Alps



Pyrenean massif

Main topics about climate change in mountains explored by the study

1) Decarbonation of tourism in the mountains

- Actions to reduce the carbon footprint (about mobility, local value chains, infrastructure)
- Label and certifications (for accommodations, for restaurants, ...)
- Enlargement of the touristic season (towards 4 seasons tourism)
- Focus on ski activities : difficult to see over short term (in France, ClimSnow study)

2) Management of water in the Mountains

Focus on France : Avenir Mountain plan

Towards more sustainable and diversified tourism

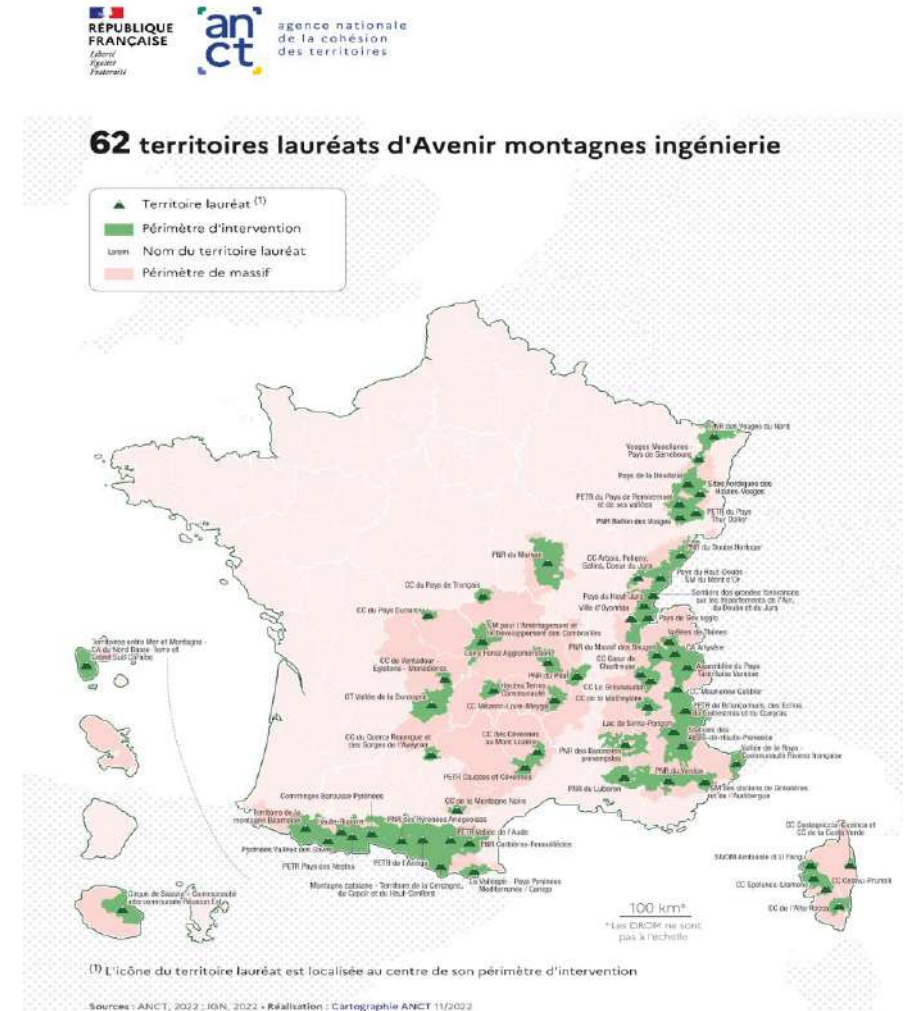
One **project manager** per selected territory

- funded up to €60,000/year for 2 years,
- Trained and accompanied methodologically

A cross-cutting and **thematic engineering offer** from twenty partners

A mechanism for **sharing inspiring experiences** including

- A support system dedicated to elected officials built with the “Fabrique of transitions”
- A **dedicated digital platform** bringing together resource elements
- Thematic webinar cycles



« Avenir Montagnes » Investment : **Some examples**

The creation of a village for relief « Sport natureHandicap »



Global cost : 2,2 M€

Welcoming the public and restoring trails in the Pyrénées national park



Global cost : 1,5 M€

Diversification for a better traffic flow management in a municipality of Corsica



Global cost : 3 M€

The development of the northern site of Chapelle des Bois, Jura mountain



Global cost : 900 000 €



Focus on water



Water management



Decrease of the resource vs increase of the demand

AT

-23% of underground water stock by 2050
+15% of the water demand in 2050

FR

30% of glacier melt in France since 1980
278m³ of water withdrawal rate / inhabitant in the mountains compared to an average of 150m³ in the country

RO

In 2022, the Danube river was at its lower level
From 1961 to 2010, the Carpathian territories suffered from 0,6 to 6 months of drought each year

ES

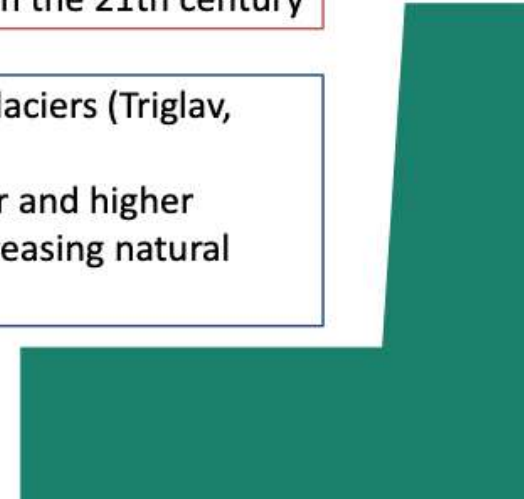
-12% of the water resource since 1980 in the Pyrenees
-20% of underground water reload in the Pyrenees by 2050

IT

-65% of precipitation in winter between 1991 and 2020
+25% expected of water stress in the 21th century

SI

- Melting of the country's last glaciers (Triglav, Skuta)
- Lower precipitation in summer and higher precipitation in winter with increasing natural risks





- **A resource under growing pressure**
 - Increasing scarcity risks (decrease in precipitation, droughts, glacier melt...)
 - Increasing water demand from several sectors : tourism and ski, agriculture, hydroelectricity
 - A growing risk of conflict of use between stakeholders
- **Anticipation of water management: an emerging topic for public policies and local stakeholders**
 - Few structural policies and actions on water management (except on risk management)
 - Recent national or regional strategies (2021-2023) : water management, flood management
- **Challenges and needs**
 - Increase the knowledge about water (consumption and reduction/ availability) and raising awareness on the issue
 - Develop experimental projects to improve data collection and water management



IT

RESERVAQUA: a European project to improve the knowledge on water resources in Alpine area

Mains recommandations from the report

4 pilars

- To increase the knowledge at the territorial level, about climate change about the zero point
- To mobilise and to sensibilise stakeholders and population
- To ensure the concrete implementation of transitions : to set up concrete actions
- To set up a new governance and research of consensus at local level
- To eco-condition funds

A concrete example in the Vosges massif

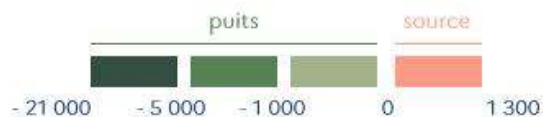
→ To set up an action plan for adaptation to climate change (Obligation from the Climate and resilience law, 2021)

- 4 steps to do this in the Vosges:
 - Step 1 : concertation to understand the situation at the massif level (with data, mapping...)
 - Step 2 : to define together the good indicators
 - Step 3 : in same time : to decide 10 concrete actions to experiment and valorise 10 actions have already done
 - Examples :
 - To reduce traffic to the summit : to set up shuttle, to tax car park,...
 - To have a best management water : campaign to sensibilise tourist to reduce consumption, and to set up small containers to store water in accomodation, to set up dry toilets
 - Step 4 : to set up a group for action training during 10 months to follow previous actions and to train ambassadors among stakeholders

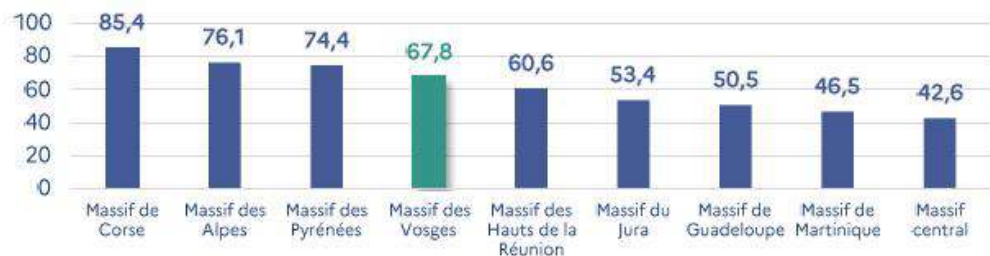
Les puits de carbone

Maille EPCI 2018

Séquestration ou émission cumulée du secteur des terres et forêts, en tCO₂e/an



Part des surfaces forestières et milieux semi-naturels en 2018 dans les massifs français, en %



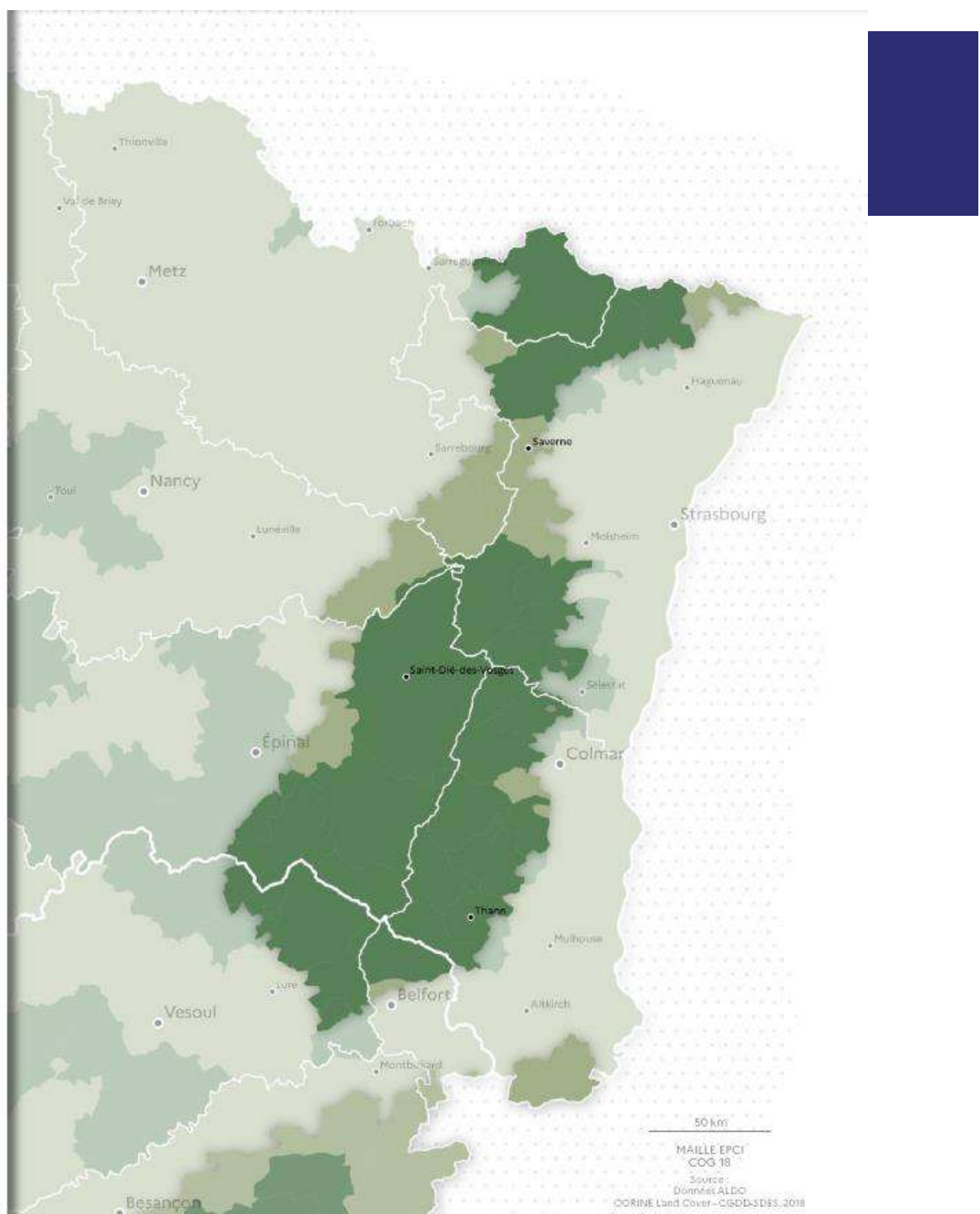
MASSIF DES VOSGES
- 3 347 tCO₂e/an
67,8 % de surfaces forestières
et milieux semi-naturels



ENSEMBLE DES MASSIFS
2 081 tCO₂e/an
57,9 % de surfaces forestières et
milieux semi-naturels



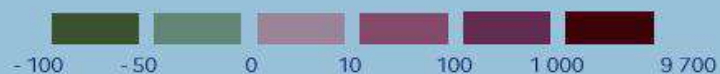
RÉGION GRAND-EST
813 tCO₂e/an
33,8 % de surfaces forestières et
milieux semi-naturels



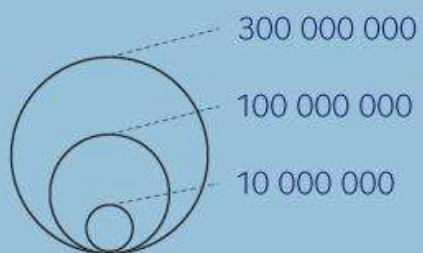
Les prélèvements en eau

Maille EPCI 2018

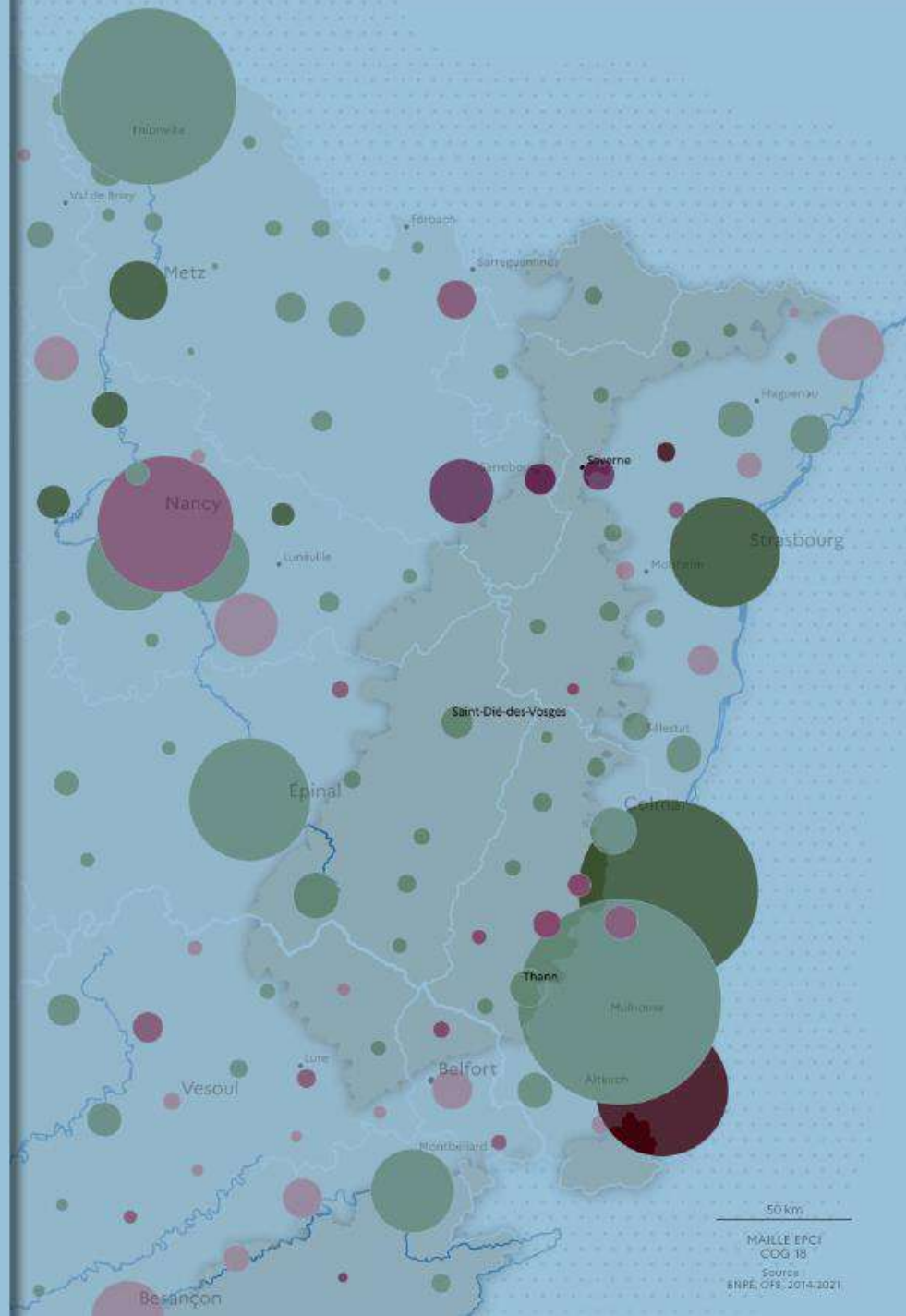
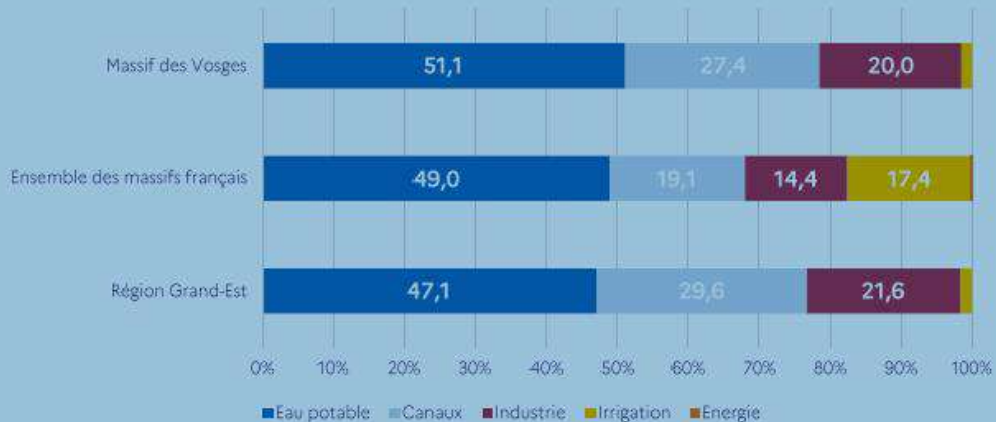
Taux d'évolution du volume d'eau prélevé entre 2014 et 2021, par EPCI, en %



Volume d'eau prélevé en 2021, par EPCI, en m3



Usages des prélèvements en eau en 2021, en %



50 km

MAILLE EPCI
COG 18

Source
ENPE, OFR, 2014-2021



Mountain areas: Europe's water towers

Blandine Camus

Policy & Communication Officer

25 June 2024



EUROMONTANA

About us

The European multi-stakeholder network for sustainable development and quality of life in the mountains

65 members from 16 countries

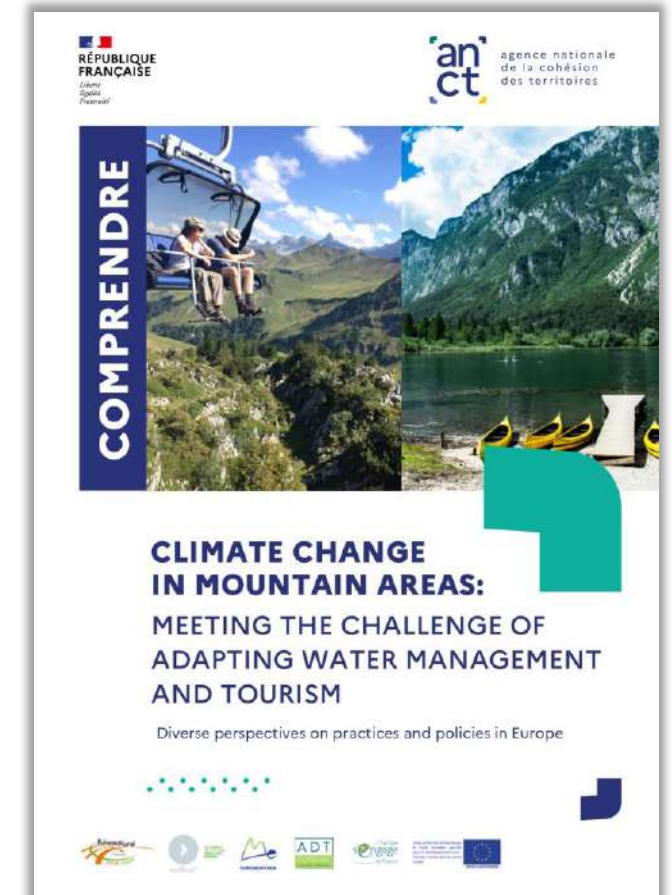
From regional and local authorities to agriculture and environment organisations and universities



Key messages from our European study

Report for the French National Agency for Territorial Cohesion (ANCT)

- Published in Dec 2023
- Comparative analysis in AT, ES, IT, RO, SL (+FR)
- Climate change adaptation, focus on tourism and water management



Key messages from our European study

Increase in water consumption

- In Europe, projections of annual demand for water in the context of climate change +8% to +25% in a scenario of 2°C of warming
- AT: 11-15% increase in water demand expected by 2050

Reduction of resources

- Retreating glaciers, less / erratic rainfall, less groundwater ...
- ES: 12% reduction in the available water resource in the Pyrenees, since 1980
- IT: water stress expected to increase by 25% during this century



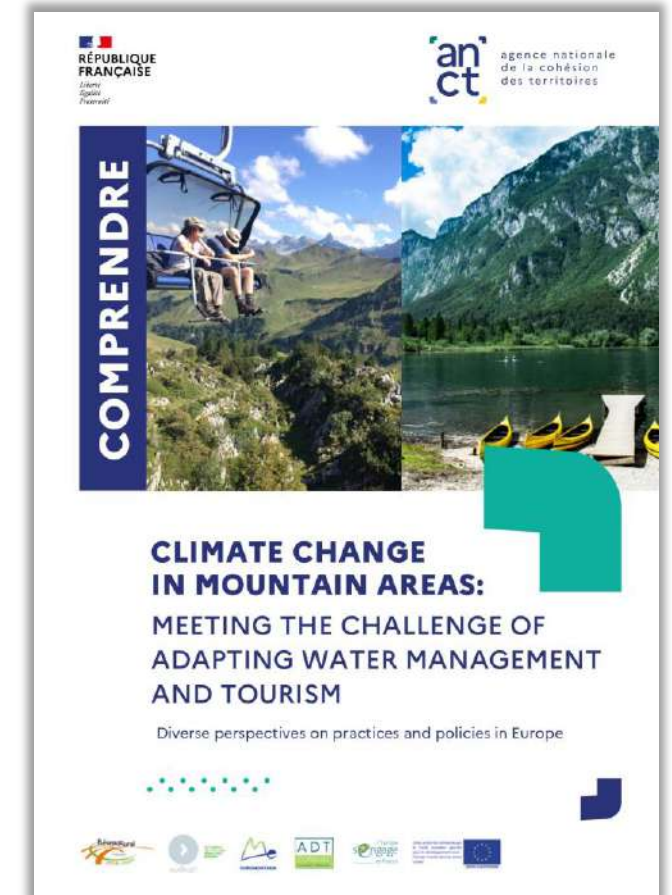
Key messages from our European study

Multiples impacts

- Tourism (AT: 48 million m³ of water used each year to make artificial snow), hydropower, agriculture, drinking water, risks ...

Lack of awareness, data, engineering

- Water is not yet always seen as a major concern
- Impacts on agriculture are the most tackled
- Mountains' specificities rarely considered in policies



Towards an EU Blue Deal?

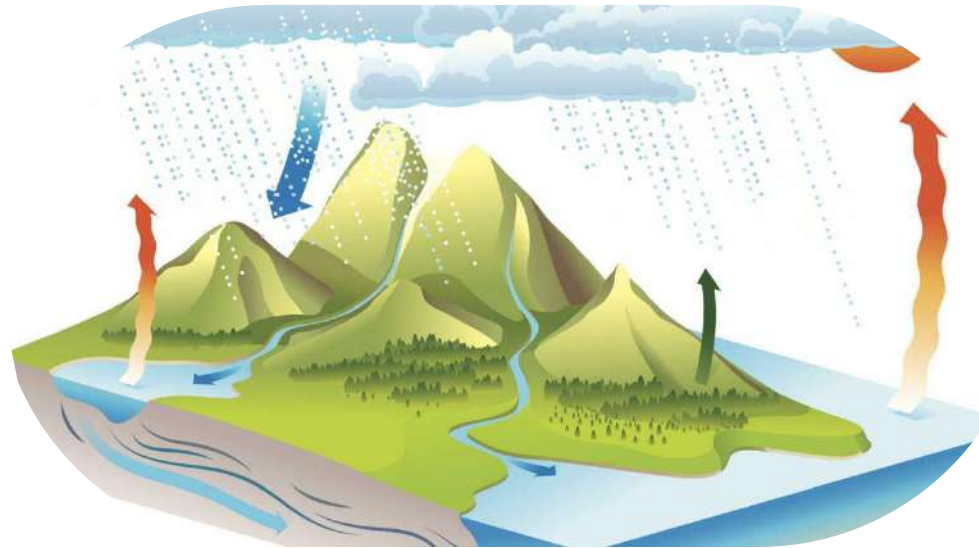
EU water resilience initiative

- Announced in Oct 2023
- Non-legislative initiative on water resilience, with the aim to ensure access to water for citizens, nature and the economy, while also tackling catastrophic flooding and water shortages



Mountains are Europe's water towers

Key role in the water cycle to store and distribute water



The Alps alone provide 40% of Europe's freshwater

The Pyrenees supply 70% of the Ebro's total flow

68% of the world's irrigated agricultural land in the lowlands directly depends on mountain run-off

Main risks for mountain areas and beyond



Reduced drinking water resources

- Lake Constance provides drinking water to 4 million people in Baden-Württemberg



Increased climate risks in the mountains

- Droughts, landslides, floods, fire risk are increasing in mountain areas



Challenged water dependent sectors

- Tourism, agriculture, and energy production are among the strategic sectors that will be most affected

3 main types of risks

Recommendations: promoting the role of mountain areas



Better recognition at EU level

- highlighting mountains' crucial contribution to water supply
- within the EU communication campaign and policies

Better compensation at national level

- fairly compensating mountain areas for providing ecosystem services to society as a whole
- cases for the water use made out for energy production

Recommendations: addressing challenges beyond water policies



Post-2027 CAP

- introducing a requirement to take account of mountain areas in the post-2027 CAP Strategic Plans through ANC payments
- encouraging eco schemes for the preservation of wetlands in mountain areas

Post-2027 Cohesion Policy

- supporting the transition of ski resorts to a 2- or 4-season model and diversification to tourism offers that are less dependent on water
- promoting investments to reduce water waste, including in more remote areas

Recommendations: addressing challenges beyond water policies



Climate policies

- boosting climate change mitigation to deliver on the EU targets for 2030 & 2050
- launching a mid-term evaluation of the EU's strategy on adaptation to climate change
- taking advantage of the International Year of Glaciers' Preservation in 2025 to strengthen the Europe's commitment to preserve glaciers

Above a temperature rise of 1.5°C, access to fresh water will become a challenge for regions that depend on glaciers and snow melt (IPCC report 2022)

Recommendations: building resilience locally with local communities



Inclusive & placed-based approach

- analysing precisely current and future water resources and identifying the associated climate risks and socio-economic impacts
- adopting placed based adaptation strategies, which can help raise awareness of sustainable water management and prioritise its uses
- co-constructing these adaptation strategies with local communities

A man in a dark blue jacket and black pants is hiking on a grassy mountain ridge. He has a child strapped to his back in a grey and red backpack. The child is wearing a black beanie and a red jacket. They are looking towards the right, where a vast mountain range stretches into the distance under a blue sky with scattered white clouds. The foreground is filled with tall, dry grasses.

Thank you !

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Let's keep in touch





PIRAGUA

OPCC

Evaluación y prospectiva de los recursos hídricos de los Pirineos en un contexto de cambio climático, y medidas de adaptación con impacto en el territorio.

Evaluation et prospective des ressources en eau del Pyrénées dans un contexte de changement climatique et mesures d'adaptation avec un impact sur le territoire.



www.opcc-ctp.org/proyecto/piragua



Interreg
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Fondo Europeo de Desarrollo Regional (FEDER)
Fonds Européen de Développement Régional (FEDER)



UNIÓN EUROPEA
UNION EUROPÉENNE

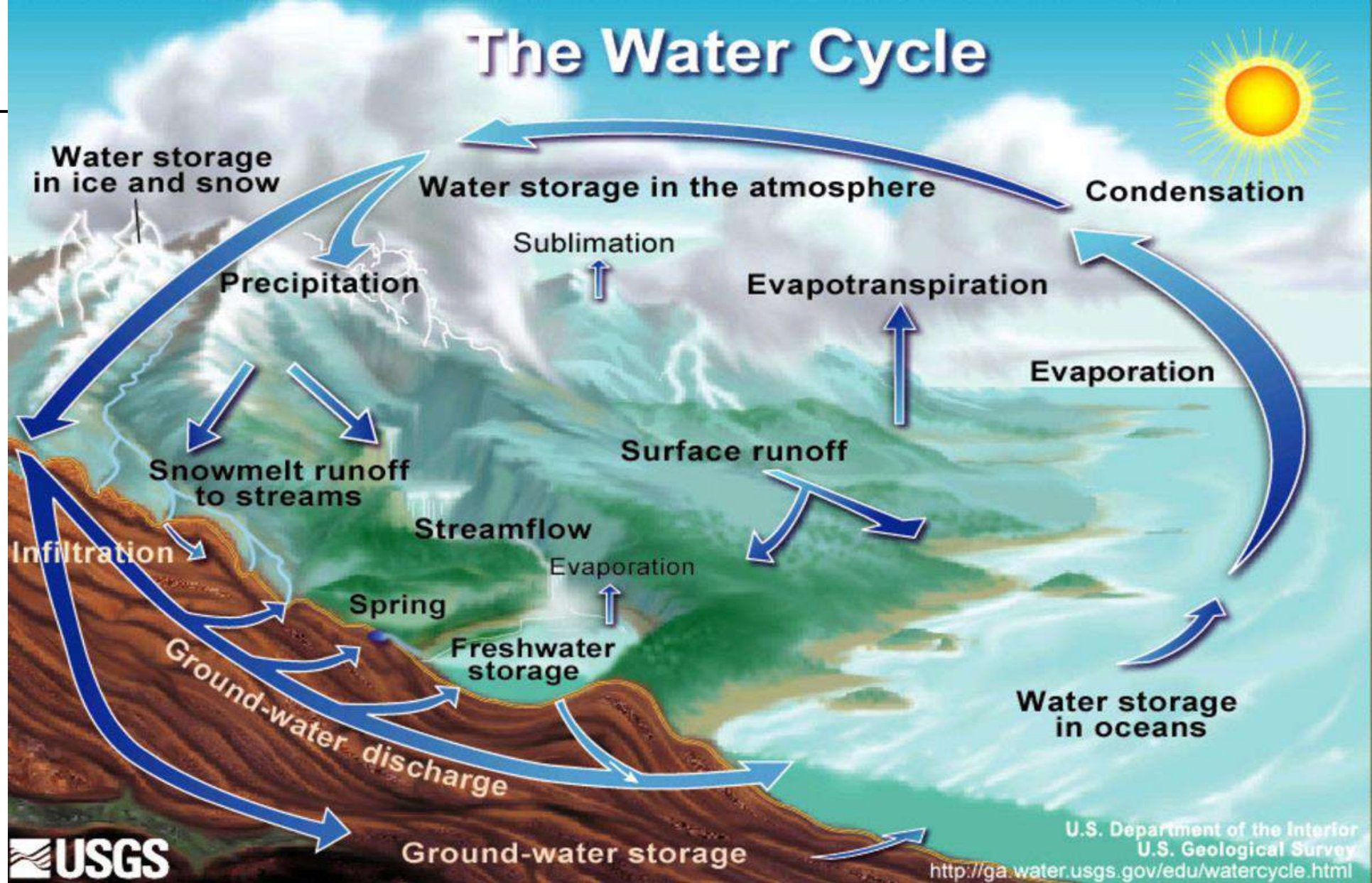


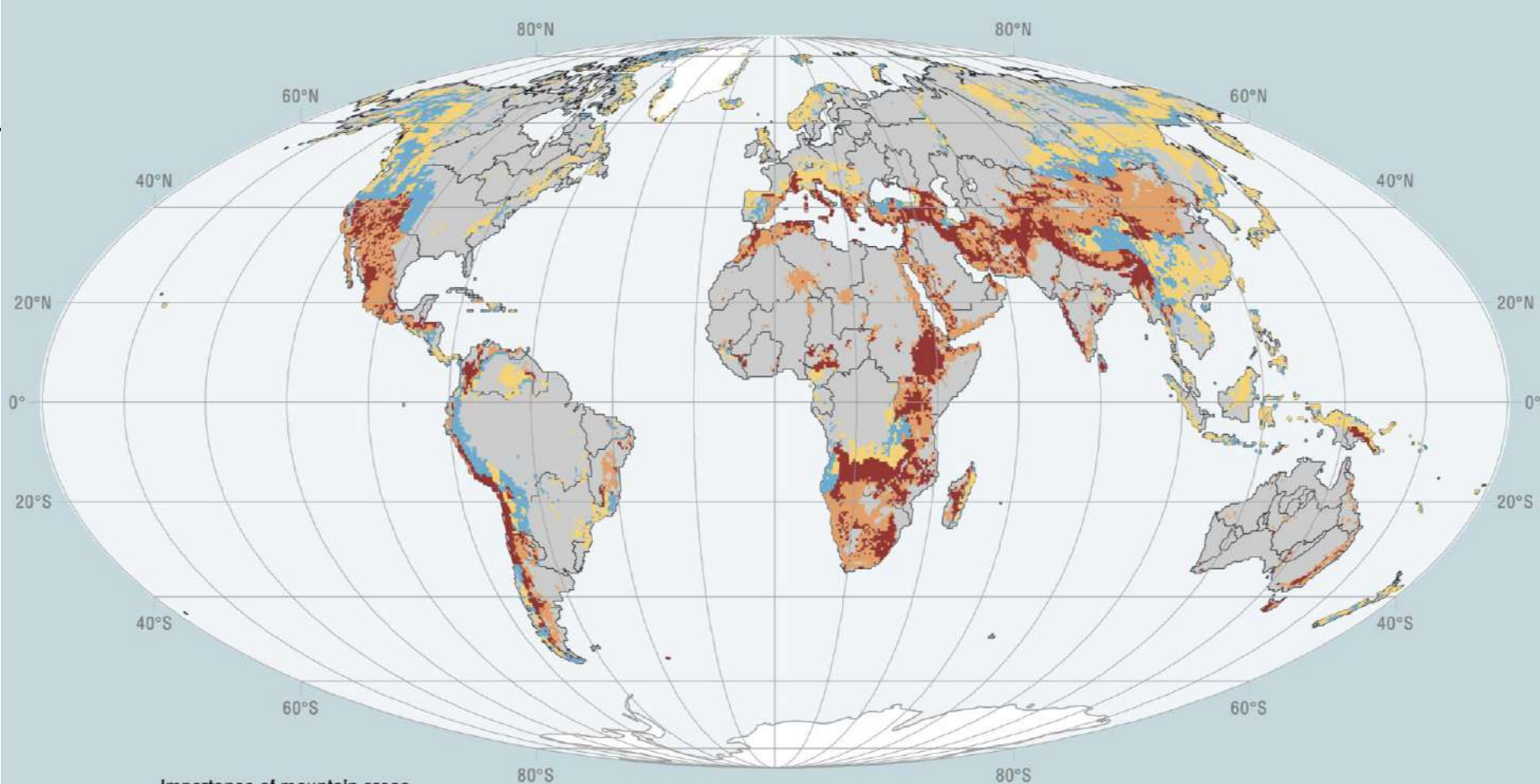
Pyrenees4clima



Co-funded by
the European Union

The Water Cycle





**Importance of mountain areas
for lowland water resources**

- Extremely important
- Very important
- Important
- Less important

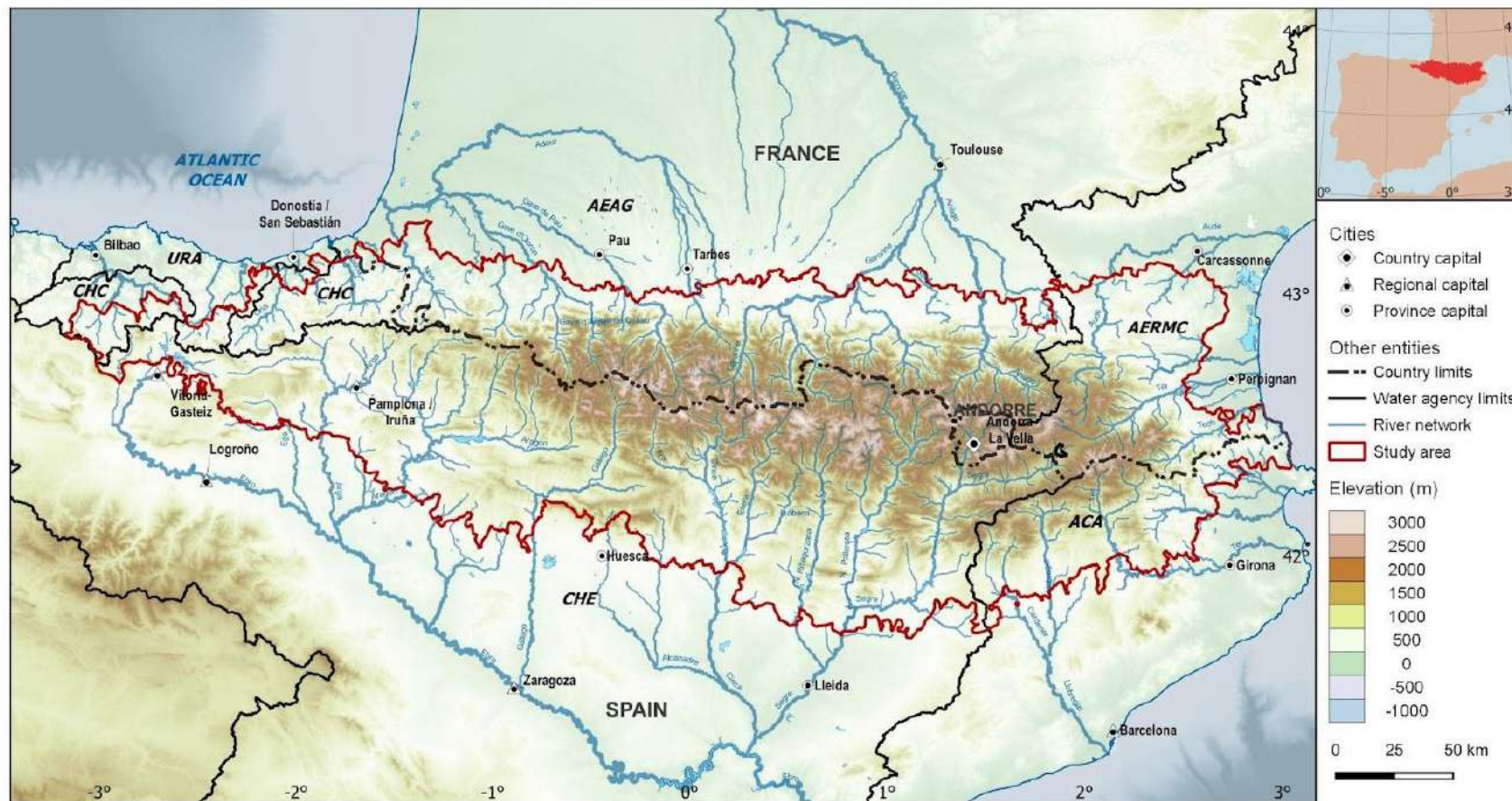
- Large river basin
- Lowland area
- Ice sheet

Map scale: approx. 1:200,000,000

Map sources

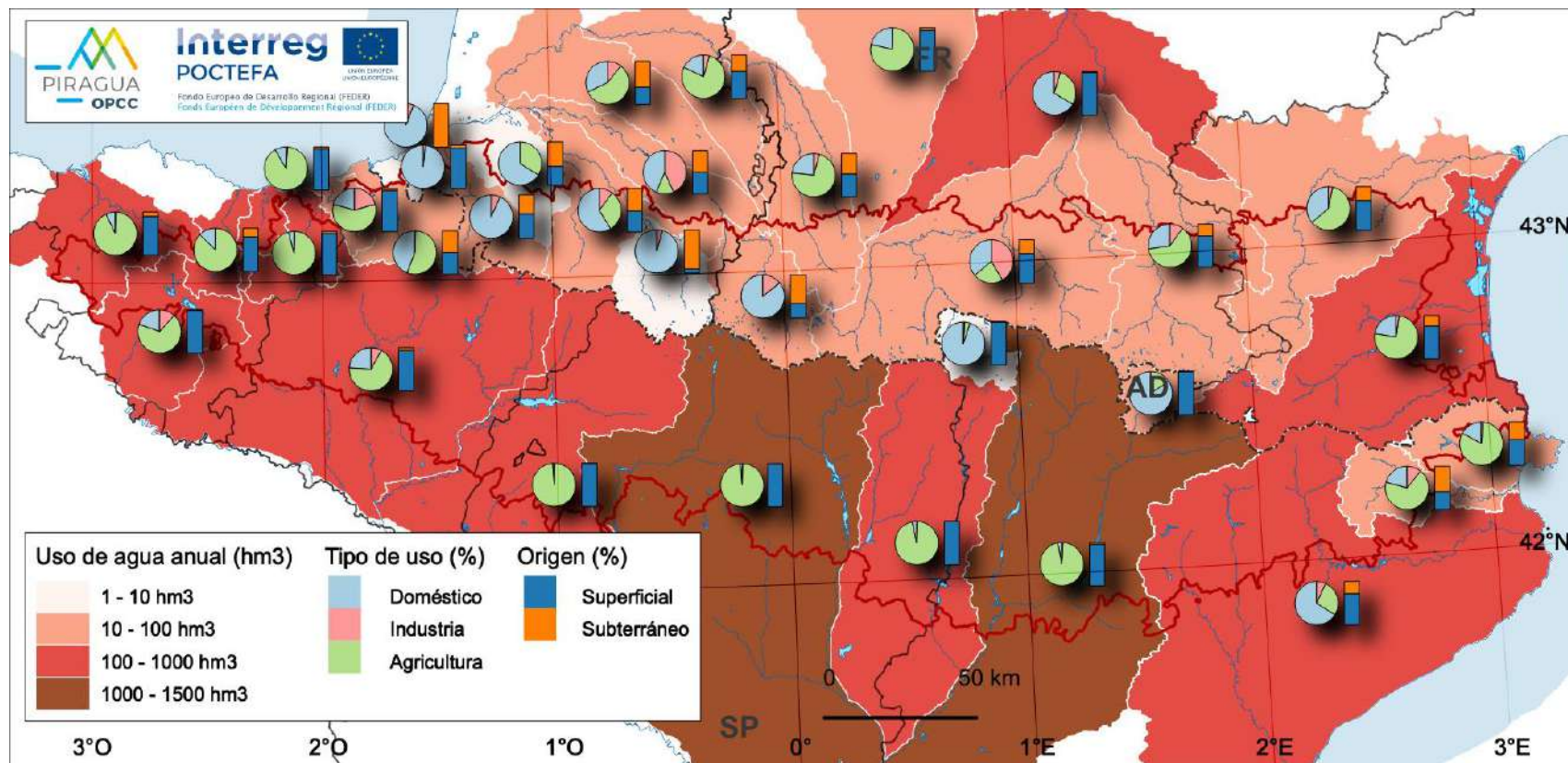
Daniel Viviroli et al. 2007, Institute of Geography, University of Bern
 Map projection: Mollweide
 Map compilation 2009: Ulla Gaemperli Krauer, CDE University of Bern

Study area



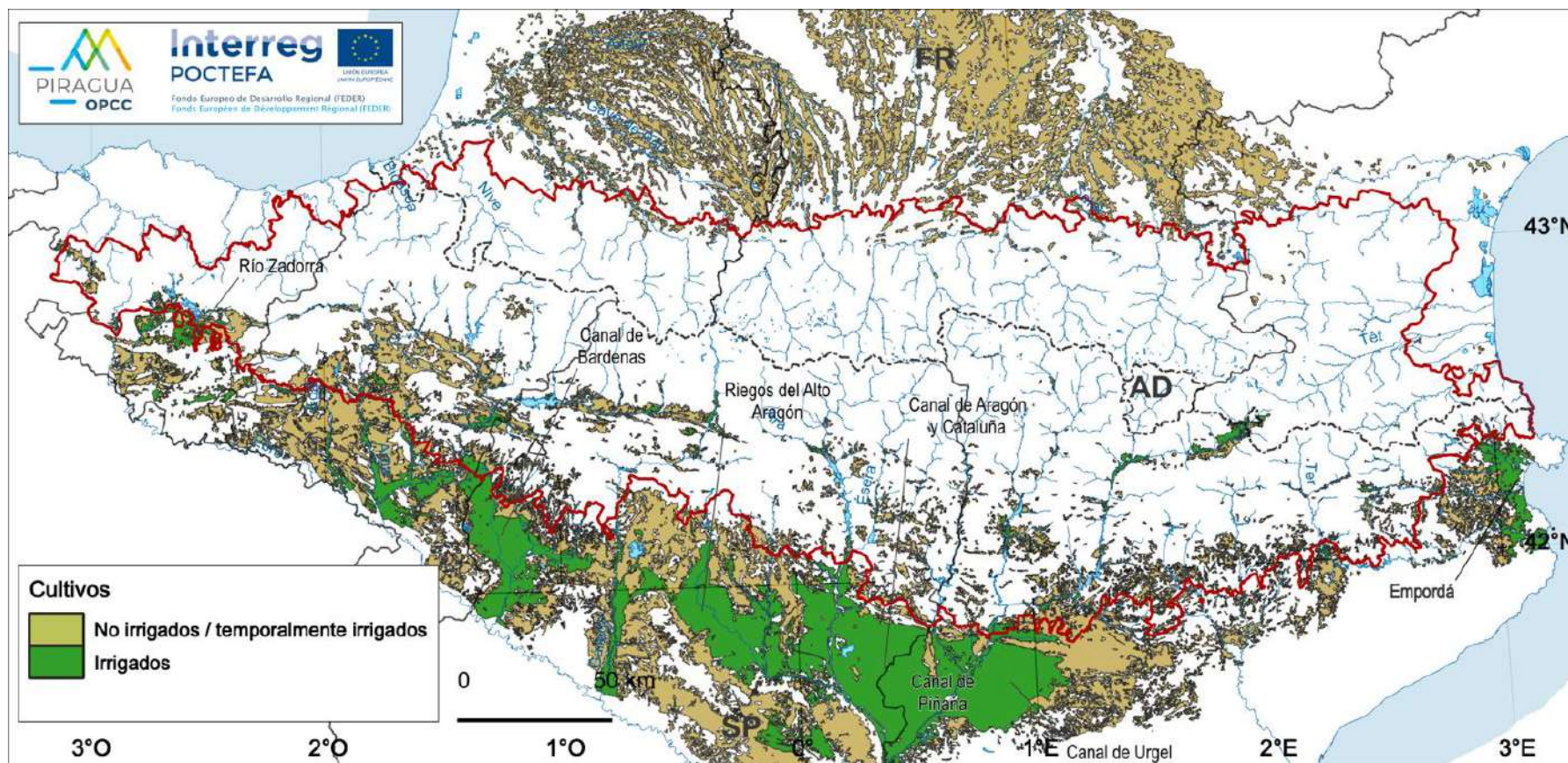
- **Three countries**, four autonomous regions (SP), two regions (FR).
- **Six water administrations** (AEAG, AERMC, CHC, CHE, URA, ACA).

Freshwater resources of the Pyrenees



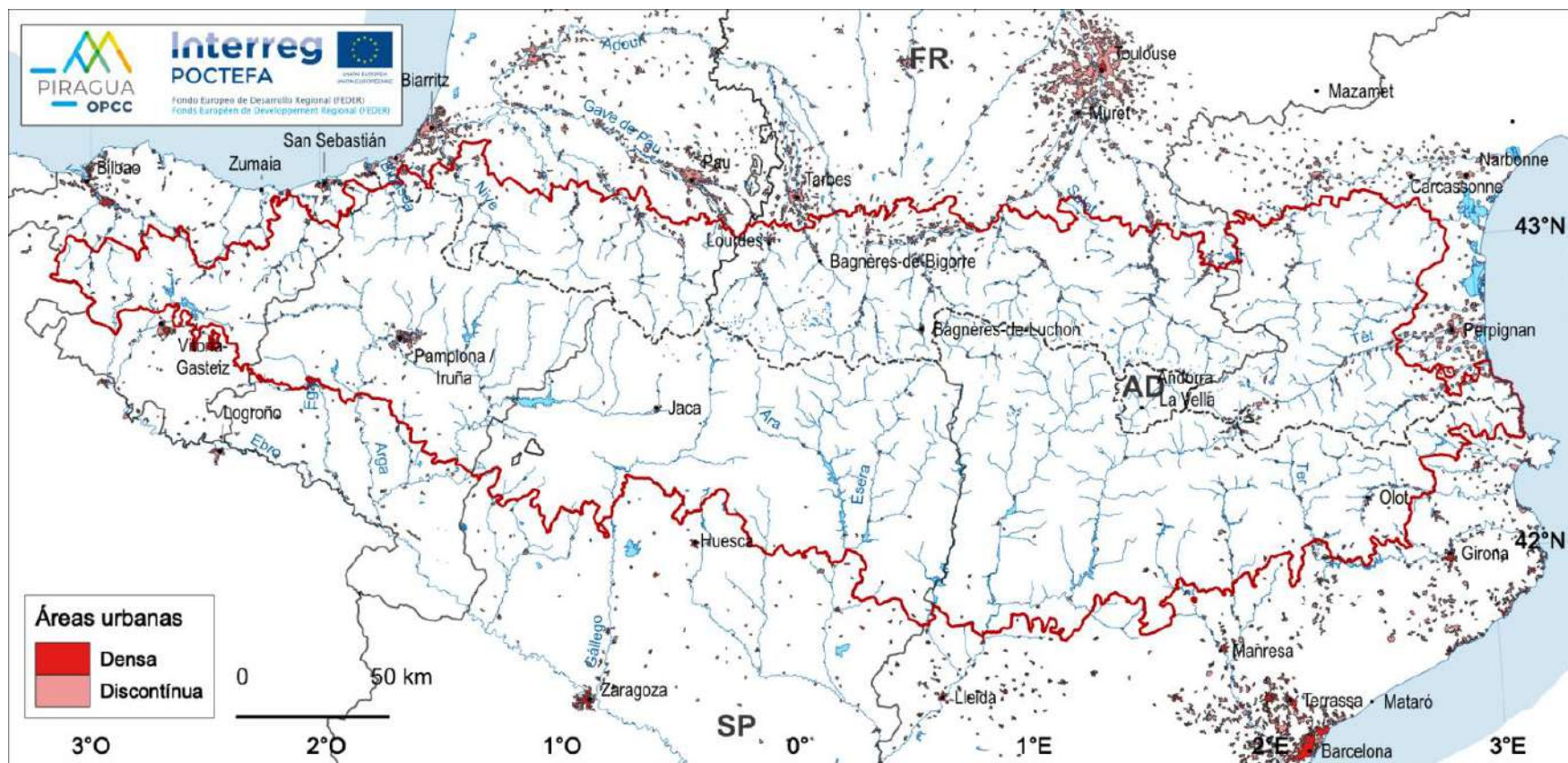
- Total consumptive use: **7,500 Mm³ per year** (Spain: 6,500; France: 960; Andorre: 17).
- To a large extent, consumptive use occurs **outside the Pyrenees**.
- Origin is main **superficial** (73%; Spain almost 100%).
- Largest use is **irrigated agriculture** (53%; Spain 77%).

Freshwater resources of the Pyrenees



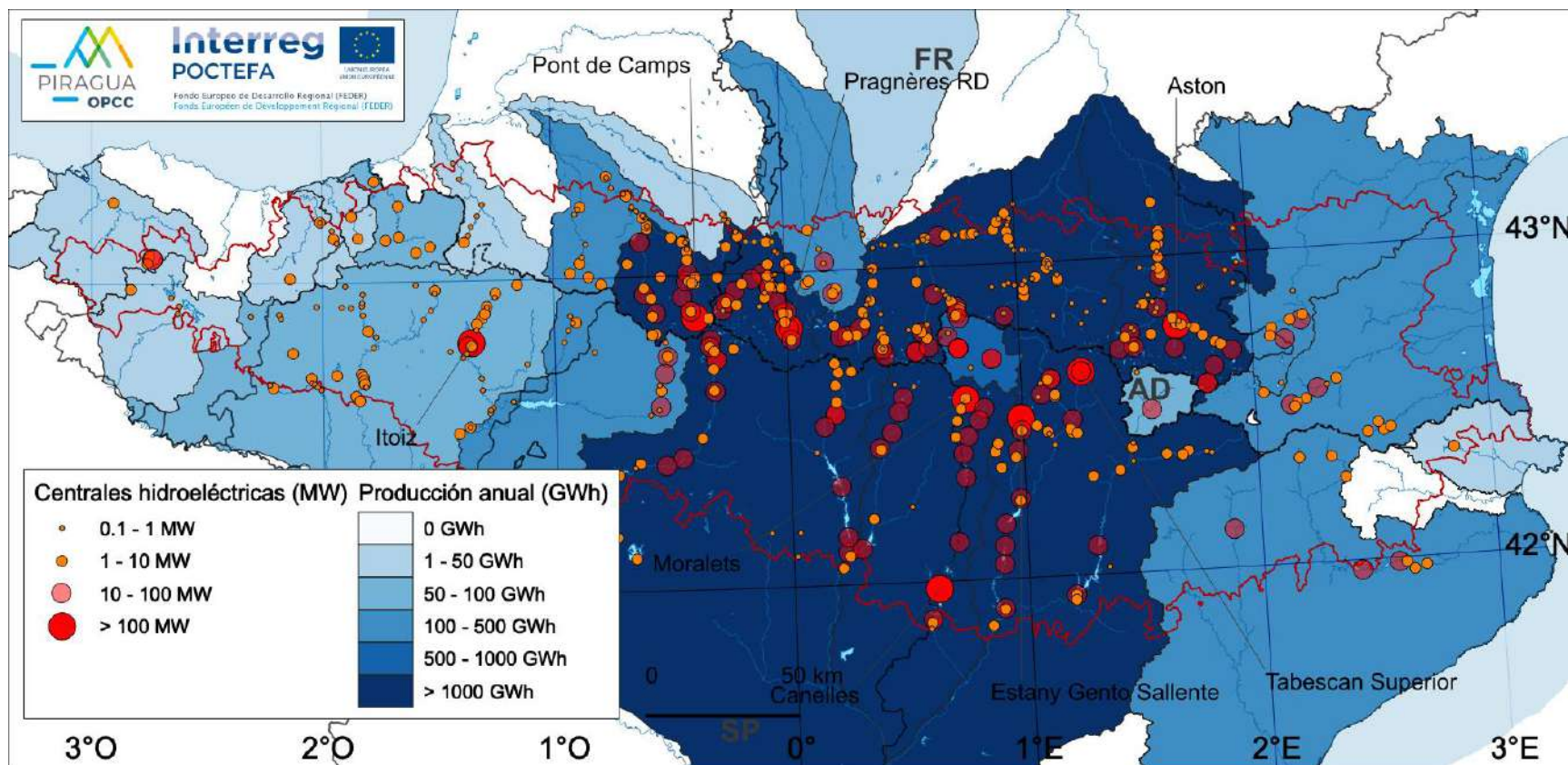
- Irrigated agriculture: 6,000 Mm³ year (4,750 España).

Freshwater resources of the Pyrenees

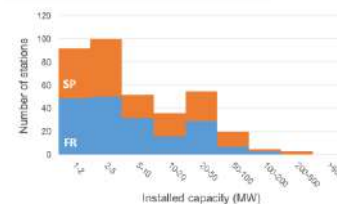


- **Urban supply:** 1,100 Mm³ per year, mostly outside the Pyrenees.
- **Industrial use:** 293 Mm³ per year.

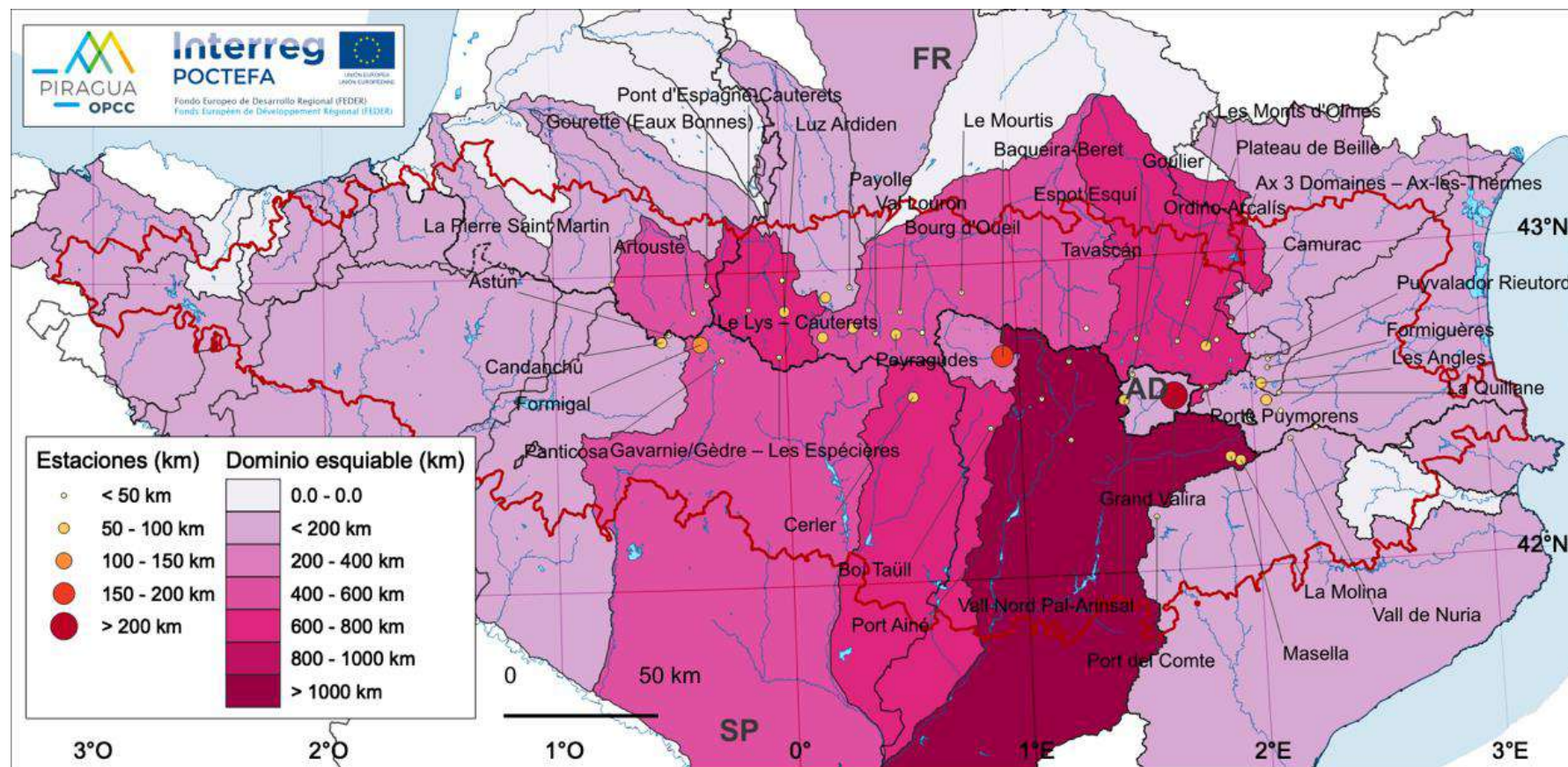
Freshwater resources of the Pyrenees



- **Hydro-power production**, the main non-consumptive use.
- Mostly **within the Pyrenees**.
- Over **600 plants**, 6,000 MW installed power.
- Production: around **11,500 GWh per year**.

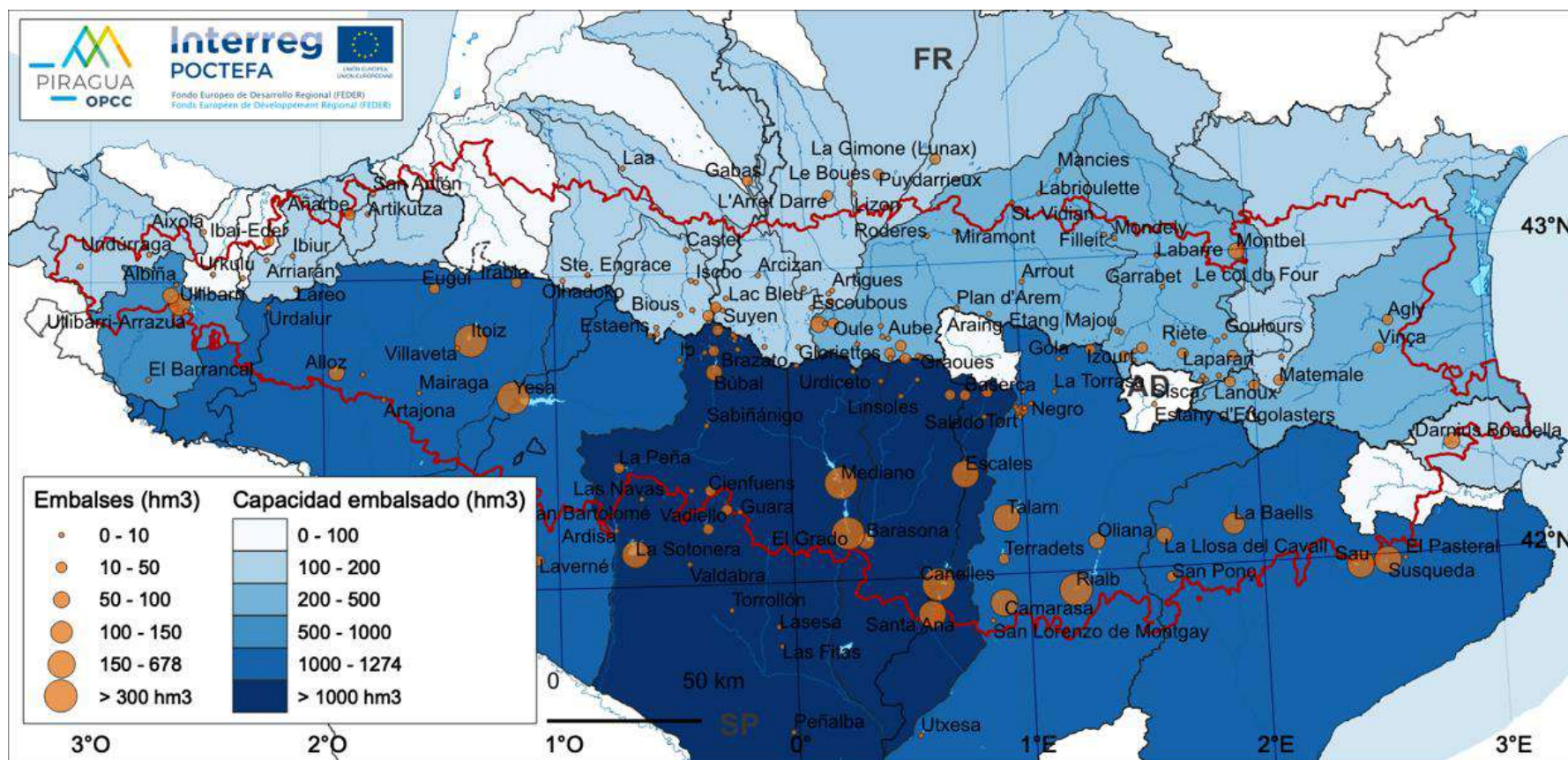


Freshwater resources of the Pyrenees

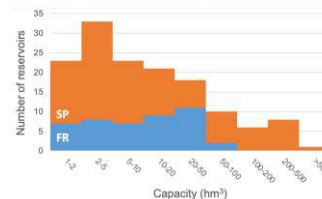


- **50 ski resorts**, with over 2,200 km domain.
- **Artificial snow** in 900 km (41%).
- Water use: **4.5 to 6.5 Mm³** per year.

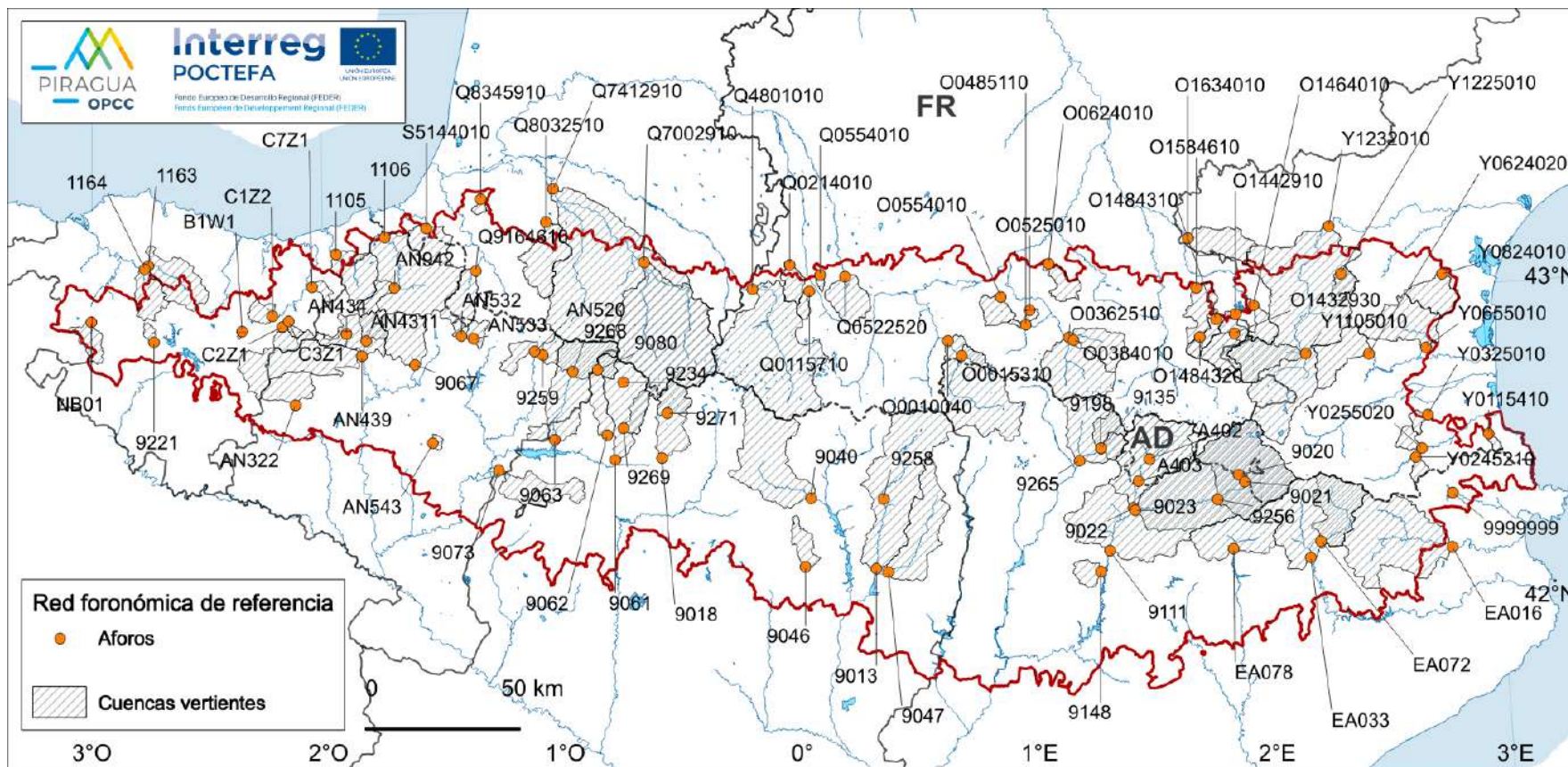
Freshwater resources of the Pyrenees



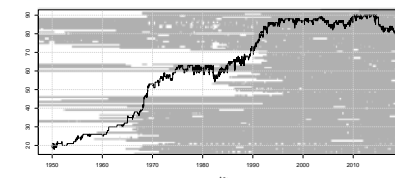
- **284 reservoirs**, 6,211 Mm³.
- 15 large reservoirs (>100 Mm³); 6 > 400 Mm³.
- **Imbalance:** France, 660 Mm³; Spain, 5,500 Mm³ (x10).




Observed trends: river discharge

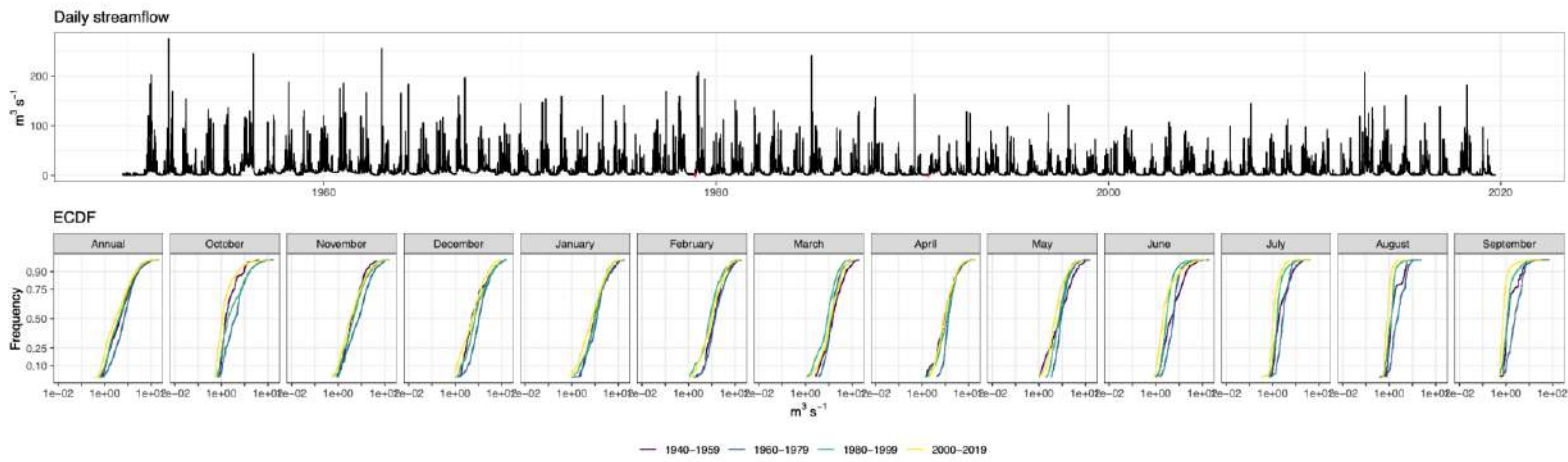


- Network of **88 gauging stations** with natural or semi-natural regime.



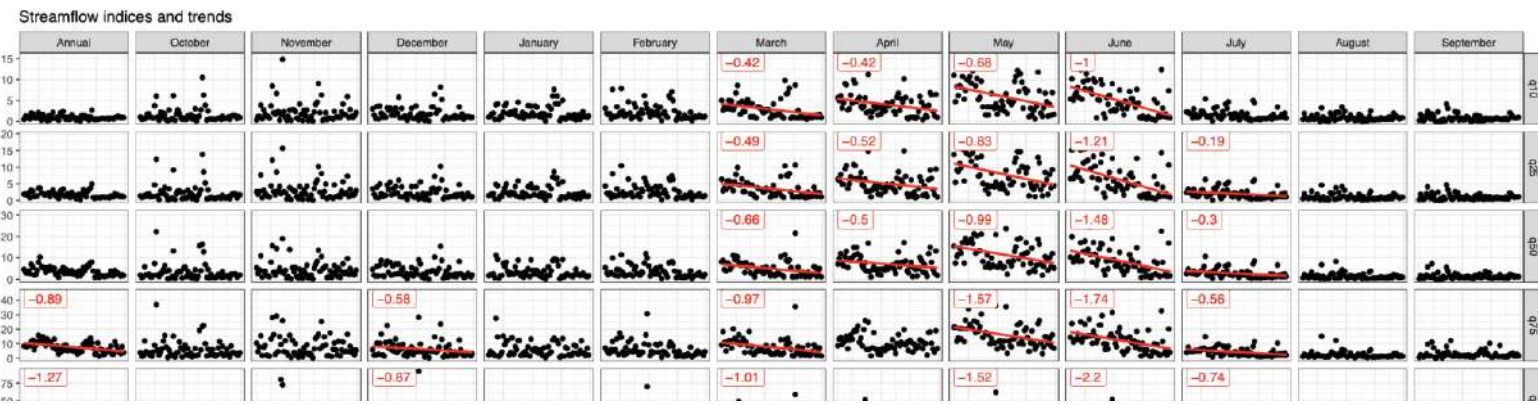
Observed trends: river discharge

SIGÜES (9063, Esca) 

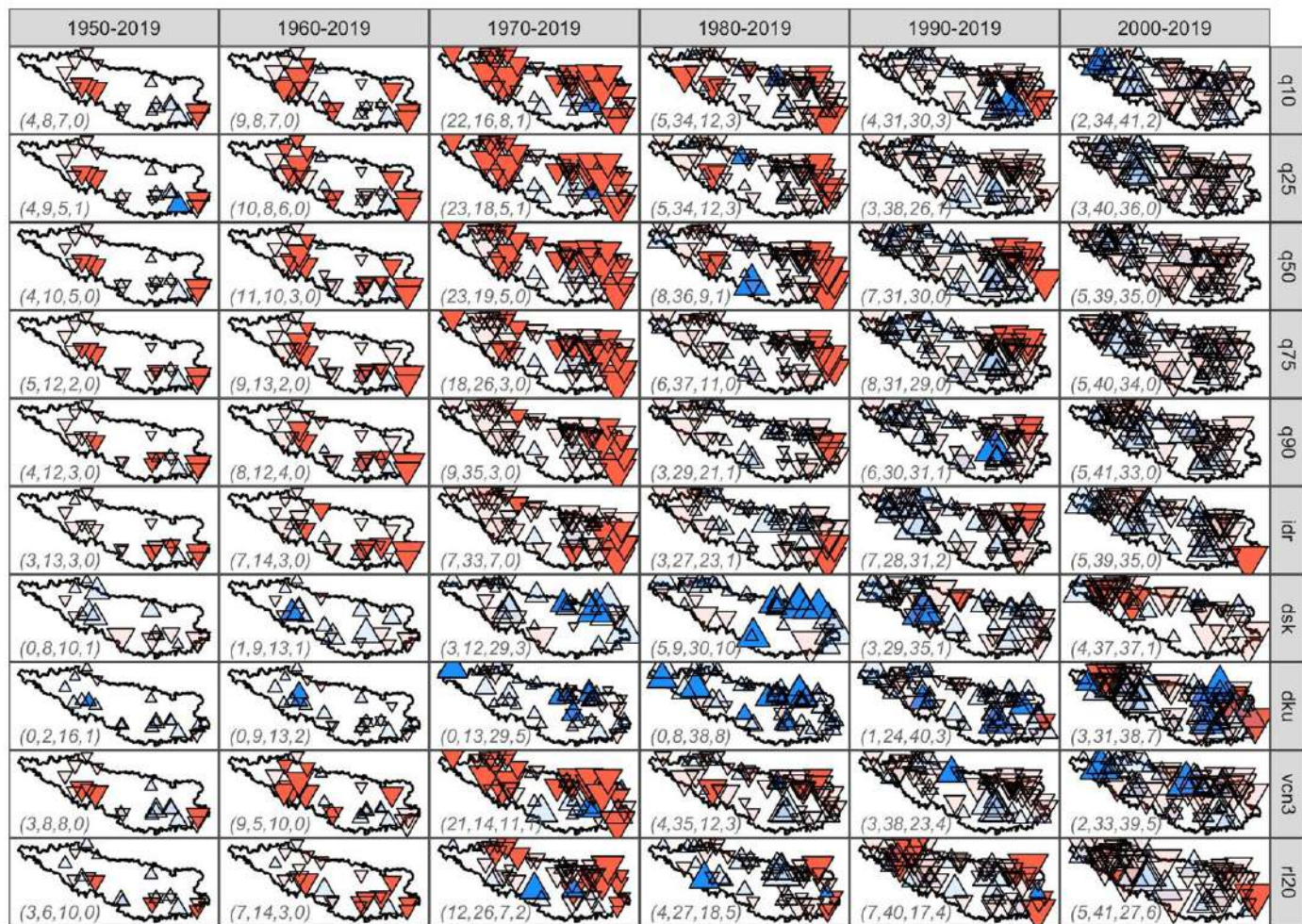


ECDF statistics (median, range, skewness and kurtosis)

Year	1940-1959	1960-1979	1980-1999	2000-2019
Annual	4.18, 26.47, 0.75, 0.37	1.5, 8.5, 0.86, 0.26	3.39, 13, 0.63, 0.48	4.99, 36.45, 0.83, 0.24
October	6.7, 26.88, 0.62, 0.4	3.76, 15.43, 0.65, 0.38	7.75, 33.61, 0.62, 0.42	10.64, 39.84, 0.65, 0.38
November	4.11, 21.29, 0.71, 0.41	1.95, 16.03, 0.86, 0.37	4.42, 22.42, 0.71, 0.37	7.07, 38.56, 0.72, 0.37
December	2.92, 22.33, 0.81, 0.35	1.28, 6.8, 0.91, 0.38	3.47, 15.21, 0.91, 0.49	5.58, 29.38, 0.87, 0.4
January	7.96, 30.66, 0.3, 0.36	7.96, 30.66, 0.3, 0.36	9.5, 31.14, 0.54, 0.45	11.85, 44.87, 0.62, 0.34
February	8.55, 39.26, 0.44, 0.47	8.55, 39.26, 0.44, 0.47	11.53, 25.82, 0.42, 0.53	13.6, 53.47, 0.66, 0.4
March	7.27, 17.09, 0.52, 0.5	7.27, 17.09, 0.52, 0.5	9.2, 20.59, 0.53, 0.38	13.54, 51.66, 0.57, 0.45
April	2.92, 5.04, 0.48, 0.42	2.92, 5.04, 0.48, 0.42	5.72, 8.84, 0.25, 0.46	7.9, 30.65, 0.56, 0.45
May	1.6, 2.3, 0.48, 0.36	1.6, 2.3, 0.48, 0.36	2.26, 4.5, 0.51, 0.63	7.06, 37.92, 0.69, 0.4
June	1.2, 1.09, 0.04, 0.63	1.2, 1.09, 0.04, 0.63	2.26, 4.5, 0.51, 0.63	4.48, 18.09, 0.69, 0.51
July	1.16, 2.11, 0.55, 0.3	1.16, 2.11, 0.55, 0.3	1.85, 6.53, 0.77, 0.43	1.2, 3.97, 0.81, 0.24
August	2.48, 5.47, 0.47, 0.57	2.48, 5.47, 0.47, 0.57	2.26, 4.5, 0.51, 0.63	1.21, 4.3, 0.81, 0.31
September	3.76, 21.11, 0.71, 0.41	3.76, 21.11, 0.71, 0.41	4.42, 22.42, 0.71, 0.37	7.07, 38.56, 0.72, 0.37



Observed trends: river discharge

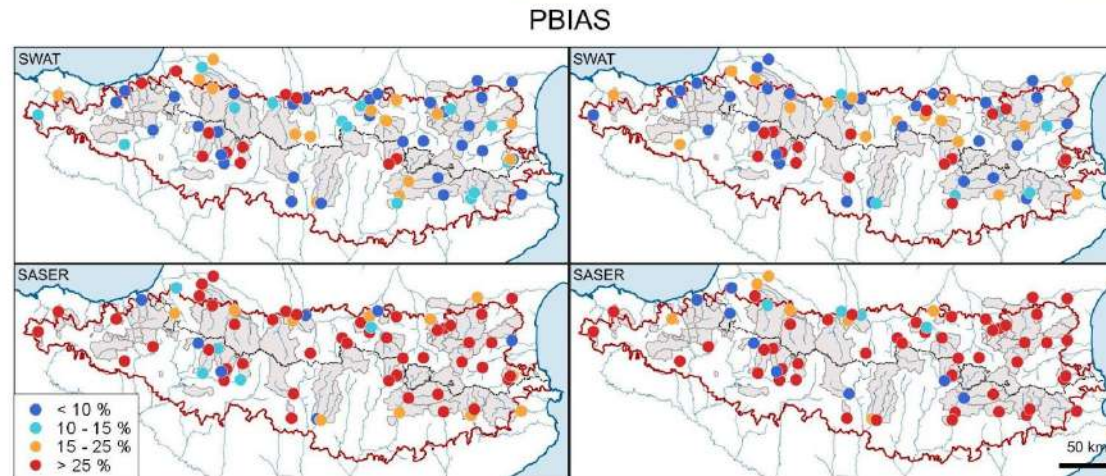
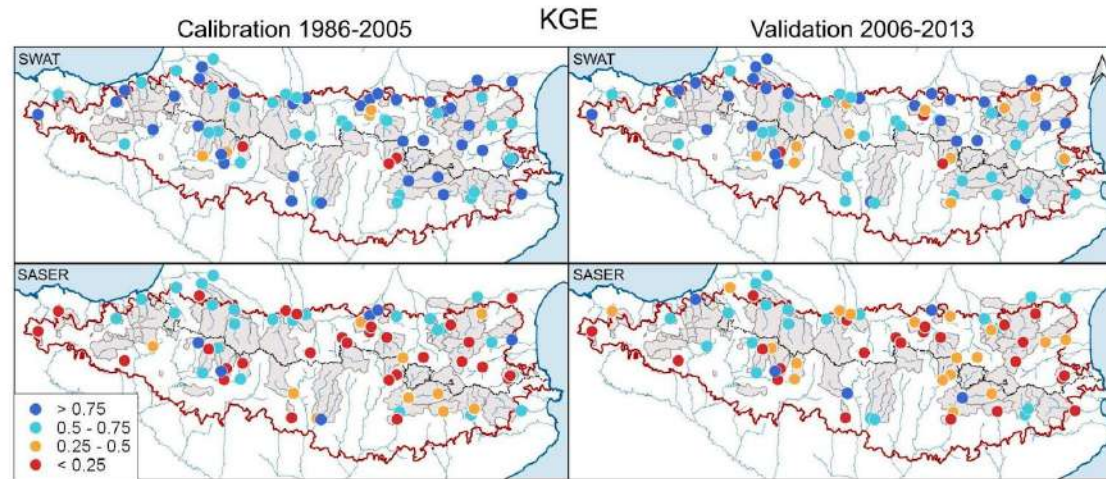


• Generalized decrease in anual discharge.

• Most notably the lower (summer) discharge.

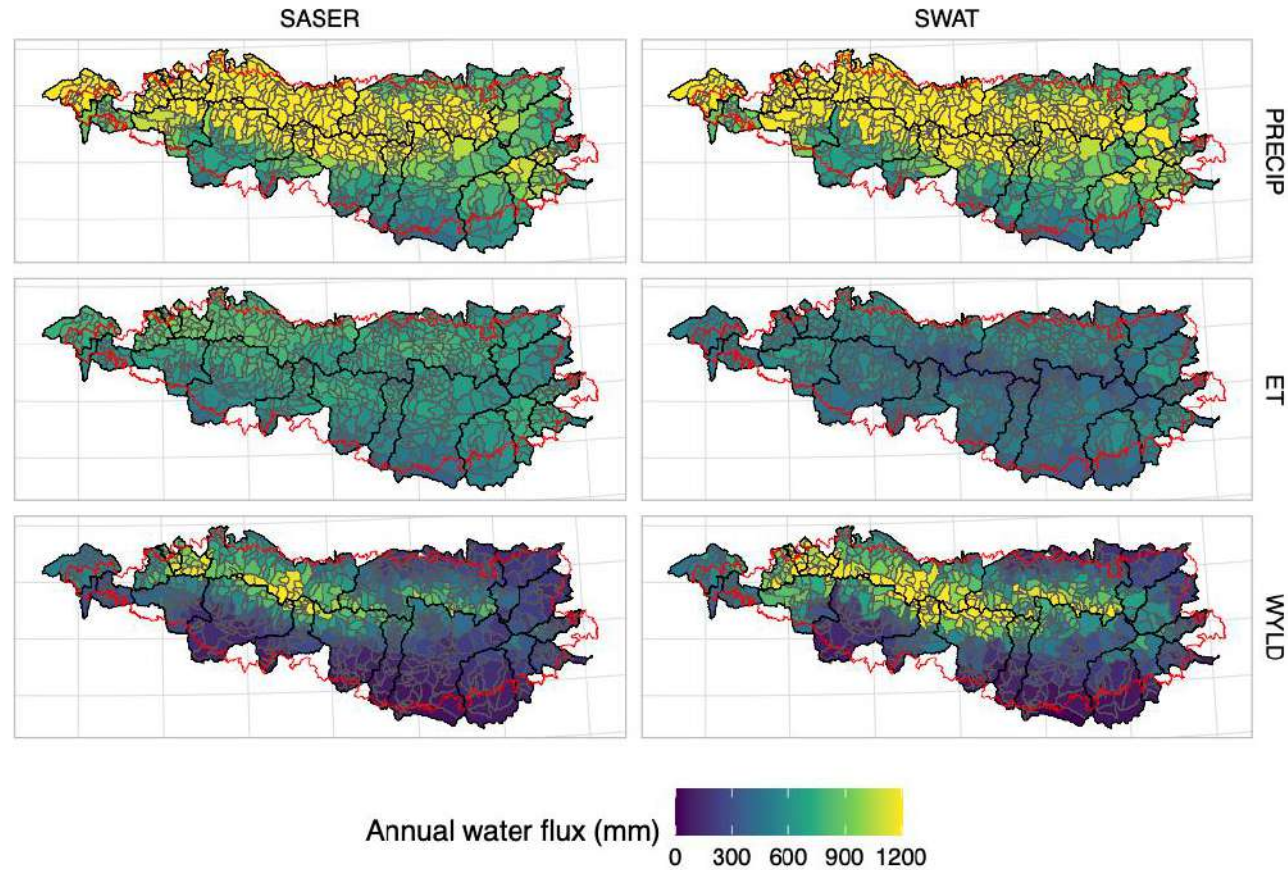
Direction of change: ▲ Asc., sig. ▼ Desc., no sig. ▲ Asc. no sig. ▼ Desc. sig.
 Magnitude of change: ▲ 0 ▲ 10 ▲ 20
 ▲ 5 ▲ 15

Expected changes



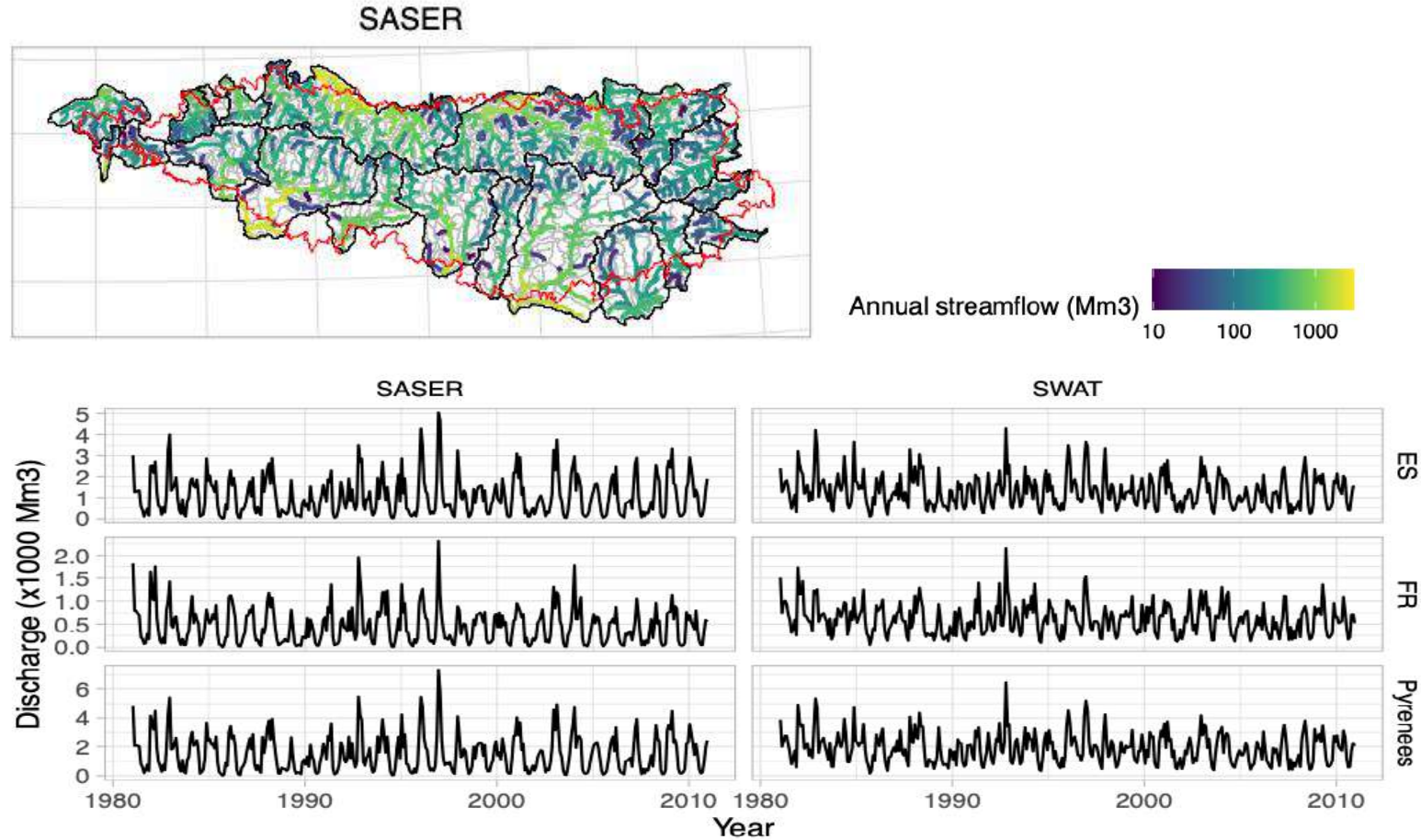
- Two hydrological models (SWAT, SASER).
- Forced with **observed climate**.
- Calibrated against **observed streamflow**.

Expected changes



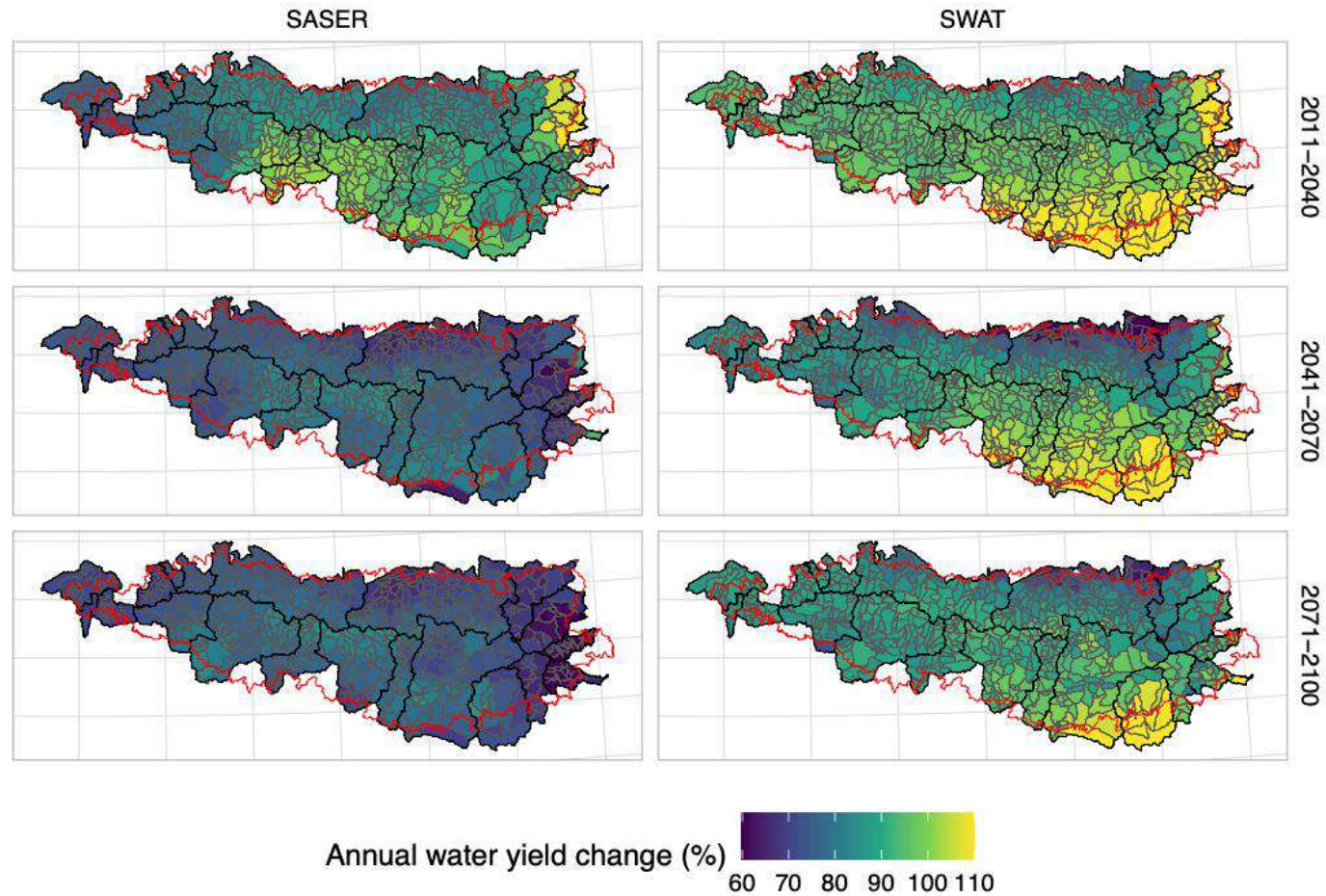
- Spatial and temporal analysis of **water balance components** over the Pyrenees.
- Average annual **precipitation**, **evapotranspiration (ET)** and **water yield (WYLD)**, 1981-2010.

Expected changes



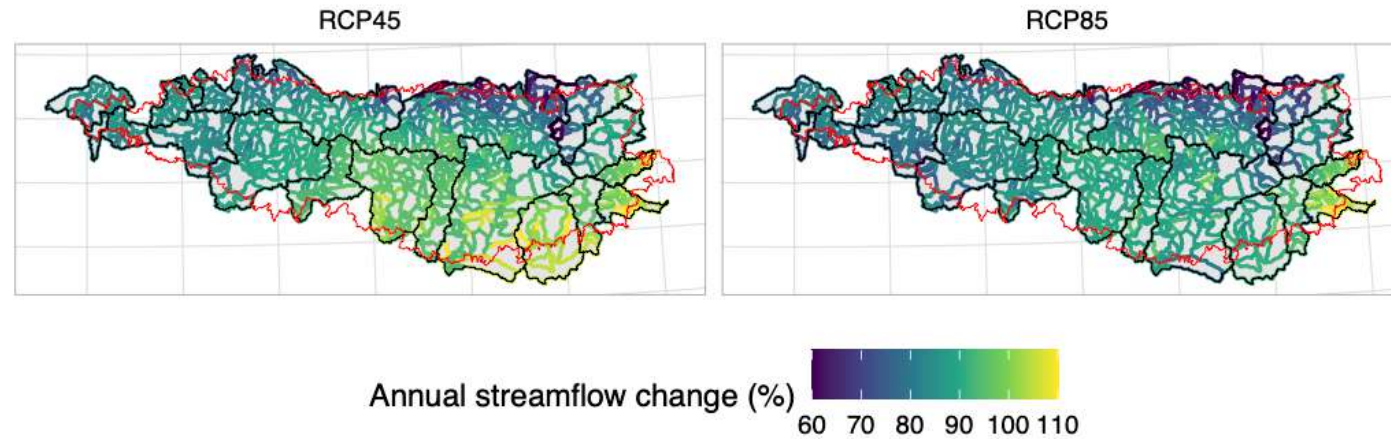
- Mean annual **streamflow**, 1981-2010.
- **Streamflow time series**, at different aggregation levels.

Expected changes



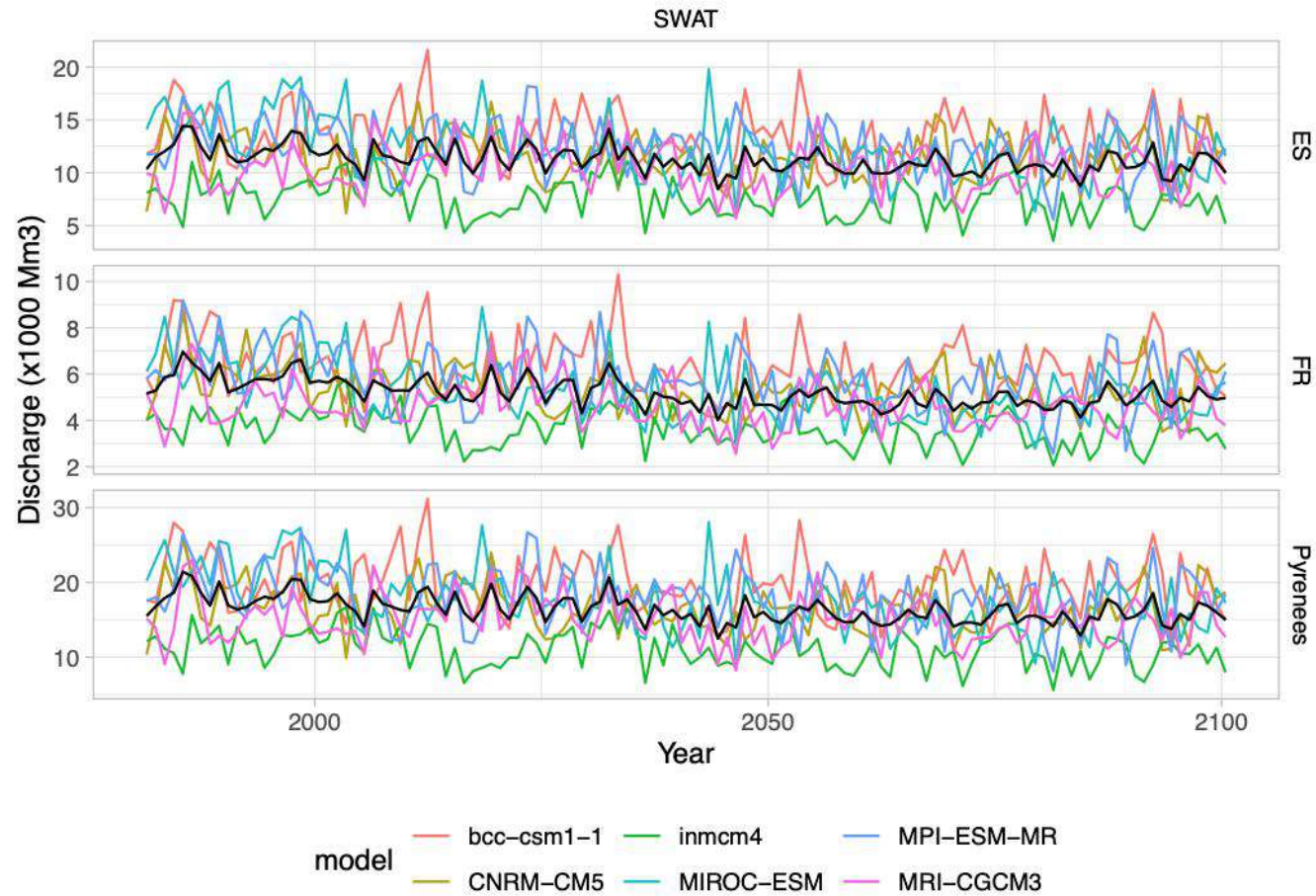
- Expected changes in **water balance components** for different future time horizons.
- **Median change in water yield** for three time horizons, as compared to 1981-2010.

Expected changes



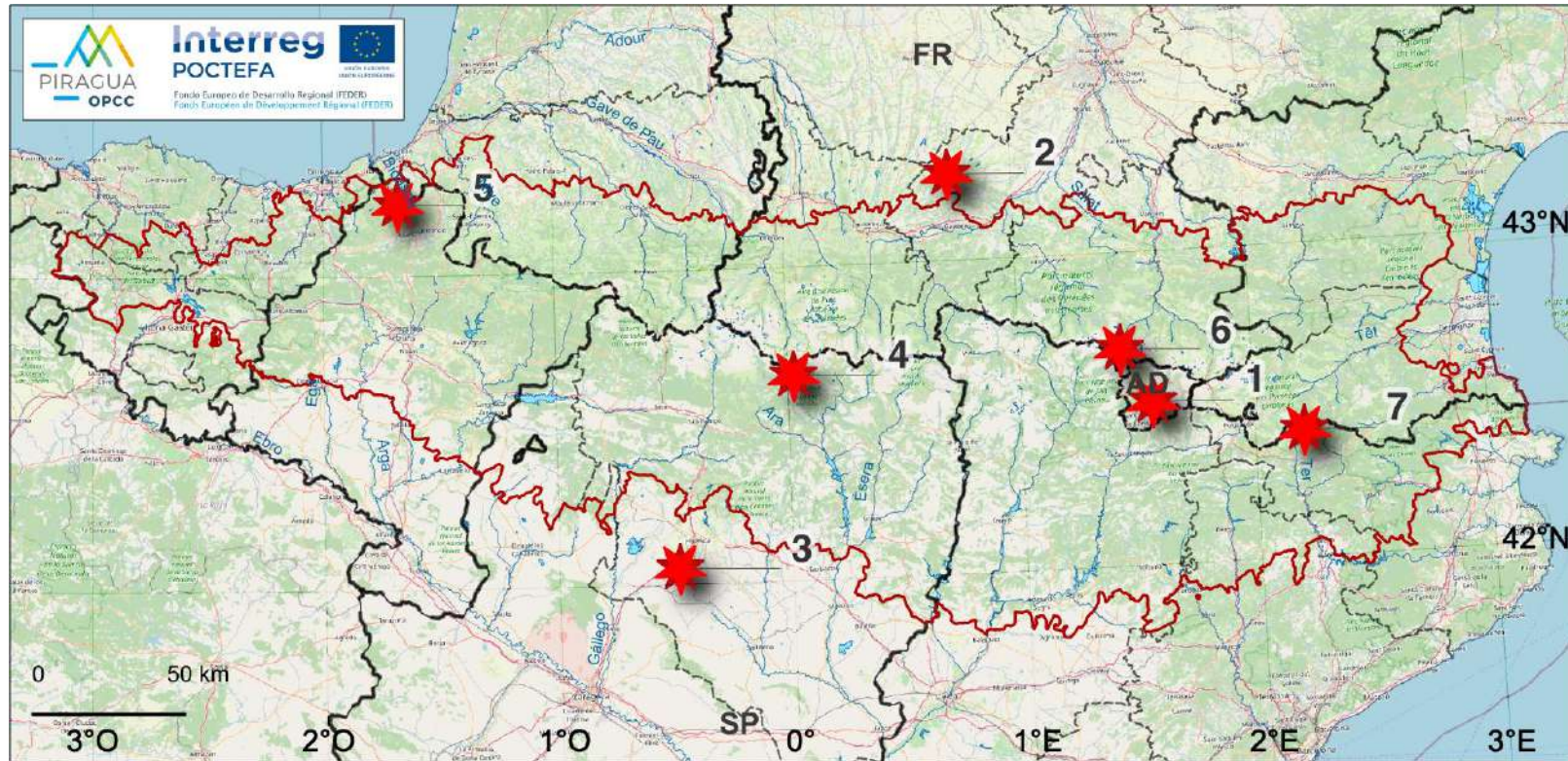
- **Median anual streamflow change** for three time horizons, as compared to 1981-2010.

Expected changes



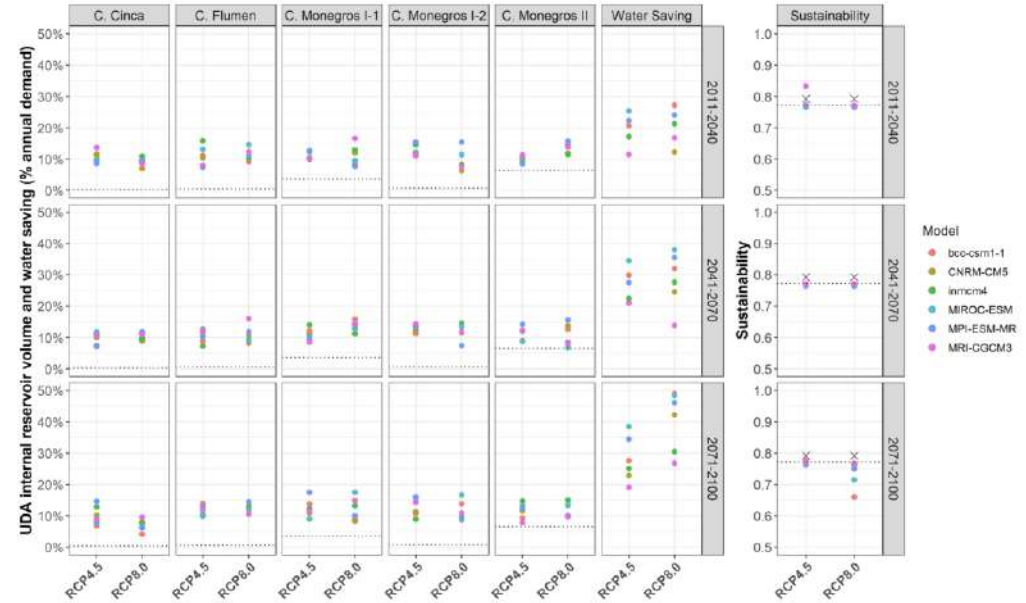
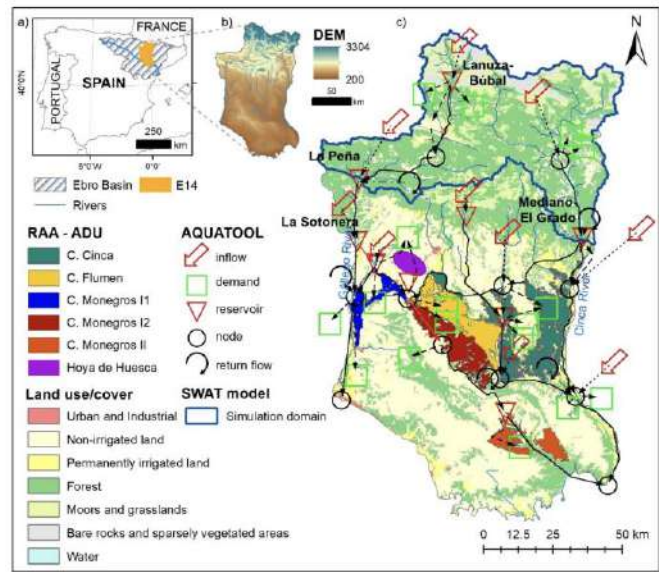
- Projected **discharge time series** under different GCM model projections, and median discharge.

Adaptation strategies

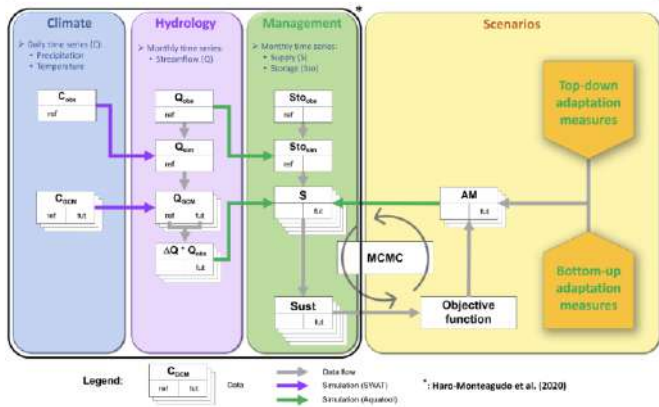


1. Competition for water resources in a climate change (CC) context (**Andorra**).
2. Management of a complex water resource system in climate change scenarios (**Neste System**).
3. Adaptation to climate change in a system focused on irrigation agriculture (**Riegos del Alto Aragón**).
4. Impact of climate change on areas of special environmental value (**Ordesa and Monte Perdido National Park**).
5. Adaptation to climate change through the management of the hydrological functionality of the territory (**Bidasoa**).
6. Territory transformation and hydrological dynamics in sensitive headwater areas (**Alto Vicedessos**).
7. Impact of extreme events on water resources (**Pyrenees**).

Adaptation strategies



- Adaptation to climate change in a system focused on irrigation agriculture (**Riegos del Alto Aragón**).



Outreach

- All data and publications are distributed in an [open repository](#), following the **FAIR principles**.



DIGITAL_CSIC / Ciencias Agrarias / Estación Experimental de Aula Dei (EAD) / (EAD) PIRAGUA OPCC datasets y documentos

English español

(EAD) PIRAGUA OPCC datasets y documentos : [12]

Interreg POCTEFA

[EN] The PIRAGUA open access repository contains datasets and scientific reports about the water balance and water resources of the Pyrenees (France, Spain and Andorra) in the recent past, present, and future projections. This includes data sets on current water uses and management (PIRAGUA_resources), observed streamflow and groundwater statistics and trends (PIRAGUA_indicators), extreme events and floods (PIRAGUA_flood), forcing historical and future climate (PIRAGUA_atmos_analysis, PIRAGUA_atmos_climate), and water budget simulations for the historical and future periods (PIRAGUA_hydro_analysis, PIRAGUA_hydro_climate), and two scientific reports: a physical basis report on the observed and projected changes in the Pyrenees' water resources and an adaptation options report based on a number of case studies. By following the FAIR (Findable, Accessible, Interoperable and Reusable) principles of data management, it brings a wide range of opportunities for researchers, water resource managers, and the general public.

[ES] El repositorio de acceso abierto de PIRAGUA contiene conjuntos de datos e informes científicos sobre el balance hídrico y los recursos hídricos de los Pirineos (Francia, España y Andorra) en el pasado reciente, presente y proyecciones futuras. Esto incluye conjuntos de datos sobre usos y gestión actuales del agua (PIRAGUA_resources), estadísticas y tendencias observadas en caudales y aguas subterráneas (PIRAGUA_indicators), eventos extremos e inundaciones (PIRAGUA_flood), forzamiento climático histórico y futuro (PIRAGUA_atmos_analysis, PIRAGUA_atmos_climate) y simulaciones de balance de agua para los períodos histórico y futuro (PIRAGUA_hydro_analysis, PIRAGUA_hydro_climate), y dos informes científicos: un informe de base física sobre los cambios observados y proyectados en los recursos hídricos de los Pirineos y un informe de opciones de adaptación basado en varios estudios de casos. Al seguir los principios de gestión de datos FAIR (Findable, Accessible, Interoperable and Reusable), brinda una amplia gama de oportunidades para investigadores, administradores de los recursos hídricos y el público en general.

[FR] Le référentiel en libre accès PIRAGUA contient des ensembles de données et des rapports scientifiques sur le bilan hydrique et les ressources en eau des Pyrénées (France, Espagne et Andorre) dans le passé récent, le présent et les projections futures. Cela comprend des ensembles de données sur les utilisations et la gestion actuelles de l'eau (PIRAGUA_resources), les statistiques et les tendances observées du débit et des eaux souterraines (PIRAGUA_indicators), les événements extrêmes et les inondations (PIRAGUA_flood), le forçage climatique historique et futur (PIRAGUA_atmos_analysis, PIRAGUA_atmos_climate) et des simulations de bilan hydrique pour le périodes historiques et futures (PIRAGUA_hydro_analyse, PIRAGUA_hydro_climate), et deux rapports scientifiques : un rapport de base physique sur les changements observés et projetés des ressources en eau des Pyrénées et un rapport d'options d'adaptation basé sur un certain nombre d'études de cas. En suivant les principes de gestion des données FAIR (Findable, Accessible, Interoperable and Reusable), il offre un large éventail d'opportunités aux chercheurs, aux gestionnaires des ressources en eau et au grand public.

Web

Buscar

Fecha Publicación Autor Título Palabras Clave Fecha Envío

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Explorar

Autor

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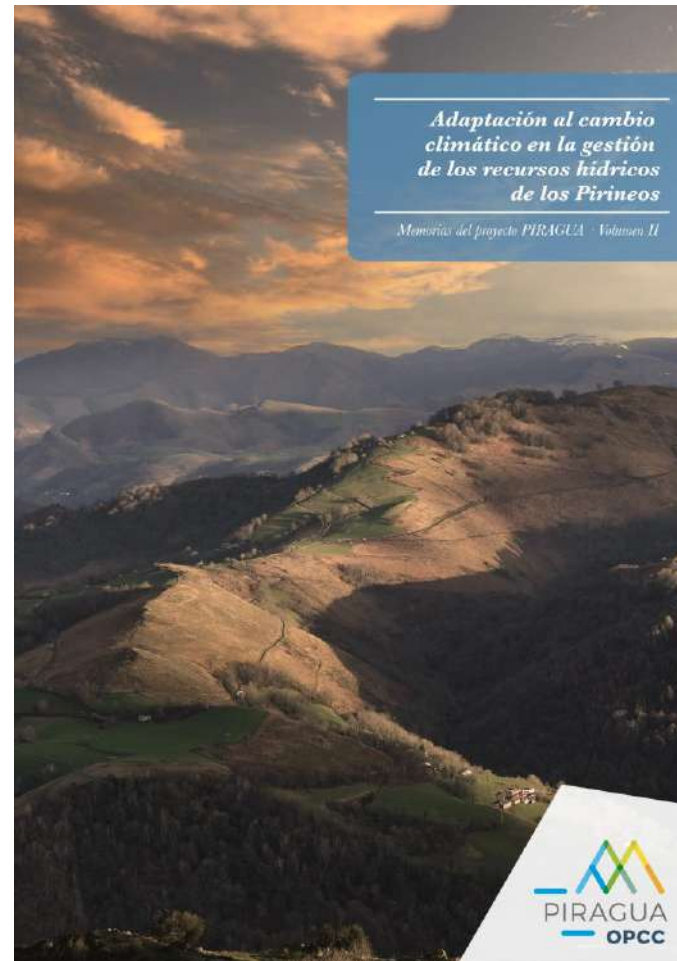
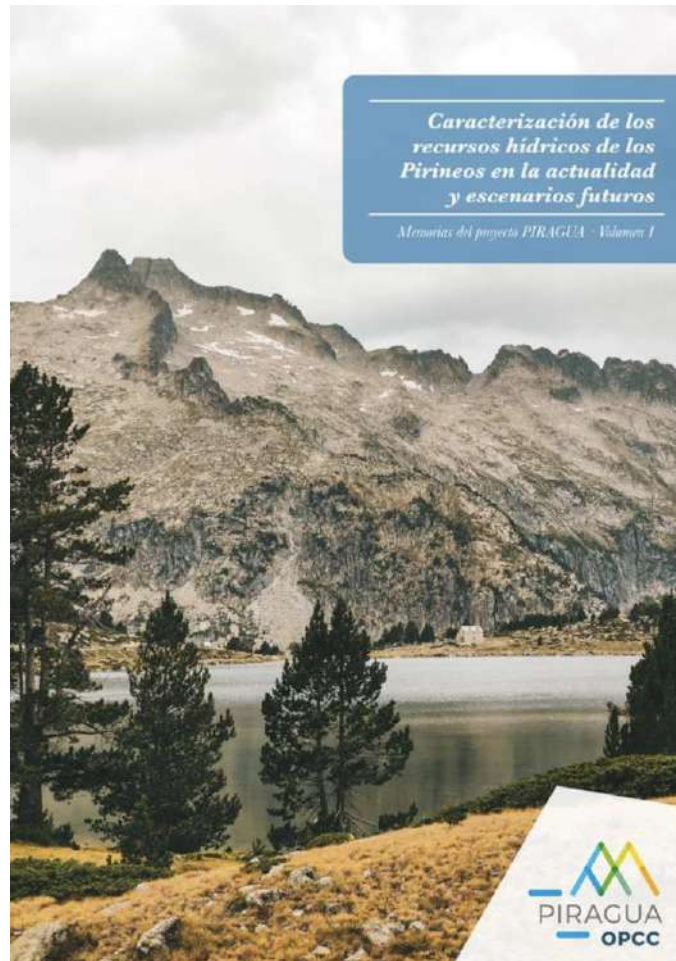
Palabras clave

Pyrenees	12
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Hydrology	4
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Adaptation	2
SASER	2



Fondo Europeo de Desarrollo Regional (FEDER)

Outreach

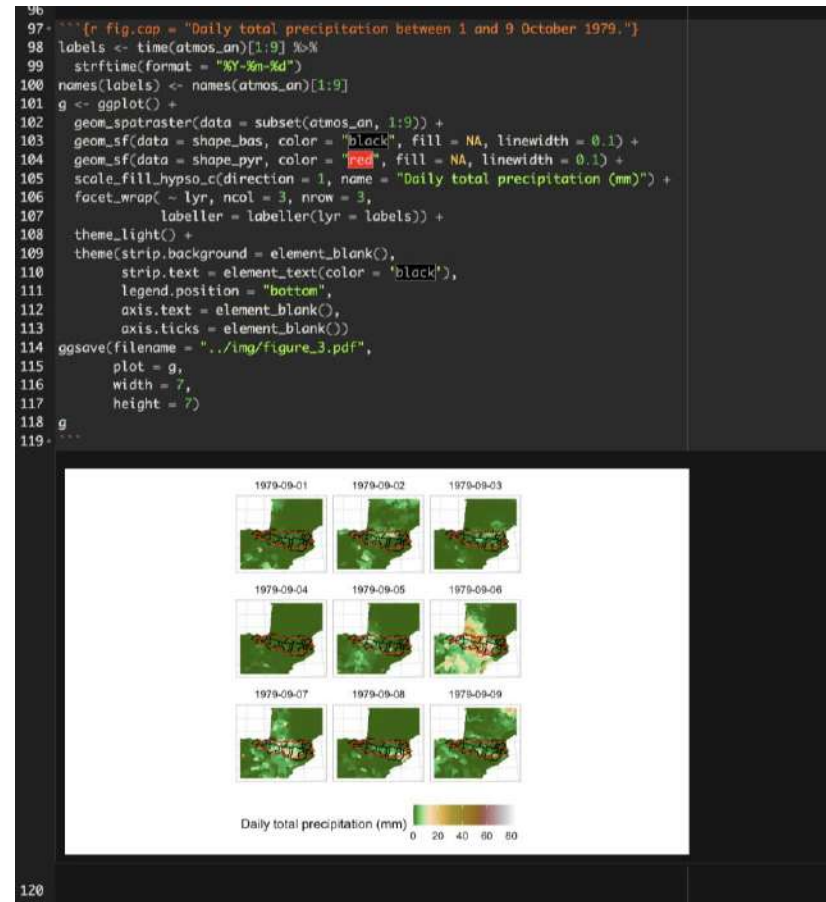


- **Two monographies**, in two languages (Spanish and French), with the physical basis and the adaptation strategies.
- **Scientific publications** and **stakeholder briefs** continue to appear.

Outreach

Datasets:

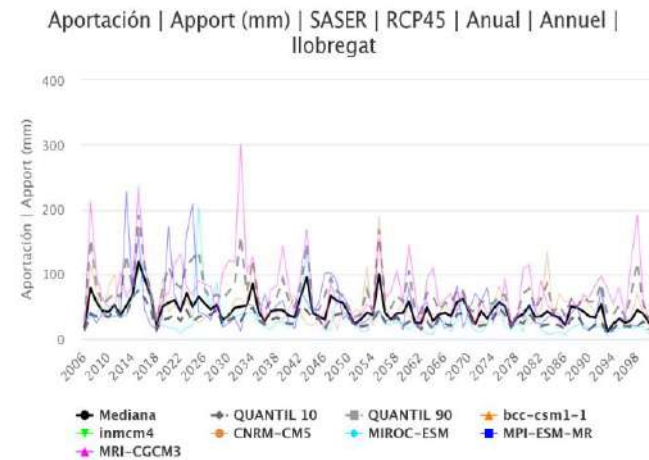
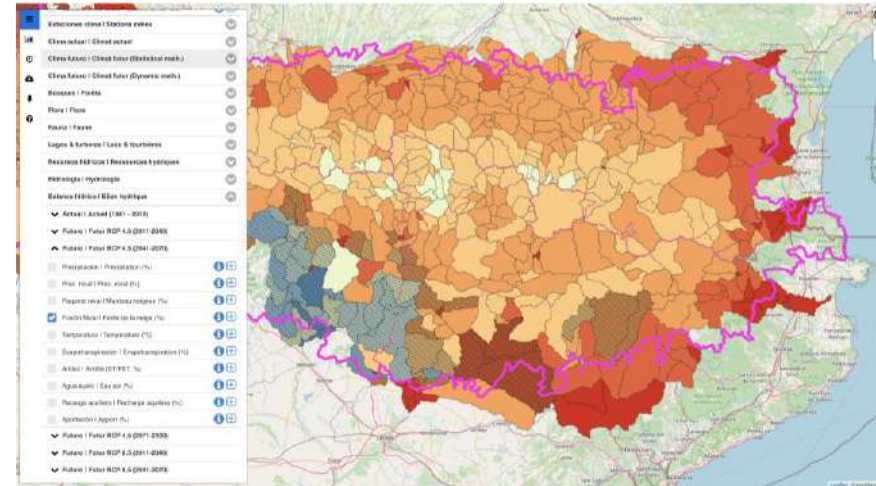
- PIRAGUA_atmos_analysis:
[10.20350/digitalCSIC/14665](https://doi.org/10.20350/digitalCSIC/14665).
- PIRAGUA_hydro_analysis:
[10.20350/digitalCSIC/14666](https://doi.org/10.20350/digitalCSIC/14666).
- PIRAGUA_atmos_climate:
[10.20350/digitalCSIC/14667](https://doi.org/10.20350/digitalCSIC/14667).
- PIRAGUA_hydro_climate:
[10.20350/digitalCSIC/14668](https://doi.org/10.20350/digitalCSIC/14668).
- PIRAGUA_recipies:
[10.20350/digitalCSIC/16381](https://doi.org/10.20350/digitalCSIC/16381).



- **PIRAGUA_recipies**, an Rstudio Notebook with demonstrations on how to use the PIRAGUA data sets.

Outreach

- Interactive geoportal, supporting WMS.
- Basic analysis options.



OPCC-PIRAGUA



<https://opcc-ctp.org/piragua>



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EU Green Week Webinar Preparing for Water Resilience in the Mountains: From Awareness to Action

The network of waterways in the Kamnik-Savinja Alps: Raising Awareness Across Borders for Conserving Drinking Water and Developing Rural Areas

25th June 2024

Mitja Bratun

Development Centre of the Heart of Slovenia
Lead partner of the LAG Heart of Slovenia

Kamnik – Savinja Alps

Lokalne akcijske skupine v Sloveniji 2014–2020

LEADER/CLLD 2014–2020



Kamnik – Savinja Alps



The network of waterways in the Kamnik-Savinja Alps: Project Details

Countries: Slovenia, Austria

Lead Partner: LAG Heart of Slovenia; **Partners:** LAG Gorenjska basket, LAG Upper Savinja and Šaleška valley, LAG Ünter Kärennten (Austria)

Programming Period: 2014-2020

Measures: 19.3 LAG Collaboration Projects

Funding:

- Total Budget: 217.058,91 €
- EAFRD: 134,778.61 €
- National/Regional: 33.694,65 €
- Private/Own Funds: 48.585,65 €
- Timeframe: 2020 to 2022

Main Activities

Water Source Analysis and Monitoring:

- Analyzed water springs in KSA and in LAG Heart of Slovenia
- Installed metal pots with QR codes for water quality checks

Water Route around Kamnik-Savinja Alps (KSA):

- Hiking trail connecting water springs

Awareness and Community Engagement:

- Organized 10 drinking water festivals and 2 school contests
- Conducted professional excursions and training events

Educational and Promotional Efforts:

- Developed and tested new tourism products
- Produced thematic educational and promotional films

Water Source Analysis and Monitoring:



Water Route around Kamnik-Savinja Alps (KSA):

Vodne poti
Kamniško-Savinjskih Alp
Water trails of the Kamnik-Savinja Alps

1:250 000

Pridružite se nam na vodnih poteh!
190 km
11 etap
4 reke
3 jezera
več kot 100 izvirov
več kot 100 potokov
več kot 100 slapov

Join us on the waterway!
- 190 km - 11 stages - 4 rivers - 3 lakes
- more than 100 springs - more than 100 streams - more than 100 waterfalls

Z brezplačno aplikacijo in pohodniško karto po Vodnih poteh Kamniško-Savinjskih Alp

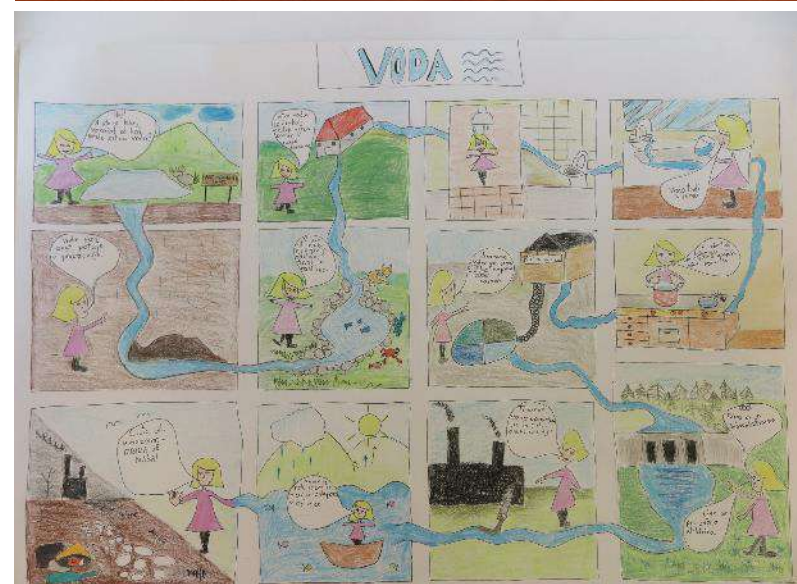
Karto dobite v turistično-informacijskih centrih v Kamniku, Solčavi, Lučah, na Ljubnem, v Preddvoru, na Jezerskem in v Cerkljah.

Celotna pot je skupaj z opisi naložena tudi v mobilno pohodniško aplikacijo maPZS, ki si jo prenesete na telefon brezplačno s spletne strani mapzs.pzs.si. Traso poti imate tako ves čas ob sebi na svojem telefonu.

Več informacij:
<http://kamnik-savinja-alps.com/>

Projekt sofinancirata LAS SRCE SLOVENIJE in LAS SRCE SLOVENIJE. Program razvoja podeželja. Evropski kmetijski sklad za razvoj podeželja. Evropska investicijska in podjetniška politika. Evropska unija. I FEEL SLOVENIA.

Awareness and Community Engagement:



Educational and Promotional Efforts:



Objectives

Conserve Clean Drinking Water:

- Raise awareness of water resources and their preservation
- Create green jobs in the KSA area

Kamnik – Savinja Alps Water Route:

- 190 km hiking trail included in the Mountaineering Association of Slovenia app
- Features numerous natural water resources

Stakeholder Engagement:

- Encourage participation and development of the region
- Promote cooperation and the revival of existing projects

Main Results

Environmental Awareness:

- Highlighted conservation and vulnerability of water resources
- Promoted the importance of clean water through various events

Tourism and Heritage Connection:

- Created sustainable tourism products linking water sources and cultural heritage
- Distributed trilingual maps in local tourist information offices

Preservation and Quality Improvement:

- Monitored and enhanced spring quality and biodiversity
- Informed relevant institutions of water quality

Summary

The Water Route around Kamnik-Savinja Alps (KSA):

- 190 km long hiking trail, 11 stages
- Passes 4 rivers, 3 lakes, 100+ springs and streams, multiple waterfalls

Project Activities:

- Analyzed 54 springs in KSA and 15 in LAG Heart of Slovenia
- Organized 10 drinking water festivals and 2 school contests
- Conducted experience exchanges, water-tester training, and workshops

Outcomes:

- Tested water quality and biodiversity at 54 springs
- 14 awareness events held
- Developed comprehensive water tourism products
- Involved diverse stakeholders

Lessons & Recommendations

Effective Bottom-Up Approach:

- Involved municipalities and stakeholders in all activities
- Considered and implemented local proposals and ideas

Encouragement for Similar Projects:

- Promoted connection and cooperation among communities
- Stimulated the revival of dormant activities

Inspiring Results through Collaboration:

- Achieved significant outcomes by uniting various organizations and individuals

Inspiring Results through Collaboration:
Achieved significant outcomes by uniting various organizations and individuals



Additional Information




Website Link: [Mountaineering Association of Slovenia Path](#)

mapZS


Prenešene karte | Moje poti | Večdnevne poti in obhodnice | Legenda karte | Jezik EN | SL | Pomoč | O aplikaciji

↳ Iščite poti, vrhove, planinske kočice...


← Nazaj

KML GPX   

Vodne poti Kamniško-Savinjskih Alp

 **Schottnikova pot** **Zahtevna** **Večdnevna** **Osnovna** **Erčne**

Pot je večinoma lahka, primerna za vsakogar. Le nekaj kratkih mest je bolj zahtevnih.



Izhodišče:
Stahovica, 435 m
46.265541, 14.603308 [Google Zemljevidi](#)

Razdalja: 175,90 km
Čas hoje: 62 h
Čas hoje nazaj: 61 h 45 min
Vzporn: 7.898 m
Spust: 7.898 m
Zahtevnost: zahtevna
Teritorij: Kamniška Bistrica

Vrsta podlage:


- Asfaltna cesta ~45 %
- Uhojena steza ~28 %
- Gozdna cesta ~11 %
- Makadamika cesta ~9 %
- Kolovoz (vlak) ~2 %
- Slabo uhojena steza ~2 %
- Stabilni kolovoz (vlak) ~1 %
- Ostanki steze ~1 %
- Sprehajalna pot ~1 %
- Pločnik ob cesti ~1 %
- Ni podatka <1 %

**POT JE ŠE V NASTAJANJU,
marsikje na terenu je še ni!**

Vodne poti Kamniško-Savinjskih Alp vodijo med izviri kvalitetne pitne vode po obstoječih poteh. Ob njih je še cela vrsta drugih doživljaja vrednih vodnih zanimivosti ter naravne in kulturne dediščine.

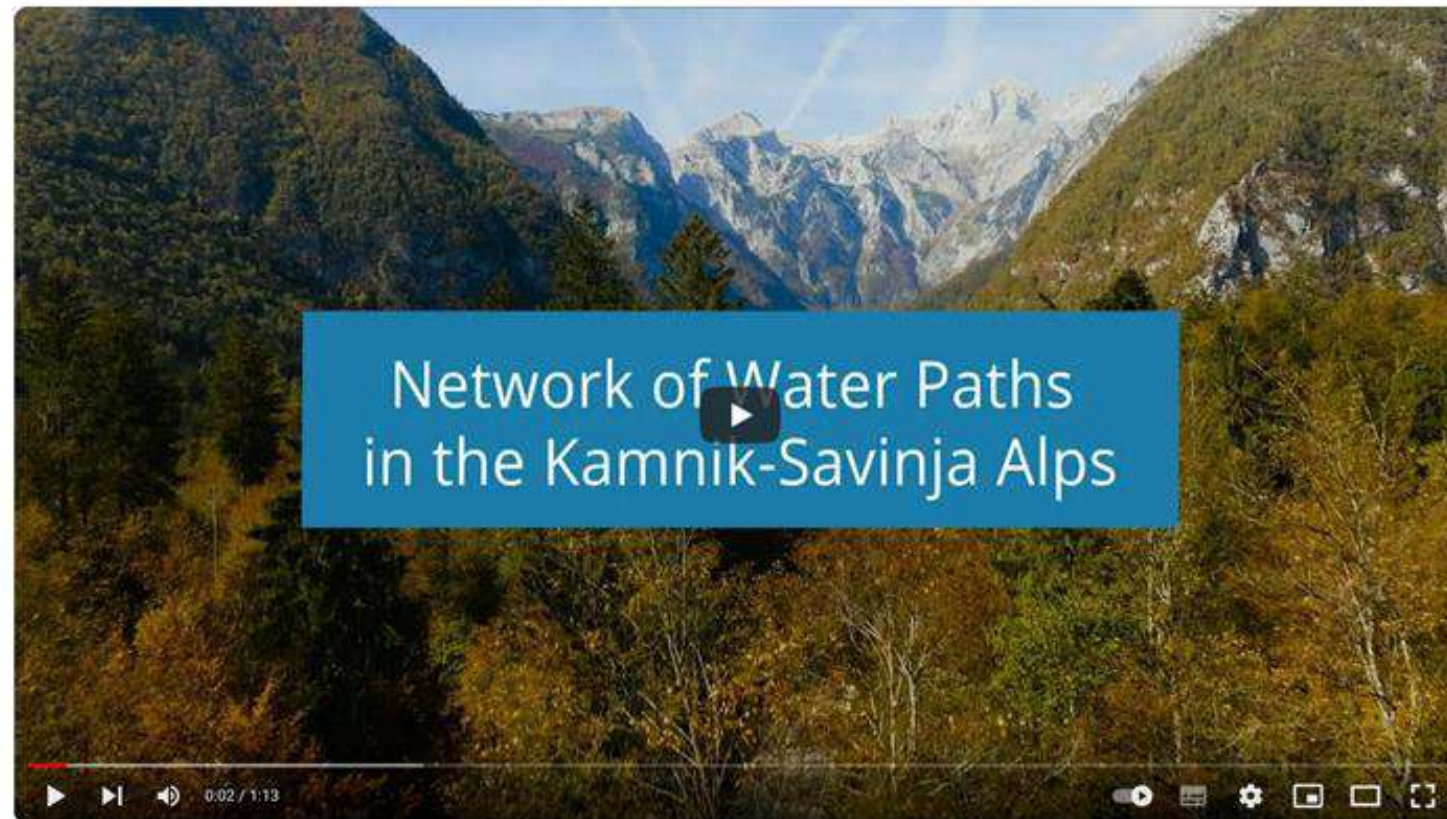
Privoščite si vanderanje med izviri, potoki, slapovi, jezini in rekami, da začutite bogstvo vodnih virov Kamniško-Savinjskih Alp.

Višinski profil



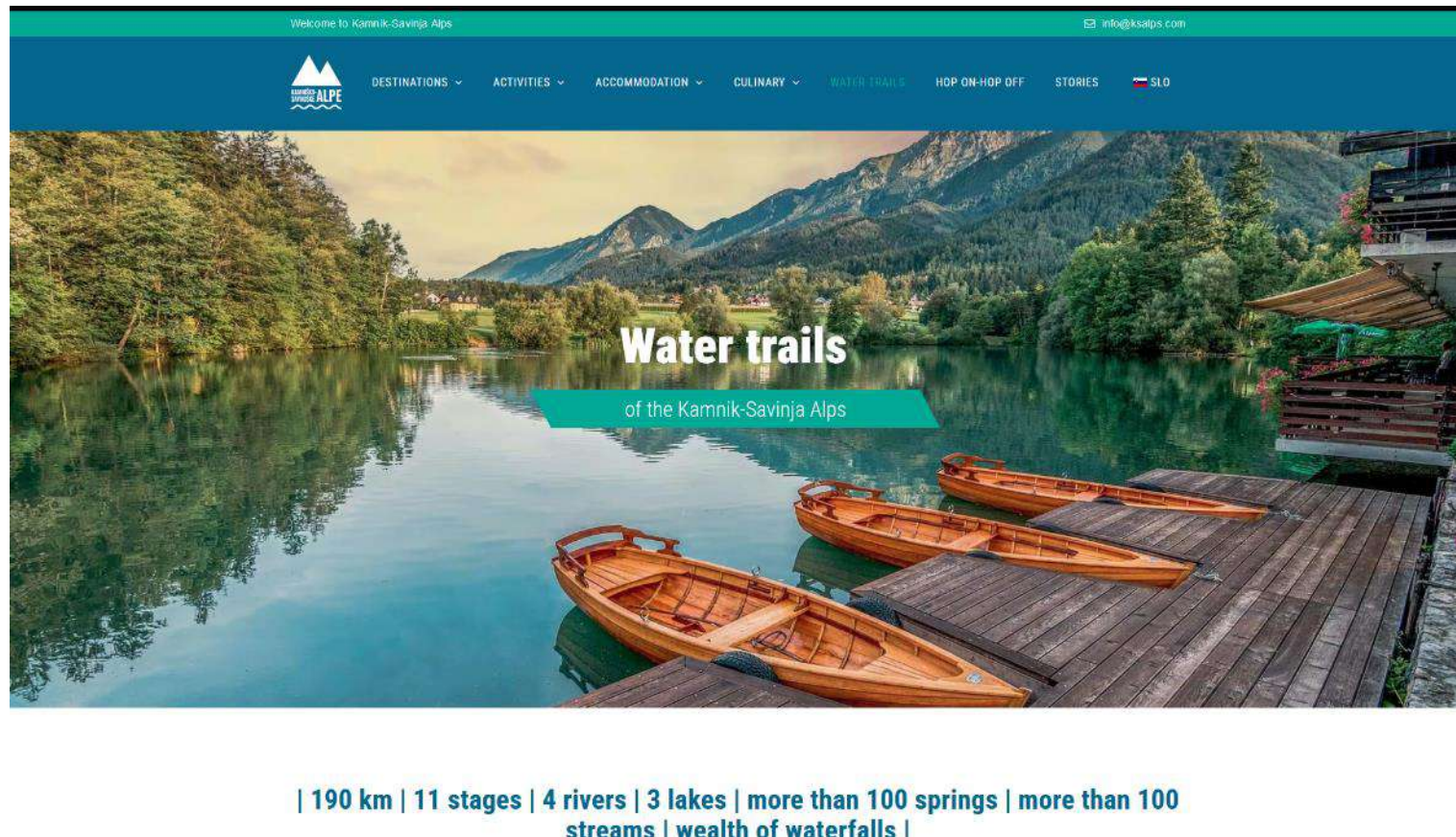
Additional Information

Youtube: [Short film](#)





Additional Information

Website: <https://www.ksalps.com/en/vodne-poti/>



Welcome to Kamnik-Savinja Alps info@ksalps.com

 DESTINATIONS ▾ ACTIVITIES ▾ ACCOMMODATION ▾ CULINARY ▾ WATER TRAILS HOP ON-HOP OFF STORIES 

Water trails

of the Kamnik-Savinja Alps

| 190 km | 11 stages | 4 rivers | 3 lakes | more than 100 springs | more than 100 streams | wealth of waterfalls |

Contacts

Mitja Bratun



Kidričeva cesta 1, 1270 Litija

las@razvoj.si

www.las-srceslovenije.si

T: +386 1 89 62 713





**MOUNT
RESILIENCE**

MountResilience

Accelerating transformative climate adaptation for
higher resilience in European mountain regions



**Co-funded by
the European Union**

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Swiss partners have received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).

MountResilience – Climate Change Adaptation

- **1 September 2023 until 29 February 2028**
- **The total EU Contribution more than €15M**
- **Horizon Europe** project under the EU Mission Adaptation to Climate Change



47 partners from 13 countries | Lead by UNIMONT – University of Milan



Regions involved

 **6** Regional demonstrator sites

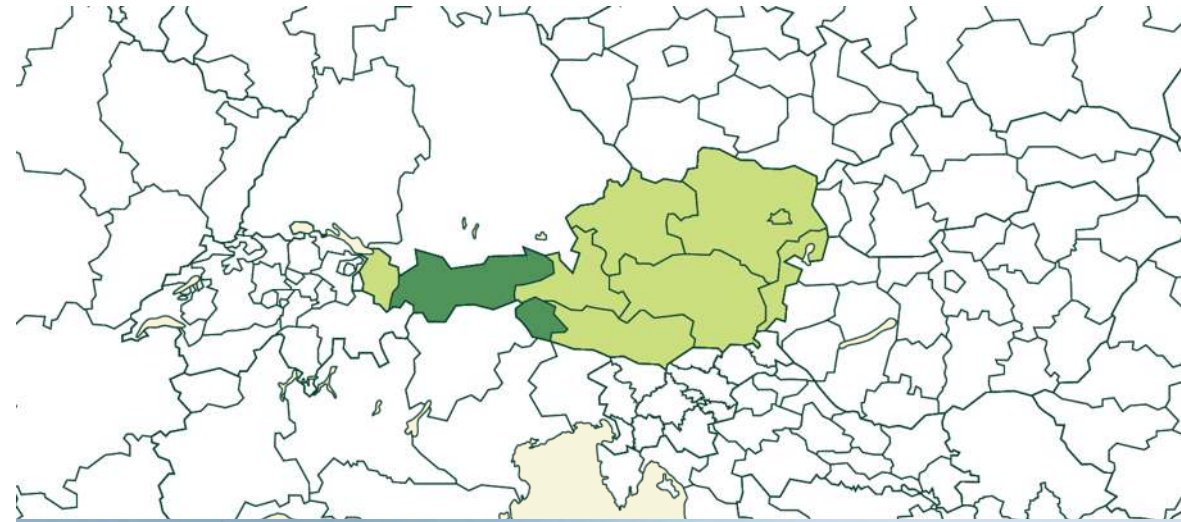
 **4** Regional replicator sites



REGIONAL DEMONSTRATORS

Tirol, Austria

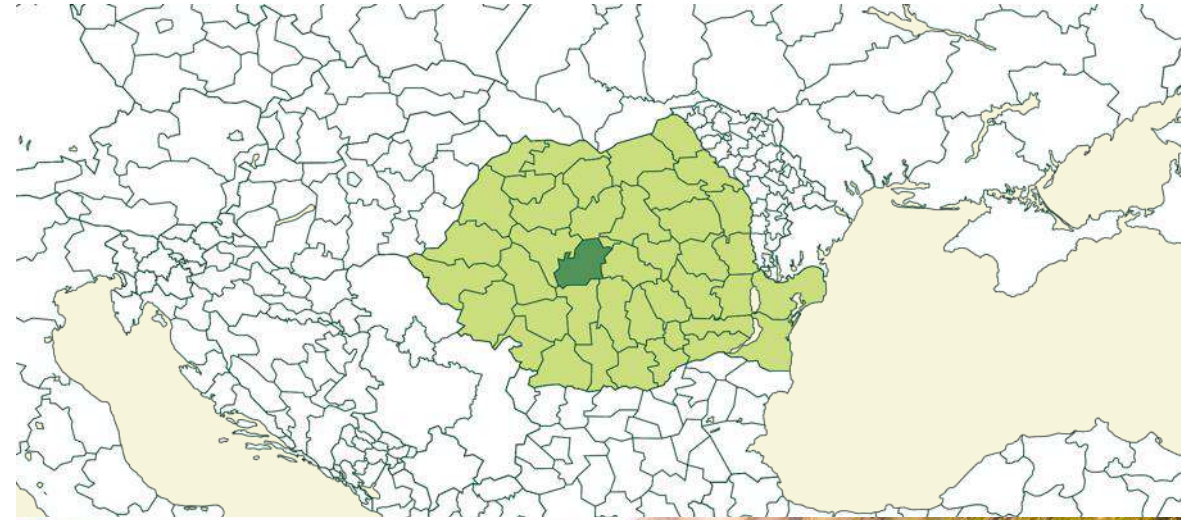
- Tourism connected to nature → highly sensitive to changes in climate
- Activities:
 - Development and expansion of a policy-instrument “Platform for Climate, Energy and Circularity”
 - Innovative solutions for adaptation in the tourism sector
 - Innovative solutions for adaptation of buildings and settlements
 - Cross-sectoral innovation based on digital solutions, new indicators, and instruments of financing/incentives to foster sustainable NB CCA measures



REGIONAL DEMONSTRATORS

Râu Sadului, Romania

- Pastoral activities dependent on meadows nutritional value → climate impact on rainfall, temperature and flora
- Activities
 - Restoring mountain meadows
 - New ways to scan the field with an equipped drone
 - Special seeding and fertilizing machines for meadows with irregular terrain and stiff slopes.



REGIONAL DEMONSTRATORS

Gabrovo, Bulgaria

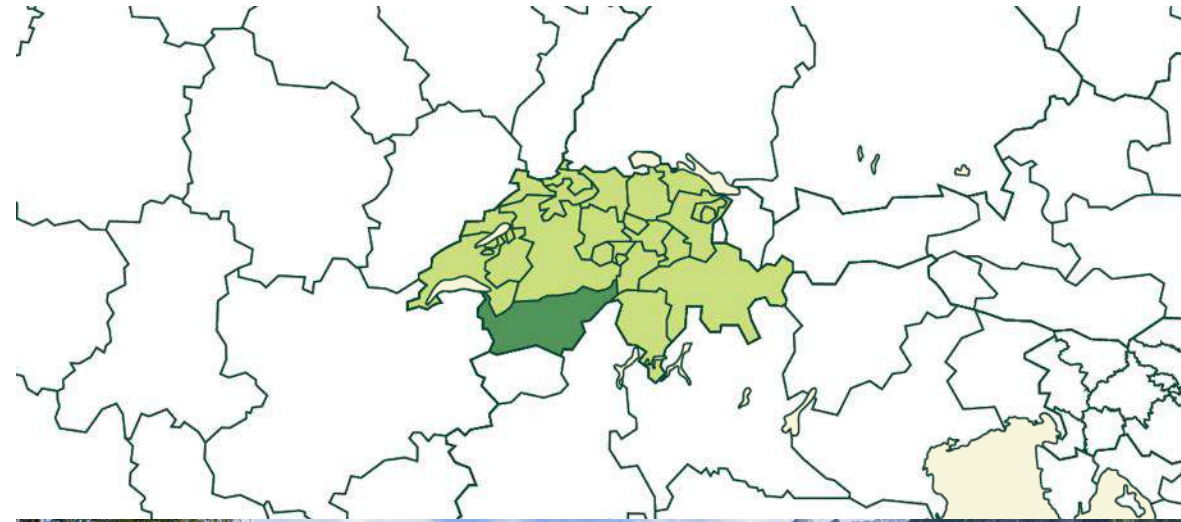
- Mountain valley city → impact of climate extreme events
- Activities
 - Innovative solutions for urban Green Infrastructures
 - Early-Warning and Monitoring System for climate events



REGIONAL DEMONSTRATORS

Valais, Switzerland

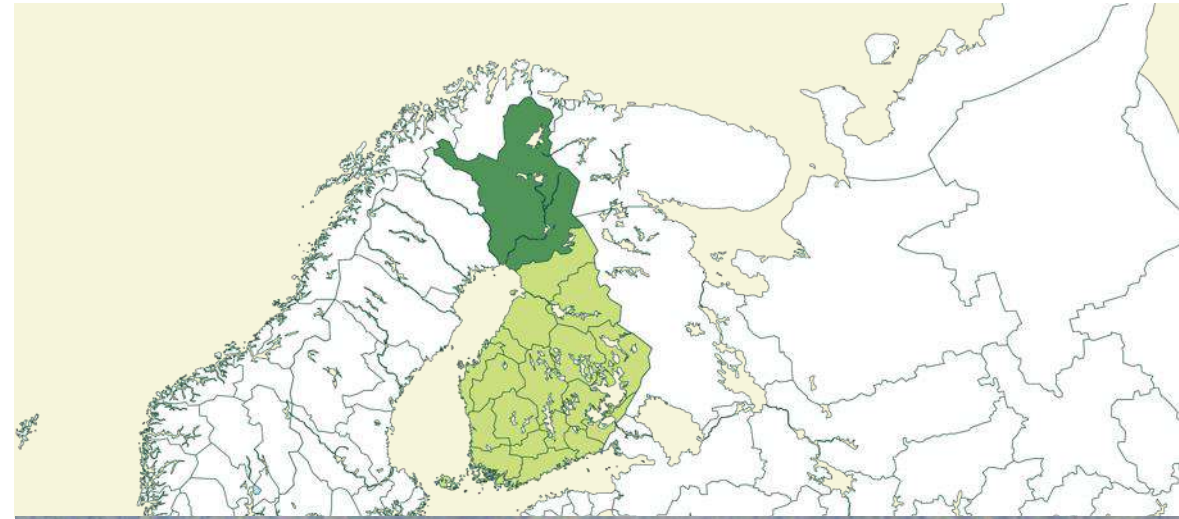
- Mountains as freshwater providers → climate impact on water supply and dependent activities
- Activities
 - Digital platform for co-creation and decision-making
 - Technologies supporting nature-based solution (NbS)
 - New sensors systems of water quality



REGIONAL DEMONSTRATORS

Lapland, Finland

- Region with nature-based livelihood → entire economic structure impacted by climate change
- Activities
 - Help regional entrepreneurs identify climate risks, anticipate and adapt
 - Develop the use of new Public Participation Geographic Information Systems (PPGIS)
 - Develop a model for regional adaptation plan
 - Develop company-specific adaptation plans
 - Develop adaptation coaching





**MOUNT
RESILIENCE**

RD Regione Piemonte

Politecnico di Torino's activities

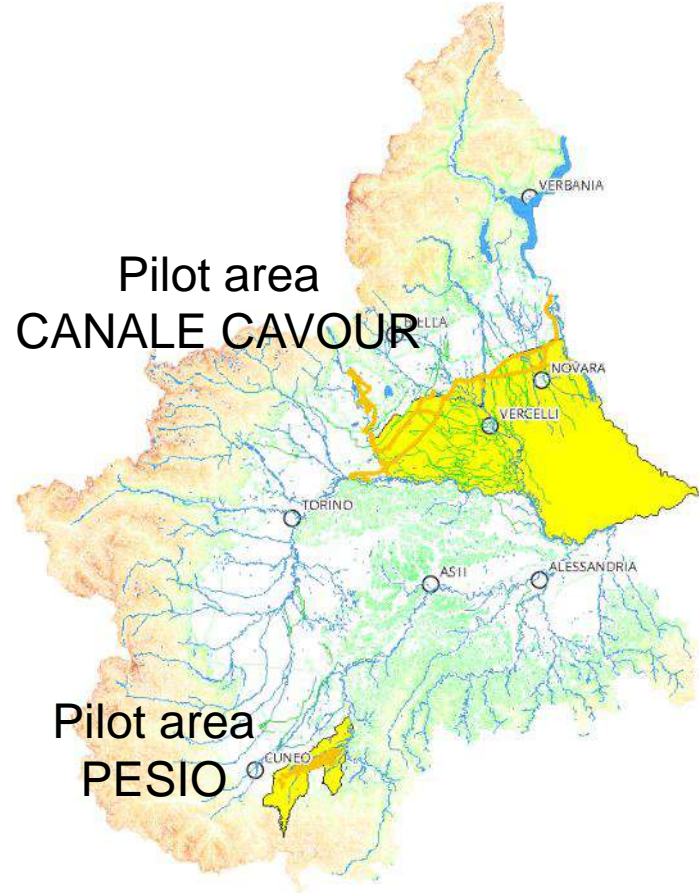
Stefania Tamea, Ilaria Butera, Edoardo Ducco



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Activities envisioned



- MountResilience aim at supporting the development of CC Adaptation solutions for water management at farm and consortia level.
- Work will be organized in
 - data collection, analysis and models setup,
 - development of decision-support (DS) tools,
 - definition of a regional strategy + stakeholder engagement.
- At the irrigation consortia scale, a set of hydrological/hydraulic modelling of upstream catchment, irrigated areas and shallow aquifer, will allow water managers to:
 - **mimic water availability** in rivers and groundwater bodies;
 - anticipate water availability and requirements using **forecasts and climate scenarios**;
 - irrigation network vs **groundwater** relationship.
 - Test operations and network modifications using a **hydraulic model** of the irrigation network, in the view of CC adaptations.

Coutenza Canale Cavour

CHARACTERISTICS

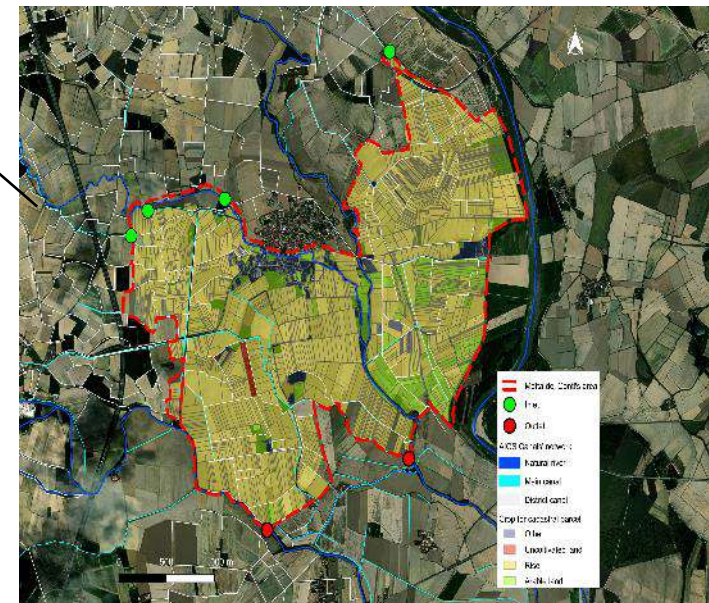
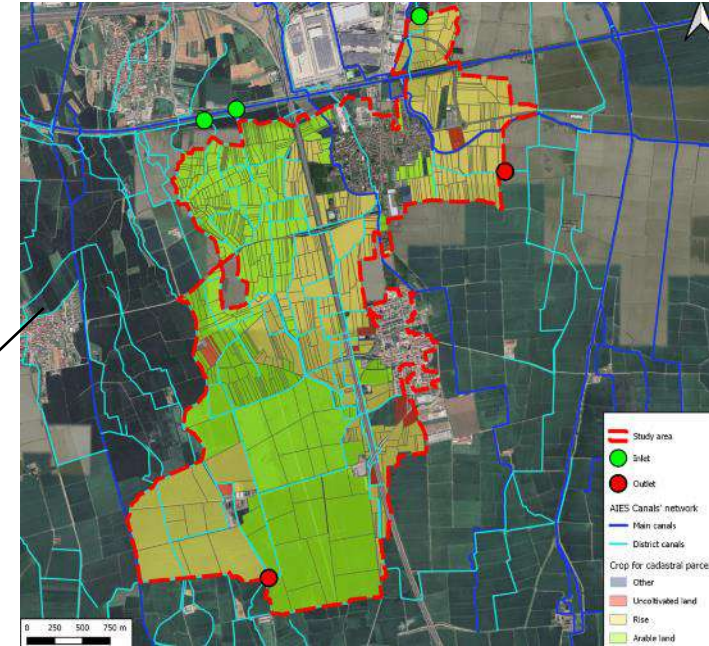
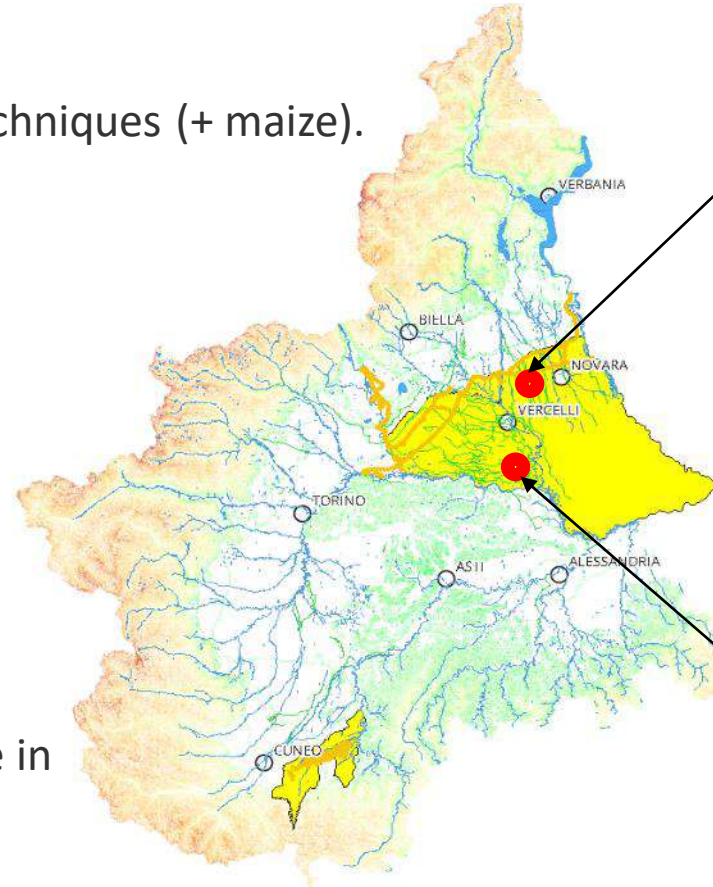
- Complex water distribution network.
- Rice cultivation using dry seeding or flooding techniques (+ maize).
- Shallow aquifer (groundwater depth 1-5 [m]).
- Time-shifted irrigation.

PROBLEM

- Drought events (summer 2022).
- Scarce acceptability of rice flooding.
- Lowering groundwater levels and its relationship with leakages.

CHALLENGES

- Enhancing rice cultivation's role and importance in groundwater recharge



Consorzio del Pesio

CHARACTERISTICS

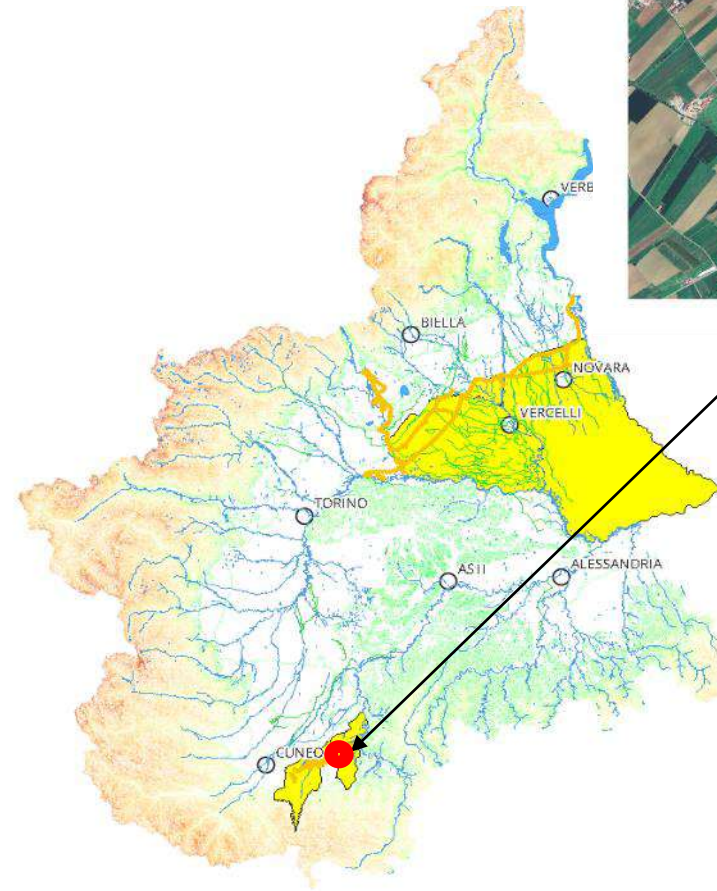
- High groundwater depth (7-15 [m])
- Corn, permanent meadows and winter cereals.
- Time-shifted irrigation.

PROBLEM

- Water scarcity.
- Evaluation of future modernization projects

CHALLENGES

- Evaluation of transitioning to pressure conduit water distribution



POLITO – Surface water availability

- **Data**

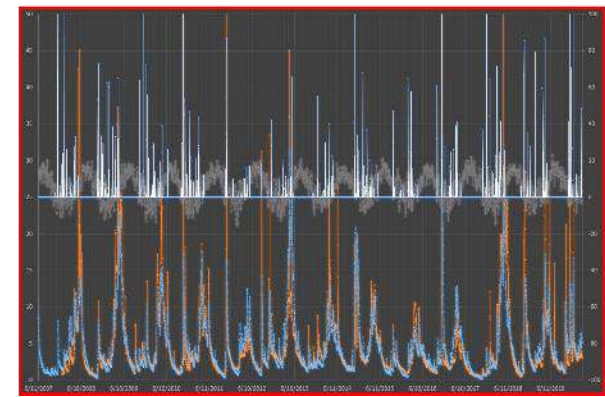
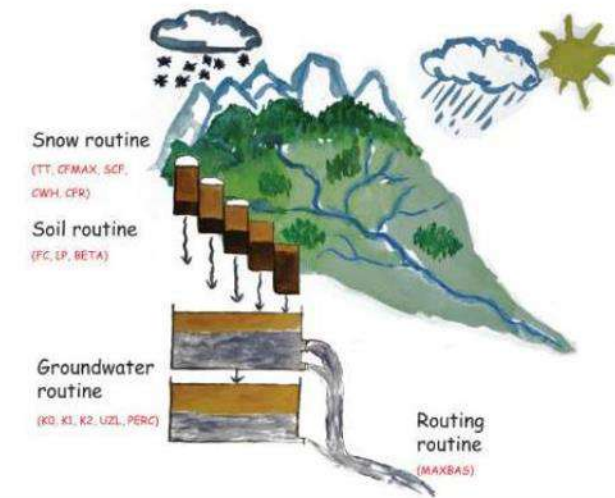
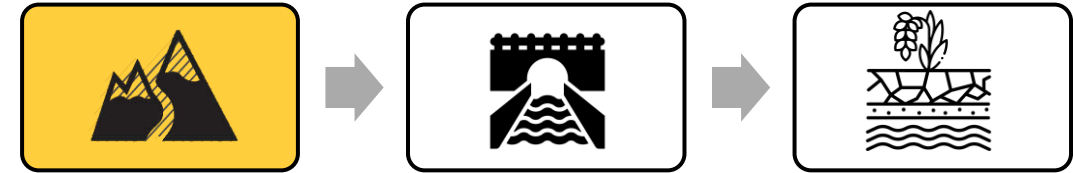
Temperature and precipitation data collected from regional and sovra-regional meteorological monitoring systems.

Data for hydrological modelling: terrain elevation, land cover and land use, soil characteristics...

- **Activities**

Hydrological simulation of water availability

Testing of meteorological variables forecast and development of a modelling chain for water availability forecast and climate change scenario



POLITO – Hydraulic modelling



- **Data**

Geospatial information of irrigation network elements (nodes, canals, ...).

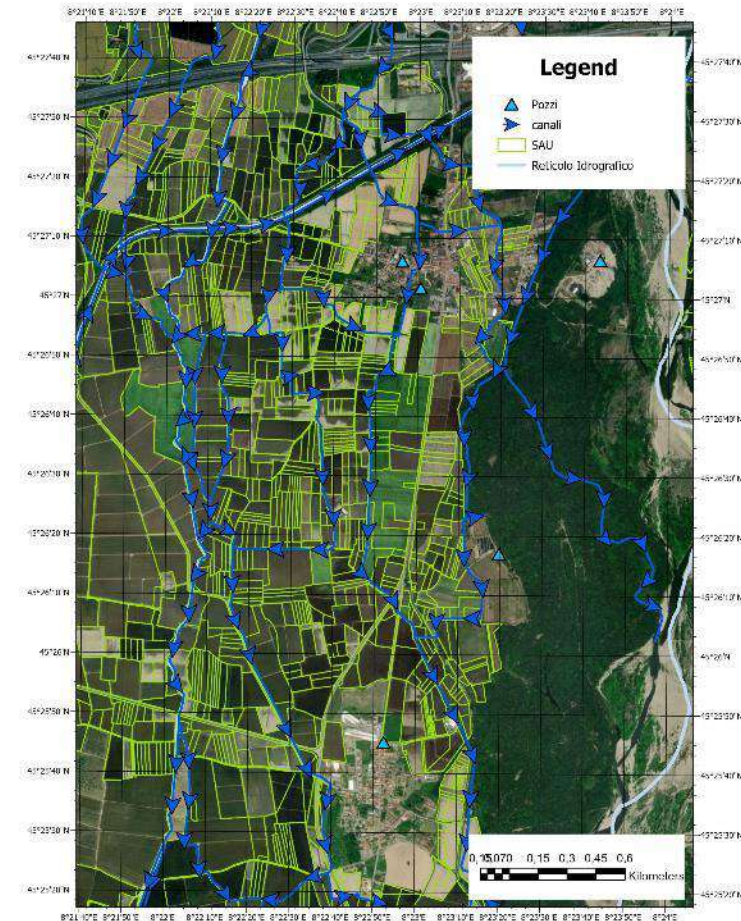
Fine-scale spatial distribution of crops data.

Research and literature analysis for hydraulic modelling tools.

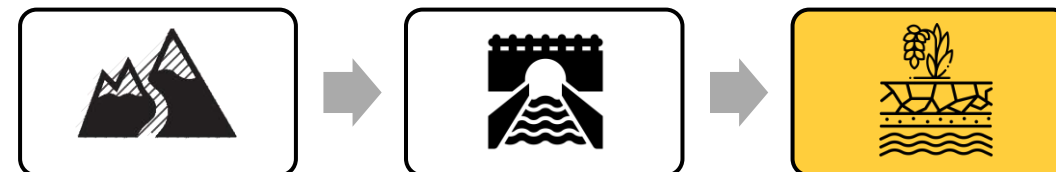
- **Activities**

Hydraulic simulations of water distribution systems (irrigation network) in different flow conditions

Local-scale modelling of soil water balance and relation with water distribution system in focus sites



POLITO – Groundwater availability



- Data**

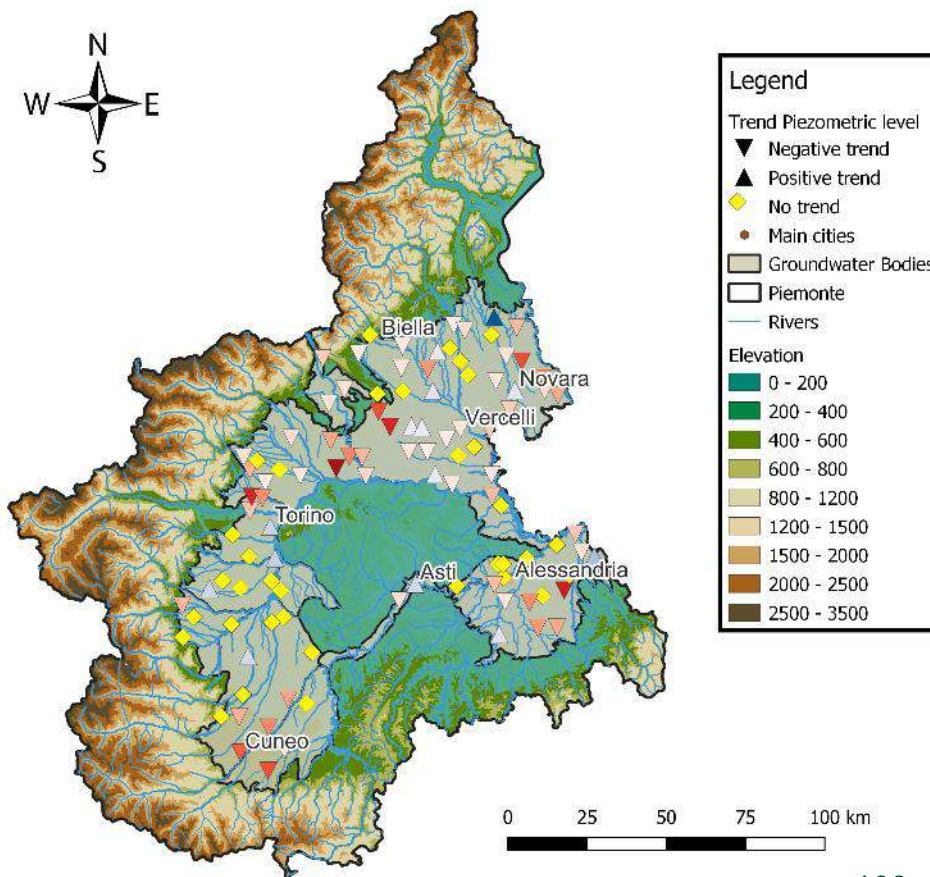
Daily piezometric level data from regional shallow groundwater monitoring system for 108 piezometers.

Daily precipitation measures from NWIOI Piemonte dataset.

Combined analysis of groundwater dynamics and precipitation at different time scales.

- Activities**

Investigation of irrigation network and groundwater relationship: groundwater level fluctuations in irrigated areas in relation to irrigation water volumes.



Thank you



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EUROMONTANA

Q&A Session

#WaterWiseEU

