GT4: Transfer

1st MONTCLIMA Seminar

Climate change and natural hazards in mountain areas

20 and 21 October 2020

Interreg Sudoe

EUROPEAN UNION

MONTCLIMA

European Regional Development Fund

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General introduction

This report has the aim of presenting the main conclusions and lines of action set during the SUDOE MONTCLIMA project's 1st Transnational Seminar on Natural Hazards and Climate Change in Mountain Areas, which was backed by the Pyrenean Working Community Consortium (CTP) through its Pyrenean Climate Change Observatory (OPCC) initiative. The Seminar took place partially in-person on 20 and 21 October 2020 in Soria, Spain.

In line with the MONTCLIMA project's vocation, this Seminar's general aim is to contribute to **the improved management and prevention of the project's four identified hazards -droughts, floods, forest fires, and erosion-**, while placing a spotlight on climate change's influence on these events. In this way, all project members contribute to the development of a **reference framework that serves as a transnational strategy to prevent the natural hazards** that affect Southwestern Europe's mountain areas with particular intensity.

These mountain areas are some of those most affected by natural events, and we can expect that these risks will increase significantly in the future as a result of climate change. Global warming has caused a drop in average

Mediterranean basin river flow of between 10-20% in recent years **, and if society does not react, droughts will be increasingly more frequent and undoubtedly lead to an increased risk of forest fires.** Fires will lead to a loss of undergrowth which, together with extreme rainfall, worsens the problem of erosion.

Due to their morphology, climate, and vegetation, mountain areas are particularly vulnerable to soil loss and, in fact, are estimated to lose between 20-50 tonnes of soil per hectare every year. This means a reduction in their ability to alleviate the effect of intense rainfall and, consequently, an increase in floods and overflowing. **Droughts are increasingly severe, and temperature increases and changes to precipitation patterns are only some of the consequences they may involve**. However, in addition to environmental damage, these hazards are also causing substantial social and economic losses that affect the way of life for residents in the various regions in question.

The devastating effects of these hazards, which derive from both natural events and their intersection with each region's services and infrastructure, **do not respect administrative boundaries or national borders. As such, they must be analysed in a coordinated fashion** with the countries and regions affected, addressing these issues through a transnational collaborative framework that benefits all parties involved. This is the only way that we will be able to protect and preserve the mountain areas that our territories share.

www.montclima.eu

Objectives

The MONTCLIMA project's 1st Translational Seminar on natural hazards in Southwestern Europe focused on:

Analysing state of the art prevention and management practices in terms of the SUDOE mountain areas' 4 main hazards (droughts, floods, forest fires, and erosion)

Debating the orientation of future prevention and management strategic framework to reinforce mountain area resilience against these four hazards while also considering the implications of climate change.

Developing a coordinated methodology with common tools that leverage best practices derived from this Seminar.

Promoting and distributing this seminar's conclusions among sector professionals and the public in general.

As with the Southwestern Europe Cooperation Programme (INTERREG V-B SUDOE), which is based on the "Europe 2020" Strategy for smart, sustainable, and inclusive growth, this Seminar's aim was to provide greater cohesion when applying good common practices to prevent environmental hazards in these territories.

Presenting the dissemination and awareness-raising video created for the Montclima project

This video, which was presented for the first time at the seminar, presents the causal relationships and cascade effect that often occurs with the project's four studied natural hazards, along with their connection to climate change.

WATCH VIDEO

Framework Presentation

In search of inspiring experiences

Luca Cetara (EURAC Research)

Managing natural hazards and climate change though transnational cooperation: The Alps example

Since its creation in the 1990s, the Alps Convention has been a pioneer in promoting common strategies to prevent natural hazards in this mountainous cross-border region.

From the time of its conception, article 2 of its statute included the natural hazards question as a fundamental component of the signatory countries' territorial planning. The text places particular focus on the role of mountain forest protection as a tool to manage and prevent natural hazards. The natural hazard question is also highlighted in 4 of the Convention's main protocols thanks to the elevated degree of Alpine citizen consciousness and awareness around this topic. These protocols include guiding principles to holistically integrate mountain risks into urban planning in particularly vulnerable areas. They also include recommendations for certain socio-economic sectors, including farming, grazing, and other primary sector activities, which are aimed at promoting biodiversity protections and conservation-based soil management. The Convention also highlighted the climate change issue in its main policy statements, alluding to its direct connection to the majority of these risks. However, the creation of the Convention's Thematic Working Groups marked the starting point when technical aspects of natural hazard prevention and management began to be explored in greater detail from a cross-border perspective.

Specifically, following avalanches and floods in 1999 and 2002, the Alpine Convention launched the PLANALP platform with help from nearly 20 high-level experts delegated by the Alpine Convention's contracting parties. This initiative was created to establish the bases of a new reactive approach that allows for more effective natural hazard leadership through cooperation and a cross-border dimension. This platform was inspired by

Official document of the Convention on the protection of the Alps (Alpine Convention)

DOCUMENT LINK

Switzerland's pioneering experience and standard platform, and was made official in 2004 at the 8th Alpine Conference. With this document, PLANALP is also fulfilling the mandate to create an alpine climate change adaptation strategy in terms of natural hazards. On the basis of the alpine region's climate change scenario, its repercussions on risk-inherent natural events, and the consequences for derived risk management, this strategy defines a vision or common framework for climate change adaptation,

while at the same time recommending specific actions through best practice examples found in different Alpine countries.

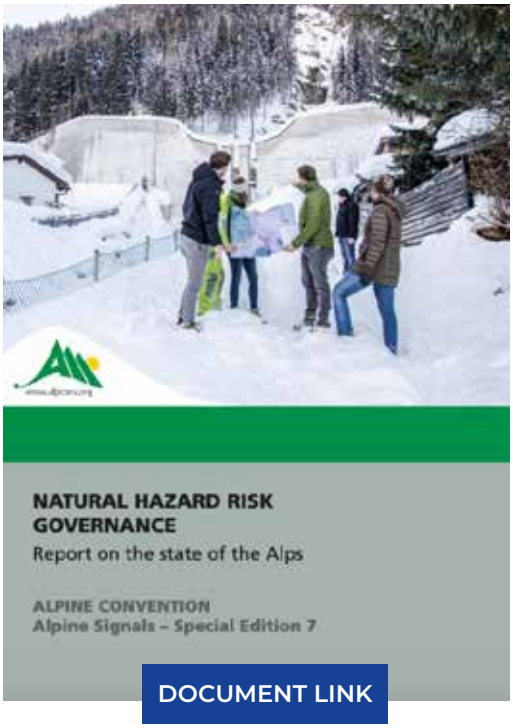
At the same time, there are other convention Working Groups and platforms that also address the natural hazard question as a transversal element. Specifically, the now disbanded Alpine Water Platform and the Alpine Forests Working Group worked on the risk of flash floods, sediment transport, and water erosion, and the protective role of forests.

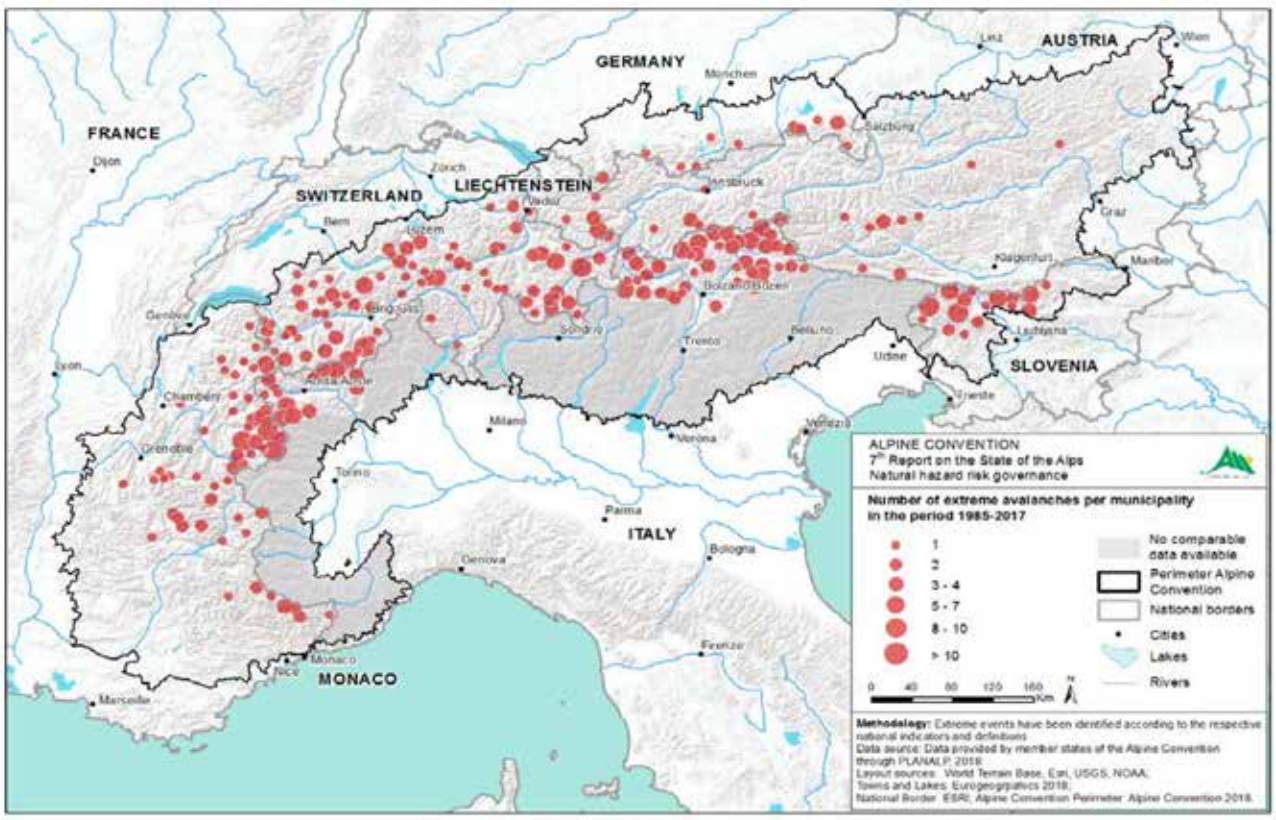
The 14th Alpine Convention took place in Grassau (Germany), and concluded with the creation of a work programme to be carried out during the 2017-2022 period.

PROGRAMME LINK

OBJECTIVES

- Developing common strategies between countries to prevent the 5 most pressing natural hazards in the Alps that, according to 2019 RSA7 governance (Report on the State of the Alps) on natural hazard risks, include:
  - Flooding
  - Avalanches
  - Flash floods
  - Rockfalls
  - Landslides.
- Encouraging exchange between countries on strategy adaptation
- Managing risks and threats
- Developing common governance questions





Extreme avalanches during the 1985-2017 period

MEASURES

After analysing the natural hazard situation in these Alpine countries, joint coordination focuses and solutions were sought to develop the following types of measures.

1. Preventative measures and spatial planning

- Protecting inhabited areas that are threatened by natural hazards
- Keeping high-threat areas free from new development
- Analysing acceptable degrees of development in risk areas
- How to properly consider residual risks when planning decisions

2. Structural and engineering measures

- Physical structures that can reduce and avoid possible risk impact
- Technology and engineering techniques that improve risk resistance (such as home structural adaptations for floods) and increased resilience
- Use of dams, flood containment dykes, flash flood controls, avalanche protection fencing

3. Solutions based on nature

- Mass stabilisation with specific plants to avoid landslides
- Avalanche and rockfall prevention through protective forests
- Flood protection with different types of vegetation to reduce surface run-off quantity and speed
- Not as much maintenance as structural measures is required
- Use of typically Alpine protective forests

4. Organisational measures based on human factors

- Disaster management
- Risk management or prevention preparation and training activities aimed at avoiding or reducing damage
- Information and dialogue with affected actors, magnitude/event forecast, public and authority alert system, and process, relief, rescue, and protective measures

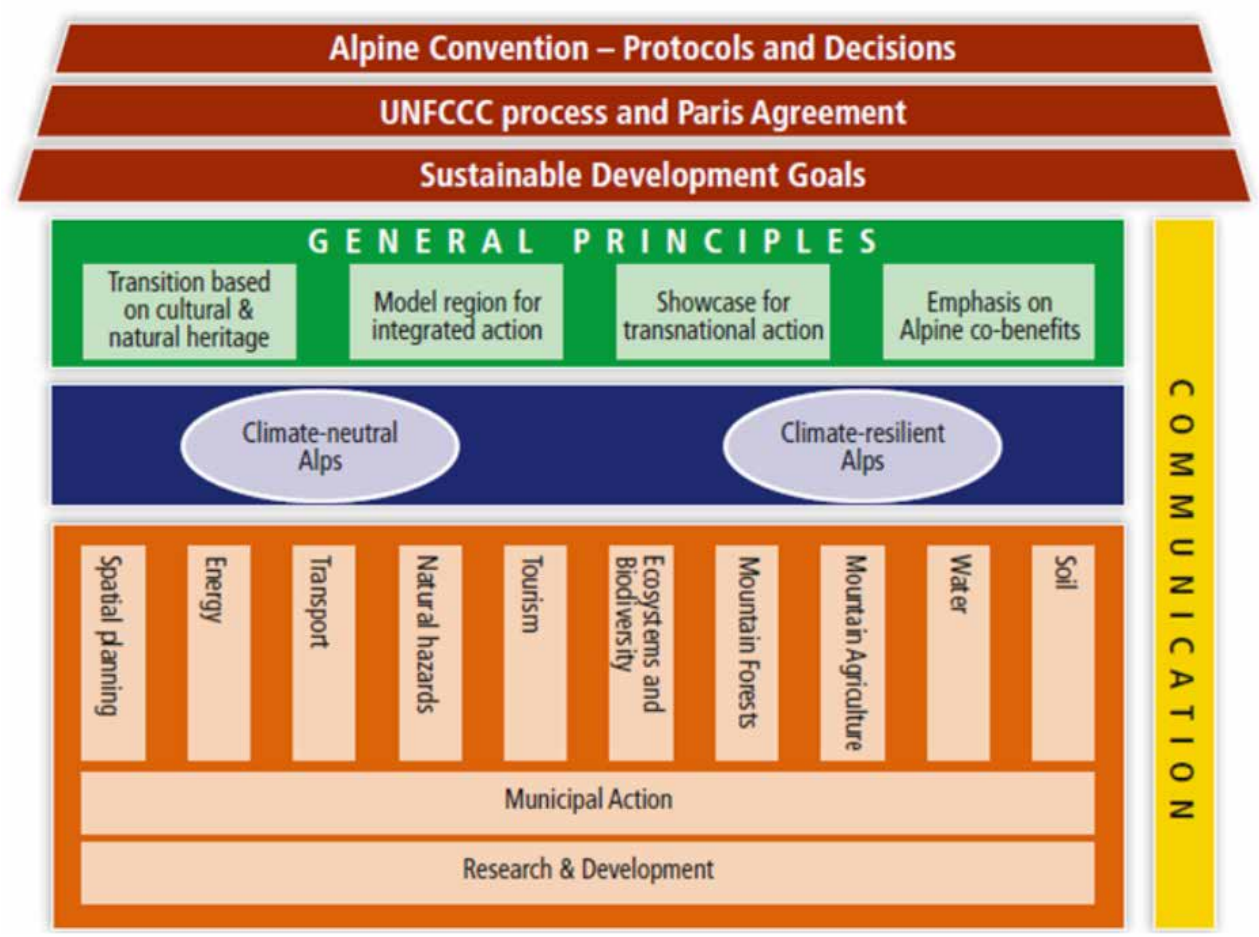
THE FUTURE
Alpine climate targets for 2050

The Alpine Climate Board (ACB) has created the Alpine Climate Target System 2050 Tool **www.alpineclimate2050.org** to implement the 2050 Alpine climate target system.

Purpose of the tool

- Finding a methodology to move from targets to action
- Defining the paths to implementation for the sectors involved in ACTS 2050
- Prioritising paths to Climate Action Plan 2.0 implementation
- Using participatory processes in all stages
- Creating an environment that is “favourable to implementation”

ALPINE CLIMATE TARGET SYSTEM 2050 DOCUMENT LINK



"Since the late 19th century, temperatures have risen by almost 2°C, a rate about twice as high as the northern hemisphere average. The impacts of climate change are affecting the living conditions of 14 million inhabitants, 30,000 animal species, and 13,000 plant species in the Alps. They vary across the Alps, but they do not stop at administrative borders" (ACB 2019).

MONTCLIMA project action progress

Natural hazards and climate change

Manuel Feliciano (Polytechnic Institute of Bragança-IPB)

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ACTION 1.3. Legal and technical analysis of risk management in the SUDOE

Sébastien Chauvin (FORESPIR)

ACTION 2. Defining a Transnational Strategic Framework

MONTCLIMA project action progress: Environmental hazards and climate change

Manuel Feliciano (Polytechnic Institute of Bragança-IPB)

ACTION 1.1. Studying the current state of practices in the SUDOE space with a transnational focus

OBJECTIVE

Collecting information and creating a common list of natural hazard prevention and management governance experiences and technical references, capitalising on successful projects as the basis for the development of efficient common strategies and tangible commitments.

1

Action development

Collecting information to identify actions taken, those in development, or future actions to take:

- CORDIS, as the main public repository and European Commission portal to spread information on all EU-financed research projects, along with their results.
- EU LIFE Programme
- University research databases
- Government databases
- Information appearing in the media:
  - The link between climate change, fires, and migrations:

    READ ARTICLE
  - The Guardian echoes how climate change can affect Europe in 20 years

    READ PUBLICATION

2

Selecting **7 case studies** relating to government initiatives and management practices:

- Three of them corresponding to leveraging missions carried out in situ in Portugal, Spain, and France
- Two of them through online interviews.

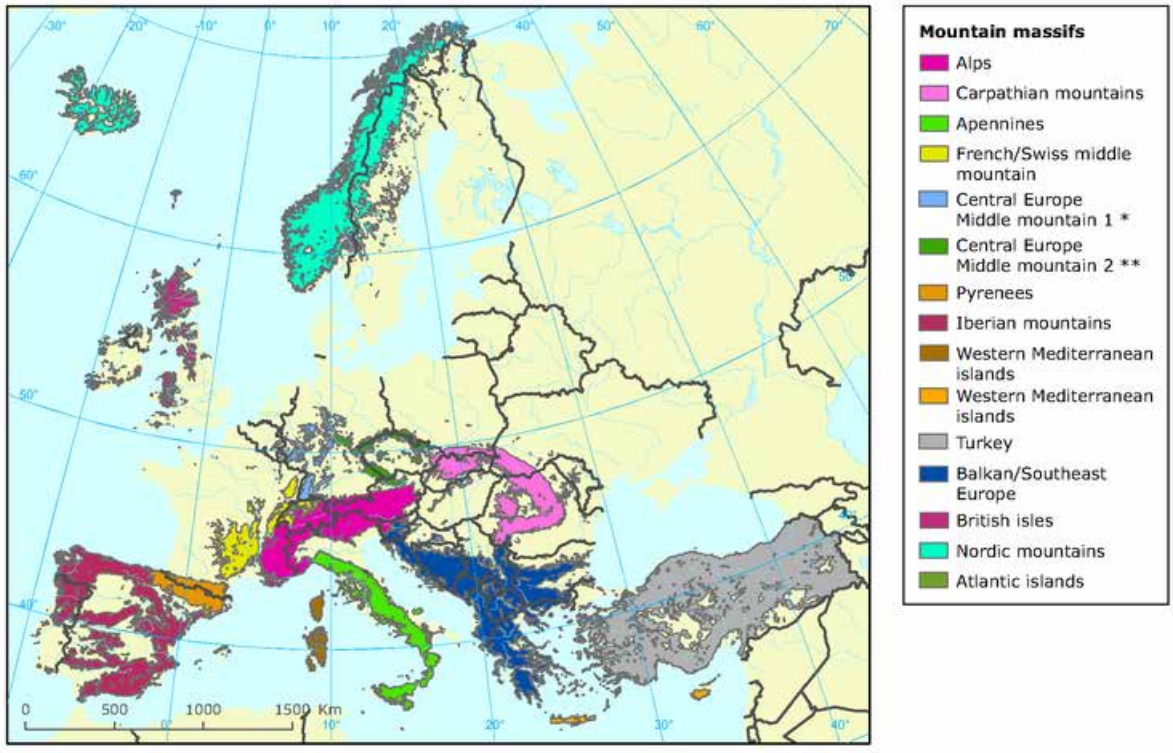
All of them involving key actors that complemented the information collected.

3

In order to organise the information collected, there will be an **analysis of the data** collected. In order to implement measures accordingly, an Excel tool has been developed with a navigation menu to select data relating to different projects.

The information collected will allow:

- The interactive map to be updated.
- SUDOE mountain area risk prevention and management best practices and successful case studies to be identified.
- A report to be produced by capitalising on successful initiatives and projects, including the most relevant best practices.
- Formulas to be defined that evaluate initiatives capable of being replicated in other mountain areas.



Work group 1's leveraging actions will allow acquired management and technical knowledge to be exploited in order to provide elements that can help improve the prevention and management of the four hazards, with a focus on multi-risks and considering their connection to climate change.

MONTCLIMA project action progress: Environmental hazards and climate change

Nacho Campanero (CESEFOR) and Rodrigo Torija (INCA Medios)

ACTION 1.2. Web application development to analyse mountain territory vulnerability

OBJECTIVE

Presenting MONTCLIMA partners with the web application that is currently being developed, which showcases information on past, present, future, and potential vulnerability in terms of the four target hazards, while facilitating their improved management.

1

Action development

Objectives of the tool:

- **Valuing existing information** on past and future risks, as well as vulnerability in terms of MONTCLIMA's 4 referenced hazards, in terms of datasets on risk indicators, prevention tools, and cartography deemed useful for risk management in SUDOE's mountain areas.
- Showing existing information services in terms of past and present vulnerability and information associated with losses stemming from these episodes.
- Showing the most relevant existing information on the territory's potential vulnerability and risk cartography.

2

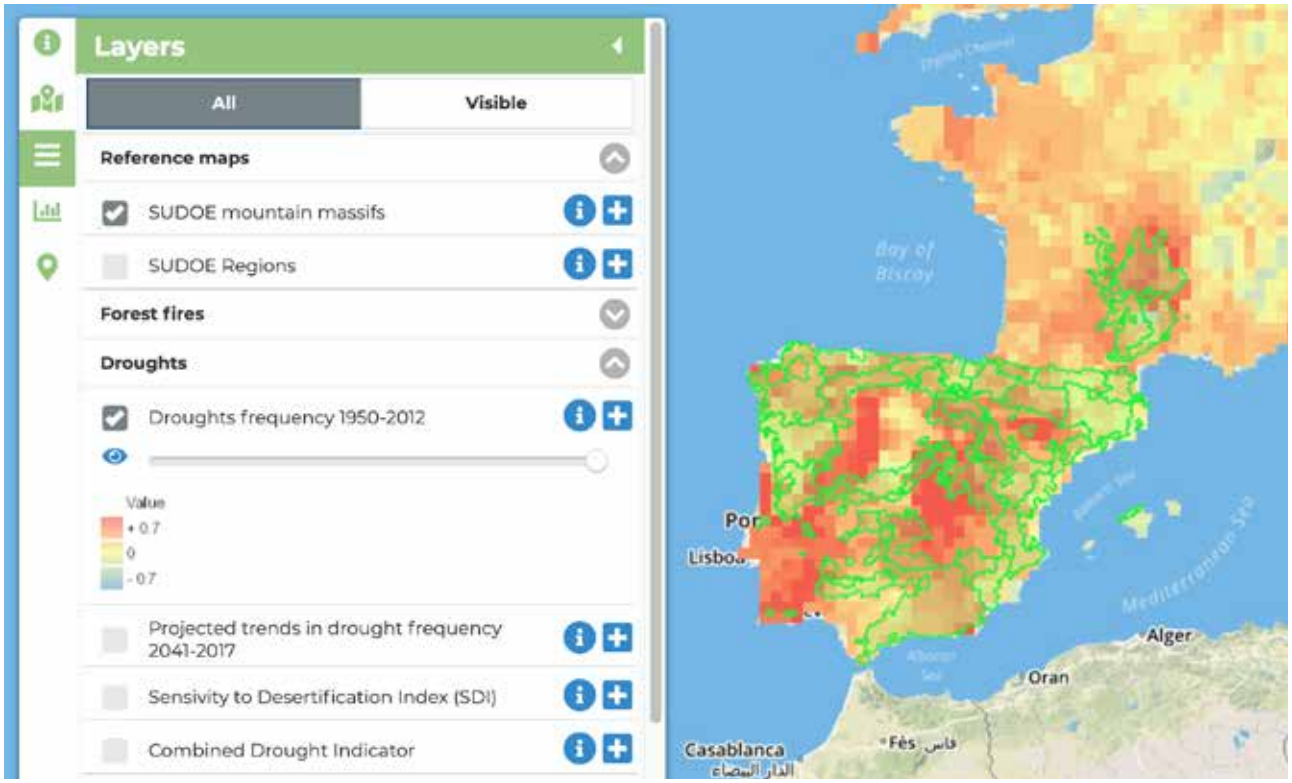
What does it involve?

- This web application's key asset is a **map viewer with extra functions** that allow temporal analysis of the evolution of different hazards.

3

What does it show?

- **Thematic cartography** associated with the 4 hazards being studied, as well as environmental and climate variables, typography, vegetation, etc. that influence different risk level intensity.
- Processing and representing of a series of risk and climate data (dataset), as well as other complementary SUDOE territory data.
- Showing both the historical evolution and future projections for the project's different risks.
- A **specific section for pilot areas**, that includes integrating detailed cartographic information on each of the pilot cases (exemplary management practices) within the sphere of the project's A1.1 action.



This tool brings together all information currently available on management and prevention of the MONTCLIMA study's 4 hazards in a way that is intuitive and on a single platform.

TOOL LINK

MONTCLIMA

MONTCLIMA project action progress: Environmental hazards and climate change

Didier Felts (Centre for Studies and Expertise on Risks, the Environment, Mobility, and Urban Planning - CEREMA)

ACTION 1.3. Legal and technical analysis of risk management in the SUDOE

OBJECTIVE

Developing a comparative analysis of SUDOE natural hazard prevention and management legal and technical tools, prioritising the analysis of local and supra-municipal level governance and management instruments and experiences.

1

Action development

Risk prevention in France is organised around 7 pillars:

1. Risk recognition
2. Event observation and alert. Monitoring
3. Preventative information
4. Territory occupation and urban development risk control
5. Risk reduction
6. Crisis management forecast
7. Experience feedback

In addition:

- The State and Directorate General for Risk Prevention stipulate a global prevention policy through documents such as the mountain river risk prevention guide, or its counterpart for glacier and periglacial risk prevention
- The essential document is the Mountain Area Natural Hazard Prevention Plan, which limits the impact of these events
- The document is implemented on a local and supra-municipal level

2

Projects

Analysing and evaluating experimentation carried out in the **Mountain Area Risk Prevention Strategy (STePRIM)** with the ONF-RTM, whose project selected was presented by the Haute Garonnaises Pyrenees Community.

The strategy's objectives were:

- Analysing various risks and ensuring the collaboration of all stakeholders involved, from institutions to civil society, and the territory's various agents
- Developing a global, shared vision of risks and measures to adopt in order to reduce the territory's vulnerability
- Developing the ability to plan for the future
- Optimising and streamlining public resources
- Facilitating the transition from regulation to implementation for urban planning project practices

3

Public authorities that state this knowledge:

- BRGM, national geological service. **Website link**
- Restauration des terrains en montagne. **Website link**
- CIPRIP mapping **Website link**
- CEREMA: database
- Other source: RTM
- PPRN prevention plan reports. **Website link**

A methodological and technical repository is necessary. STePRIM works on this line of action.

4

Tracks for a transnational framework:

Implementing and fostering the best territorial resilience and risk integration process in the Valentin valley based on the resilience compass.

Applying a collective intelligence tool to question, evaluate, and increase dynamics that strengthen resilience and construct an adaptive perspective.

A resilient territory is one that:

- Anticipates all types of disruptions
- Acts to avoid or mitigate the consequences of disruptions
- Recovers, adapts, and transforms

THE RESILIENCE COMPASS

This consists of 6 drivers that are broken down into 18 key actions:

- Strategic and integrated governance
- System continuity and robustness
- Moderation and satisfaction of basic needs
- Adaptation, learning, and innovation
- Anticipation, knowledge, and monitoring
- Social cohesion and stakeholder solidarity

The results of this analysis will feed the A2 transnational risk prevention and management strategic framework, providing cartographic information that will be incorporated into the A1.2 geoviewer.

MONTCLIMA project action progress: Environmental hazards and climate change

Sébastien Chauvin (FORESPIR)

ACTION 2. Defining a Transnational Strategic Framework

OBJECTIVE

Creating a common SUDOE risk prevention and management strategy and identifying key entities and individuals interested in taking part.

1

Action development

Why?

- This would be a common framework with strategic operational recommendations that leverage best practices and past experiences, as well as existing legal and technical tools.
- Target audience: those responsible for mountain territory development.
- Adapted to the characteristics of the SUDOE territories.
- Similar problems require common responses that allow the advantages of cooperation to be exploited.
- A simple, dynamic document that presents the main recommendations to take into consideration.
- It does not intend to substitute local, international, or national strategy documents, but rather to produce a memorandum with directives to detect and prevent natural hazards in mountain areas.

2

How to act?

- Focusing on leveraging and the operational aspect.
- The document would not need to be produced “ex nihilo” because there are prior frameworks, however a refined analysis of everything that exists on a national and regional strategy level in the participating territories must be carried out.
- Finding common points in previous frameworks between Spain, France, and Andorra, and highlighting best practices in management.
- Recognising needs.
- Identifying key entities and individuals that are interested in being a part of the strategic framework.

3

First tracks to define the document's structure:

- Identifying and analysing risk
- Establishing "risk factors"
- Estimating levels of risk
- Identifying actors involved
- Examining means of risk control, reduction, prevention, and preparation
- Catastrophes and disaster management measures
- Lessons learned from previous projects

In order to properly assess risk, we must:

- Quantify the risk:
  - » In space and time
  - » Classifying the territory's climate
  - » Defining sociological characteristics that may influence a risk event being caused
- Prevention actions:
  - » Initial state: Analysis and diagnostics on the territory's starting point
  - » Actions aimed at the population: information, awareness-raising, reconciliation
  - » Observation
  - » Control of the territory's different uses
  - » Actions aimed at the territory: Engineering infrastructure for preventative protection, specific material means, territorial land planning
  - » Control
- Defining and quantifying alert, detection, and combating measures:
  - » Experience feedback
  - » Best practices
  - » Prioritising
  - » Plan application calendar
  - » Budget and funding
  - » Plan execution results and controls

4

Next steps for the document's development:

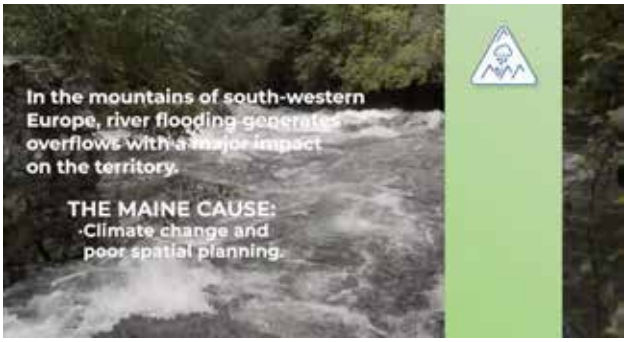
- Presenting the steps developed/ actions taken
- Identifying possible stakeholders and entities interested in taking part in its production
- Identifying needs and presenting leveraging results
- First rough draft proposal
- Partners, members, and associated stakeholder contributions
- Adjustments
- Second document structure proposal
- Adjustments
- Third document rough draft proposal
- Final approval

The framework document will integrate operational and strategic recommendations for each core focus, based on the results obtained from leveraging actions, and applicable to the SUDOE territory's mountain areas. By experiencing similar problems, common solutions will be offered thanks to cooperation.

Best practices to prevent mountain area hazards

During the seminar, six best practices examples were presented, which were selected through an open call. The selection was carried out following pre-defined criteria (geographical area, pertinence, territorial representation, topic addressed, the representativeness of the hazard addressed, and its novel nature) in order to illustrate some virtuous examples in terms of mountain area risk management and prevention.

FIRES: WATCH VIDEO



FLOODS: WATCH VIDEO

DROUGHTS: WATCH VIDEO

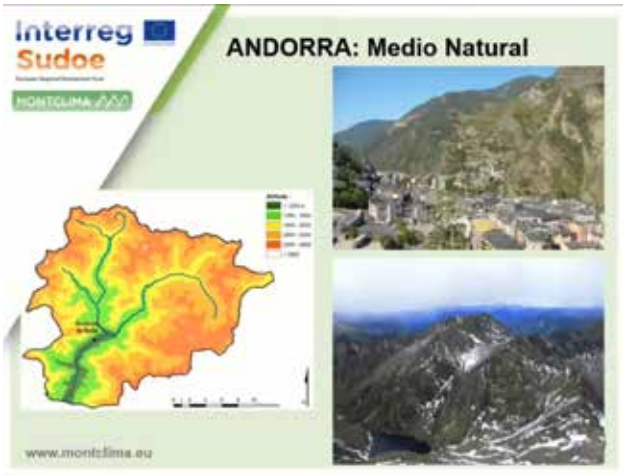
EROSION: WATCH VIDEO

Ramón Copons (IEA-CENMA) Institut d'Estudis Andorrans

Forests as protectors against avalanches through forest management. Encamp (Andorra)

Introduction: General framework, objectives, and motivation

- 60% of the Andorran territory is located above 2,000 metres.
- Multi-risk area: Avalanches, landslides, river and flash floods, and fires.
- The importance of protective forests to reduce the frequency and intensity of these events.
- Legal framework to avoid occupation in territories found to be in areas that are particularly exposed to natural hazards.
- Cartographic tools available to the public.
  Website link



Best practices example

- INTERREG POCTEFA CANOPEE project. 2014-2020 programme.
- Objective: guaranteeing perennial Pyrenees forests against an environment of climate change.
- Implementation in an Andorran pilot area. In 2000, there was a fire in Encamp that burned 14 ha of wild pine tree forest, of which 12 were protected.
- The forest's regrowth is very slow, so management is needed to reduce the impact of fires and make forests more resilient.
- Silvicultural treatment was carried out on 1 ha to reduce the virulence of potential fires, which consisted of:
  - » Ground vegetation clearing.
  - » Cutting lower branches below 2 metres.
  - » Removing trees that are dominated, sick, and/or dead.
- Result:
  - » The forest's vulnerability to forest fires was significantly reduced.
  - » Flames were kept from reaching the canopy.
  - » The forest's resilience and vitality in case of fire was increased.
  - » A future climate monitoring map was created, which considered forest vulnerability to climate change.

Future actions: POCTEFA ACCLIMAFOR. 2020

The intention is to use these **climate monitoring maps** in other pilot projects. In this case, in a black pine forest that currently serves to prevent erosion streams and flash flood channels.

The monitoring maps produced through the CANOPEE project will not only be used to prevent avalanches, but also from a multi-risk perspective to value the protective role of forests in the face of natural hazards.

Carmen Martín López (Extremadura Regional Government)

Forest management in terms of fire risk in a context of climate change

Project location

- The project covers geographic areas on the South face of the Central System of the Sierra de Credos to Las Urdes and Sierra de Gata.
- It is being led by the Directorate General for Forest Policy, with various lines of work carried out between fire fighting and prevention services and forest management and land planning services.

Analysis

- Extremadura has an average of 850 forest fires every year. The majority of these occur in areas that are difficult to access, making these fires difficult to extinguish as personnel must be transported by air.
- Fires in this area have major erosive effects, with very fast water channels, and other impacts associated with economic losses due to overflows in reservoirs and rivers, as well as a loss of fish.
- An exhaustive study has demonstrated that the causes of these fires has to do with livestock handling.
- Forest cover infrastructure must be created and maintained so that it can be used as a defence against fires, and post-fire restoration of the vegetation in these areas is an urgent need.

Lines of work

- Implementing a dynamic prevention project regarding fire rates in Extremadura.
- **Specific case:** the fire started on 27 August 2020 in Cabezuela del Valle (Cáceres) that lasted through mid-September.
- Promoting maintenance work and preventative infrastructure improvements

OBJECTIVES
Avoiding erosion and a loss of land. Hay was distributed to protect surface layers of soil in the area most affected by the fire. After the first rainfall, this measure proved itself to be a way of considerably reducing water erosion, reducing landslides and their speed.

in public forests to encourage livestock breeders remain and fire breaks are maintained.

- Restoring forest cover after large surface area fires that require urgent posterior analysis and work.
- Reconciliation with the mountain livestock sector. In the past there have been

discrepancies between the fire prevention, forest, and livestock sectors, but the time has come to change mentalities and reconcile interests.

OBJECTIVES
Establishing prescribed burns in areas of the Sierra de Gredos to achieve vegetation discontinuity and prevent fires while adding value for livestock farming. This fulfils a double objective: preventing fires and supporting livestock farming.

A reconciliation between forest policy and livestock sector interests is key to working in forests and being able to prevent fires.

Marc Viñas Alcon (Mountain Ranger in Northern Ireland's National Trust)

Project for the main access to the Slieve Donard summit

Background

- Hiking trails offer great opportunities to enjoy the outdoors, both for physical activities and active trips to mountain areas.
- Climate change affects many areas around the world, including plateaus and mountain areas. This means that outdoor activities have also been changing due to rain, snow, ice, and other extreme climate events that anticipate things to come.
- As the impact of climate change becomes more evident, we will have to face new challenges to design and manage mountain trail maintenance.

The Slieve Donard case

- At 850 m above sea level, Slieve Donard is the highest mountain in Northern Ireland and is part of its recognisable landscape.
- Hundreds of thousands of visitors pass through its main access annually.
- Large sections of the trail have suffered serious damage due to the presence of humans, which has been exacerbated by climate factors, particularly intense rainfall.

OBJECTIVE

Repairing damage caused by water erosion and restricting human traffic along the trail to protect the plateaus.

Procedure

- **Hiking trail restoration work** is carried out according to techniques that involve minimal impact to the landscape, which have been applied with success over the last 30 years to protect hiking trails in England and Ireland.
- They follow the trail forged by other conservation pioneers that attempted to respect the landscape's character and natural state while improving visitor experience. Much like John Muir, who promoted the creation of the National Park Service **(https://www.nps.gov/index.htm)** in the United States after serving as President Roosevelt's guide in Yosemite.
- Faced with the pressure brought by climate change and other potential impacts, we must implement existing trail management and construction standards, and share wisdom and experience in challenging situations.

Mending our ways. The quality approach to managing upland paths.
(Countryside commission and British Upland Foundation Trust)

DOCUMENT LINK

Conclusions

- Wetter winters will increase surface flows, producing greater erosion potential.
- Waterlogged soil due to trail surface flooding causes increased trample damage.
- Warmer winters will lead to less snow cover, which will reduce protective insulation in trail areas.
- Longer vegetation growth seasons in the highlands may help with the vegetation restoration process.
- A drier climate could debilitate plant growth, threatening the success of highland reforestation work.
- Intense rains, climate variability, and extreme weather events can cause grave impacts and chronic pressure on trails.
- Highland administrators are already adopting trail designs to ensure that they are sensitive to the landscape's configuration.

The greatest difficulty that we currently face is linked to increased climate variability, which presumably makes certain extreme weather events more unpredictable, and increases uncertainty as to where and when they might occur.

Santiago Fábregas (AECT Espacio Portalet)

Securus Project: user safety on the Bielsa-Aragnouet and Portalet passes

OBJECTIVE COMPLETED

Increasing the number of days border passes are open with a framework of safety.

Financing

€9.9 M, within the SECURUS (2016-2019) and SECURUS 2 (2018-2020) projects

Users/year on three border passes

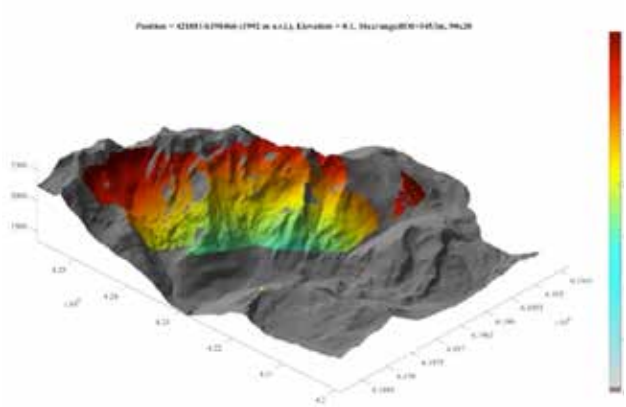
- Portalet: 460,101
- Bielsa-Aragnouet: 370,840
- Somport (not included in this project): 474,500

Actions developed

Bielsa-Aragnouet

- Prevention and pro-activity: producing a strategic road plan to study priority actions and investments.
- Collecting, analysing, and evaluating weather data: inventory and creation of a geographic information system for the road to geolocate all elements and prioritise investments while evaluating investment priorities.
  - » Data collection has improved with the implementation of meteorological sensors and stations in the road's environment, and in areas whose altitudes make them prone to avalanches.
- User information: the creation of a webcam network to provide real-time information. Information provided on the border passes' websites, which have seen visits increase exponentially: **www.bielsa-aragnouet.org** and **www.espalet.eu**
- Protecting infrastructure and services with classic avalanche risk prevention measures:

  - Snowpack holding systems (metal rods).
  - Balcony protection using wooden blinds.
  - New technologies: placing an avalanche prevention radar
  - Replacing bridges and road packing to avoid deep landslides.
  - Winter road equipment. Information through the Twitter account.
  - To protect service and its elevated costs: anti-snowdrift fencing and lightning rods with surge protection systems.
- Highlighting the importance of maintaining forest value as a system to protect against natural hazards. In this line of work, specific forest areas have been categorised.
- Training personnel and those associated with roads. Collaborating with the Universidad Menéndez Pelayo to teach two seminars on natural hazards (2018 and 2019).



Avalanche detection radar

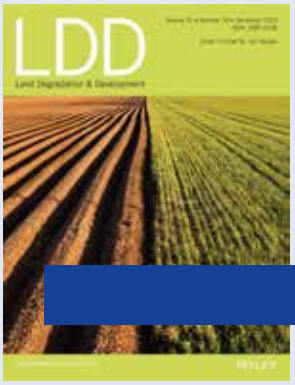
Transnational cooperation within this project's framework has allowed service to be improved, offering practical information in real time and guaranteeing safety. Infrastructure and investments made were improved and protected, optimising public resources while benefiting the user.

Alejandra Morán (CTFC-Centro Tecnológico Forestal de Cataluña)

Erosion risk management to mitigate the impact of climate change

OBJECTIVE

Evaluating the potential impact (horizon 2050) of extreme rainfall and fires on forest soil loss in the Mediterranean region, and proposing management measures to mitigate soil loss within the context of climate change, according to the study recently published by the CTFC.

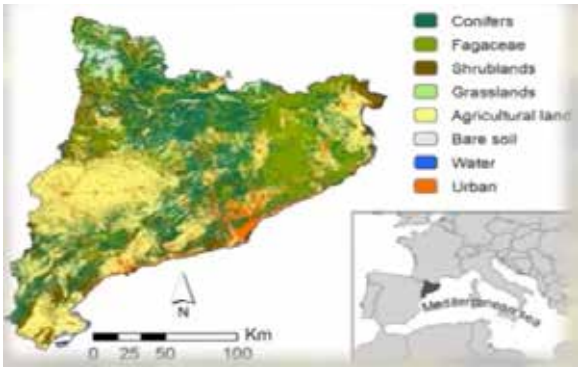


Soil loss is one of the main problems facing the Mediterranean basin's agroforestry systems, which is associated with multiple factors:

- Recreational activities
- Overgrazing: a particularly pressing issue in forests found in countries of the Mediterranean basin's southern watershed
- Forest fires
- Extreme rainfall

Area of study

Catalonia, which is 60% covered by forested lands. The predictions for this area indicated that the frequency and intensity of fires and extreme climate events will increase in the coming years.



Projections are carried out under different scenarios with direct and indirect change factors:

- Climate change-related factors.
- Fire fighting and management capacity.

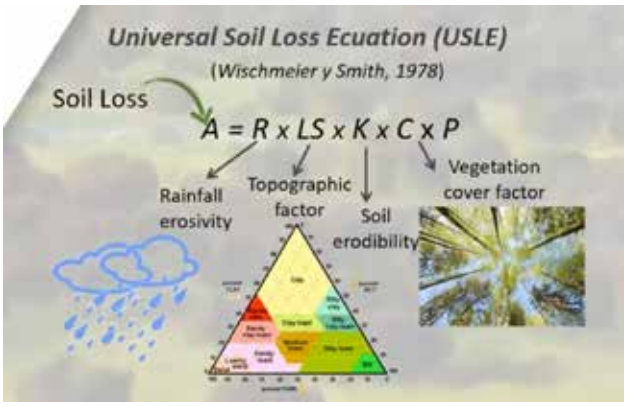
Empirical model for soil loss predictions *(Wischmeier and Smith, 1978)*

Universal soil loss equation A=RxLSxKxCxP

Allows for a calculation of the amount of soil eroded in tonnes per hectare depending on interaction between the following factors:

- **A:** Soil loss
- **R:** Rainfall-runoff erosivity (variable factor)*
- **LS:** Topographical factor (constant)
- **K:** Soil erodibility or rate of erosion vulnerability or susceptibility, intrinsic characteristic of each type of soil depending on composition (constant)
- **C:** Vegetation coverage factor. Provides information on the role vegetation has played in mitigating potential erosion (variable)**
- **P:** Human-induced management practices aimed at minimising soil erosion. E.g.: soil minimisation analysis after applying physical barriers to fight erosion.

(*) R: In order to obtain estimates on rainfall-runoff



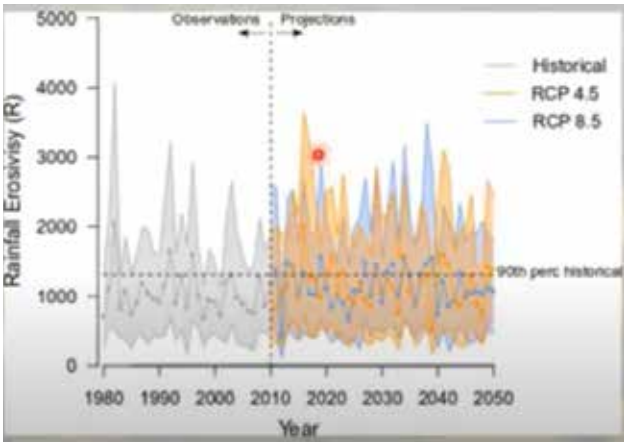
erosivity changes, two climate models from the Intergovernmental Panel on Climate Change (IPCC) are used

(**) C: The information obtained from R is included in a dynamic landscape model called Medfire to make future vegetation cover estimates.

Empirical model for rainfall-runoff erosivity predictions *(Diodato and Bellochi, 2010)*

Model calibrated for the Mediterranean basin that allowed annual erosivity values to be calculated between 2010 and 2050 using emissions scenarios with different severities for the climate's projected evolution.

Conclusion: the projections agree on a future increase in annual rainfall-runoff erosivity compared to 1980-2010 records, either due to more extreme rainfall or rainfall concentrated into shorter periods, with no significant difference between the two scenarios considered.



Empirical model for vegetation

coverage change predictions *(Van der Kniff, 2000)*

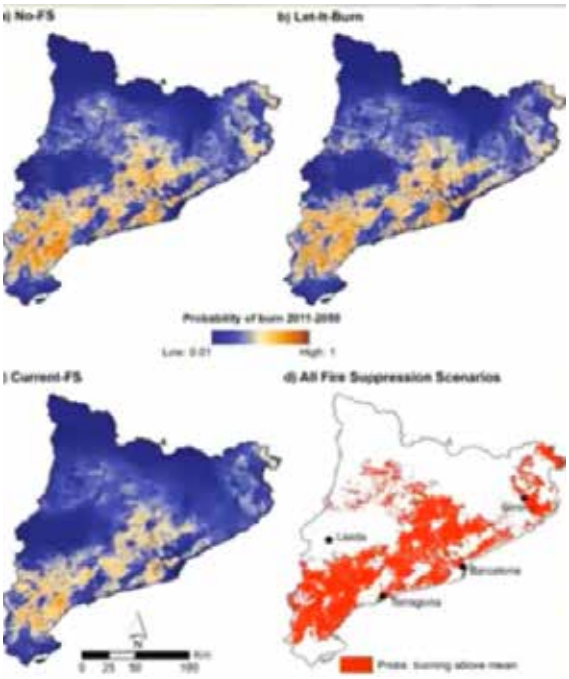
Vegetation coverage change prediction based on the Normalized Difference Vegetation Index (NDVI), which can be extracted from satellite images.

The NDVI is used to estimate vegetation quantity, quality, and development based on measuring the intensity of certain bands of electromagnetic spectrum radiation that vegetation emits or reflects.

The model allowed vegetation coverage values (C) to be calibrated for each of the 14 dominant species in Catalonia:

- A seasonal set of satellite images was used to extract NDVI values from each of the species based on plant mass maturity.
- Monthly values were calculated, and then an average coverage value was extracted for each of the species based on forest maturity.

In case of fire, vegetation coverage is lost and the soil is completely exposed to rainfall-runoff erosivity, which destroys the vegetation coverage parameter.



Areas of increased soil loss risk associated with fires

Medfire model for vegetation and landscape change predictions *(Brotons, 2012)*

Medfire is a vegetation dynamics model on a landscape scale that consists of two models:

- Secondary succession process simulation model from shrubland to forest and forest maturity processes.
- Fire regime simulation model: allows burn areas, fire size, ignition location, fire type, and fire management to be simulated.

With all the values, landscape change predictions (2010-2050) were carried out, and annual predictions were obtained on:

- Forest type
- Age
- Fires

STUDY RESULTS

1. Forests in Catalonia mitigate approximately 94% of potential erosion in the absence of vegetation.

The model covers three different scenarios:

- **a.** Without fire suppression
- **b.** Current level of fire suppression
- **c.** Intermediate scenario or "let burn", which allows topographic fires to reduce fuel available on the landscape level, and create fire breaks for future fires

No major differences are detected between scenario a and c results. However, if the current scenario is maintained, up to 5-6% of soil loss is mitigated on a regional level.

2. Fires are the cause of between 12-16% of annual erosion. In years with severe fires, up to 90% of total erosion.

3. During the 1980-2010 period, extreme fires did not coincide with extreme rainfall. It is probable that there will be an increase in the probability of these two events occurring contemporaneously in the coming decades. Their combination would produce a 150% increase in eroded soil when compared to average loss reference values.

4. The study allows the areas with the highest risk of soil loss associated with fires to be identified and mapped. Areas with a high probability of burning, even various times in a row, have been identified in the region.

Integrating all of this information allows management recommendations to be derived to reduce future erosion risk, in consideration of the effects of climate change:

- Developing a spacial prioritisation protocol in the areas must vulnerable to erosion is essential in order to minimise fire risk:
  - Forest management: reducing the fuel load or vertical fuel continuity within the forest.
  - Management on the landscape level:
    - Modifying the configuration of land use to reduce fire risk.
    - Carrying out prescribed burns, the application of which is not sufficiently wide-spread enough to minimise fire risk on a major scale.
- Actions to minimise erosion risk after fires: applying beds of hay, erosion barriers, etc., taking advantage of the period between the end of fires and intense rainfall.

The application of modelling allows for high-risk fire-related erosion risk areas to be identified and protocols to be applied in priority areas. The study's results highlight the importance of handling the landscape and reducing fire risk to minimise soil loss and its potential impacts on said ecosystems.

Santiago Fábregas (AECT Espacio Portalet)

Creating a cross-border network of canyoning and flood risks

Creating a cross-border canyoning network between the Autonomous Community of Aragon and the Department of Pyrénées-Atlantiques. The two regions have a total of 350 ravines with great diversity.

OBJECTIVE

Creating a cross-border canyoning network between the Autonomous Community of Aragon and the Department of Pyrénées-Atlantiques. The two regions have a total of 350 ravines with great diversity.

The activity is a part of InturPYR, an INTERREG POCTEFA project for tourism innovation in the Pyrenees.

Financing

1.5 million euros in financing. Some 10% is dedicated to canyoning.

The project's basic lines

- Prevention and pro-activity
- Local ravine guide experience and knowledge
- Establishing a common methodology
- Networking
- Using new technologies
- Collecting data to facilitate future decision making in scenarios that include adverse phenomena linked to climate change.

Actions

- Infrastructure assessment and improvement
- Anchors
- Life lines and safety
- Access via trails and paths
- Cleaning channels after major rainfall

The project began in 2017, focusing mainly on **adapting facilities** within the infrastructures that allow for activity in the ravine, which entailed the elimination and replacement of defective or old installations. Accessing the stepped aquatic environment with heavy work material, and adapting to the different laws in both regions was a challenge. As an example of this, authorisation requests had to be submitted to 26 different organisations to carry out this work.

Considerations on ravine risks and the practice of canyoning:

- Difficulty due to flow variations depending on precipitation, intensity, and characteristics of the river basin
- Difficulty due to the vertical variation
- Difficulty due to exposure: escape from the ravine

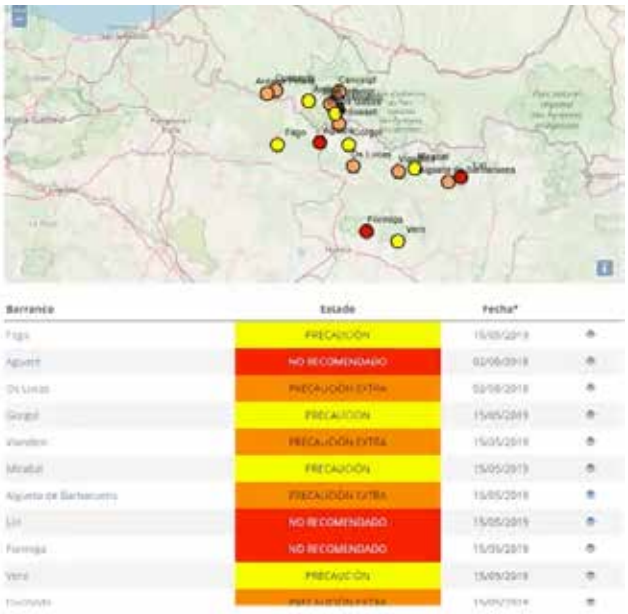
Spreading and adopting the implemented

MEASURES ADOPTED

Installing webcams to investigate flow variations. Obtaining local guide knowledge and data, the real level of risk was defined and made public to users on a new website.

The website offers comparative images of normal conditions versus extreme events.

WEBSITE LINK



methodology among users is sought:

1. **Flow variation:**
   - » Definition of the normal reference flow
   - » Definition of extraordinary flow
   - » Definition of extreme flow
2. **Difficulty of the canyon, height:**
   - » Water
   - » Vertical
   - » Exposure
3. **Skill of group leader** descending the ravine and skill of an individual
4. **Other conditions that affect safety:** temperature, defective anchors, dead animals, recent rockfall, etc.

Levels:

- Precaution: normal conditions
- Extra precaution: extraordinary conditions
- Not recommended
- Prohibited: in the case of France, due to the variation in flow due to hydroelectric activities

A generally accepted evacuation plan has been created for each ravine, which indicates:

- Ravine approach area
- Entrance
- Exit
- Return
- Evacuation routes

This activity has been picked up by the media
News story link

New initiatives

Incorporating artificial intelligence as a tool applied to automatically interpret ravine images and establish flow predictions based on rainfall models.

Canyoning has promoted a good example of cross-border cooperation that is not exempt from the challenges of different regulations in both territories and the difficulty posed by aquatic environments in any intervention. In addition, development was carried out with the involvement of the territory's agents (local guides and administration), implementing new technologies and even applying artificial intelligence to obtain real-time information, provided to users as quickly as possible.

Francisco Álamo. Forest technician, shepherd, and beekeeper

Controlled shepherding project against forest fires

Situation

- The replacement of dominant indigenous vegetation like oak and ash groves with pine reforestation, as well as forest and agrarian policies carried out over the last decades, have left a landscape that is highly flammable and prone to fires.
- Faced with persistent forest fires and climate change, a project financed by the Community of Madrid was implemented to **maintain fire breaks, trails, and defensive areas** through shepherding.

Strategy

- Due to the terrain's characteristics and dominant vegetation, the most effective way to achieve these maintenance objectives is through **goat farming.**
- Goats include thorny plants, pyrophyte shrubland, and low branches from trees such as cistus, briar, and pine in their diets. By removing tree branches, **they impede vertical fire propagation.**
- They are also efficient agents in transporting and spreading seeds, and

contribute to **soil fertility** with their excrement.

- These efforts require the supervision of a shepherd to direct the flock so that the

animals feed on areas where vegetation is thicker and technicians think it is most appropriate, since they would eat the most appetising plants otherwise without resorting to the less desirable shrubs that tend to be those that must be staved off.

- Help from dogs is essential to this process, since they have accompanied and defended flocks for centuries, and ensure shepherding activity is maintained.
- Dogs also ensure coexistence with wild fauna, and wolf packs in particular, which are vital to ecosystem health and balance.

Conclusions

Shepherding work does not just help mitigate climate change or avoid erosion, it also allows healthy, sustainable food to be produced,

maintaining rural populations and preserving part of our culture and traditions.

Livestock farming is an essential ally to keep in mind when it comes to preventing fires, mitigating erosion, and fighting climate change. In addition, it is key to keeping populations in rural mountain environments.

Workshop

MONTCLIMA action co-creation and orientation

Objective

Developing cooperation projects requires the organisation and preservation of spaces for reflection and co-creation. Spaces that allow for exchange between partners and stakeholders, for example the workshop developed with the sole purpose of guaranteeing proper product execution, and their best possible contribution to current needs and demands.

Agenda:

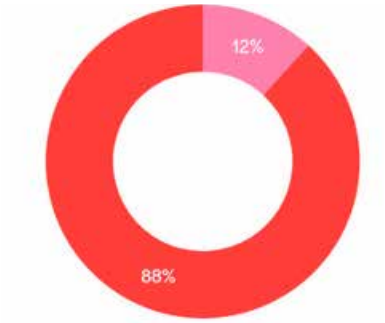
17:30 Virtual welcome for MONTCLIMA partners and sector attendees
17:45 Welcome and presentation. Eva García Balaguer, Director of the OPCC
17:50 Brief presentation of the dynamic. Xavier Carbonell, ARC Mediación Ambiental
17:55 1st PART. Action 1.2. Map viewer
18:15 2nd PART Action 1.3. Legal and technical instruments
18:35 3rd PART. Action 1.1. Selection of natural hazard management practices
18:55 4th PART. Action 1.4. Transnational strategic framework
19:15 Next steps and closing session

1st PART

Action 1.2. Analysis of mountain territory vulnerability using the Map Viewer tool

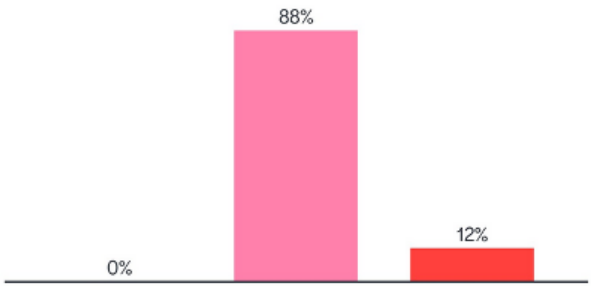
RESULTS

Initial assessment of the tool responding to three questions by applying Mentimeter



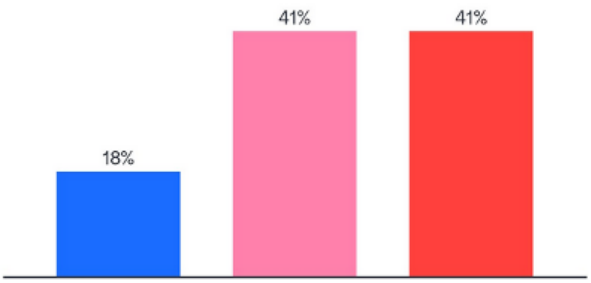
On tool interest

- 12% Moderately interesting
- 88% Very interesting



On its usability

- 0% It is a very complicated tool
- 88% The tool seems easy to use
- 12% Don't know / no answer



On the viewer's priority focus

- 18% An awareness-raising tool
- 41% An instrument for analysis
- 41% Collecting available information

KEY CONTRIBUTIONS

1. Exploring alternatives when no historical data is available

Some risks do not have historical data available since the cartographic scale was prioritised in the first stage to allow all of SUDOE's mountainous massifs to be covered, allowing for different states to be compared.

In these cases, alternatives are proposed such as a change in scale, making a specific section for each autonomous region, or implementing pilot cases.

2. Scrutinizing more local data in later stages

Priority was given to major indicators that also allowed for comparison between different massifs, but other panels can be added along the way with maps from specific countries.

Interest was expressed in having the platform be able to scrutinize more local data from each country's initiatives later on, analysing these phenomena on a national, departmental, regional, and municipal level.

3. Clearly defining the concept of Risk

In the presentation information or viewer introduction, the definition of risk must be quite clear as, for example, France considers erosion to be a phenomenon instead of a risk.

4. The viewer as a collection of information and tool for analysis and awareness-raising

In particular, the viewer should serve to collect all available information and be able to share it, providing an overall perspective on risks. This is a very powerful tool for information sharing that goes beyond border to provide a global vision.

It is also considered that it can be an innovative analysis tool in future stages, despite results being achieved on the long term, and in an environment with many associated uncertainties. Likewise, it is considered to be a useful tool in terms of awareness-raising.

5. Indicating data origin sources

It must be ensured that sources of data confirming fire and flooding events, or flooding/flash flood combinations, is made available.

6. Defining who will be responsible for exploiting data

The need to indicate who will exploit data collected and how it will be used is considered.

7. Defining quality validation and adapting data to its objective

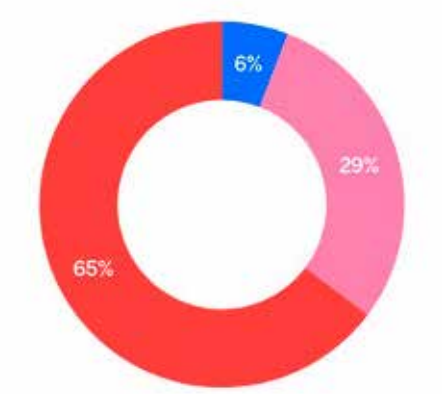
Those who were responsible for GIS data validation are specified. The criteria that have been applied are the scientific robustness of data, the representativeness of all territories, and the balance between the four hazards. All data are produced within the framework of research projects on a European scale.

8. The need for agreement, dialogue, and more extensive discussion

The need and interest for these more extensive agreement, dialogue, and discussion actions is emphasised, both for this tool as well as the others included in the MONTCLIMA project.

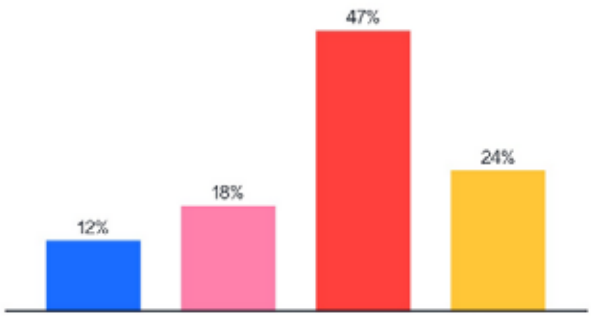
2nd PART
Action 1.3. Legal and technical instruments

RESULTS
Initial assessment of the tool responding to three questions by applying Mentimeter



On tool interest

- 6% Little interest
- 29% Moderately interesting
- 65% Very interesting



On the scale of technical and legal analysis

- 12% On a local scale
- 18% On a national scale
- 47% On a transnational scale
- 24% On a regional scale

KEY CONTRIBUTIONS COLLECTED

9. Exploring different types of projects that handle the multi-risk focus on a transnational scale

Although the transnational scale is considered the most appropriate, there are not many tools that handle the multi-risk focus on this scale. Different types of projects will have to be explored to avoid analysis being extremely reduced.

The multi-risk focus on a translational scale:

- Occurring in some cases, such as the Rhine, with flooding risk management initiatives.
- This is not typical in France, where initiatives tend to be departmental, local, or in some cases, regional, but different organisations would have to be consulted.
- There is no habitual focus on mountain areas.

10. Considering the geographical more than the administrative dimension in risk analysis

In many cases, the focus will move away from administrative limits as the dimension of risks is more geographical than administrative. For example, the focus for flood risks is carried out by river basin.

Nevertheless, there are examples of transnational cooperation on forest fire risk that does not correspond to topographic indexes as fires can cross borders.

11. Strengthening knowledge exchange and transferability with other virtuous examples in equivalent territories

Taking advantage of the Alps experience, "since it is a transnational, strategic document" for learning and establishing synergies. Consulting individuals responsible for the strategy regarding the methodology and lessons learned, with an eye on experience transfer.

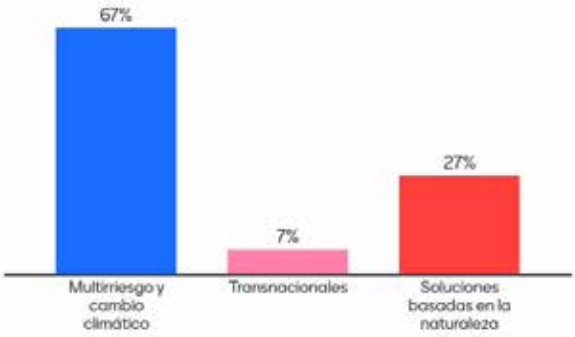
3rd PART
Action 1.1. Best practices selection

3rd PART
Action 1.1. Best practices selection

RESULTS
Initial assessment of the tool responding to three questions by applying Mentimeter

On tool interest

- 100% Very interesting



On the priority focus that the document must include

- 67% Multi-risk and climate change
- 7% Transnational
- 27% Solutions based on nature

KEY CONTRIBUTIONS COLLECTED

12. Connected best practices with the geoviewer

It is interesting to note that MONTCLIMA wants to connect best practices and the geoviewer to take advantage of the most virtuous experiences: multi-risk and nature-based, that link climate change with natural hazards, etc. On one hand we have the best practices database with a search engine, and on the other is MONTCLIMA's intention to take advantage of the most virtuous experiences through the geoportal.

13. Including an adaptable analysis of the best practices selection

Current and past best practices might not be in the future. For this reason, an adaptable analysis is considered in terms of what we understand to be best practices.

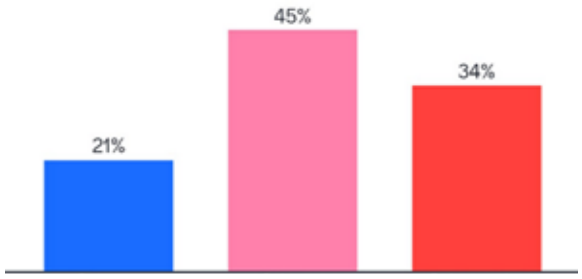
Carrying out an initial assessment of best practices is already considered to be quite ambitious if we take into account the Alpine example, where it took 15 years to complete the assessment and formalise a strategy.

14. Not limiting best practices information collection solely to those that address climate change

Expanding the information collection focus in order to include other interesting initiatives that can also be taken advantage of, that are addressing multiple natural hazards and phenomena.

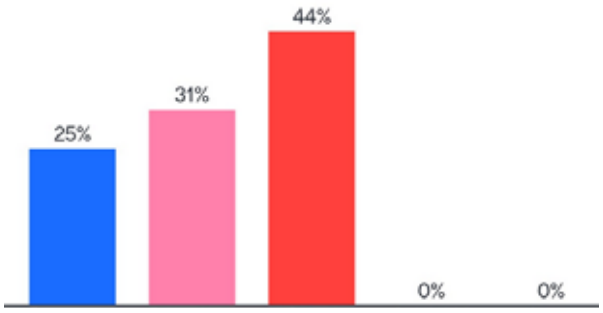
4th PART
Action 1.4 The transnational strategic framework

RESULTS
Initial assessment of the tool responding to three questions by applying Mentimeter



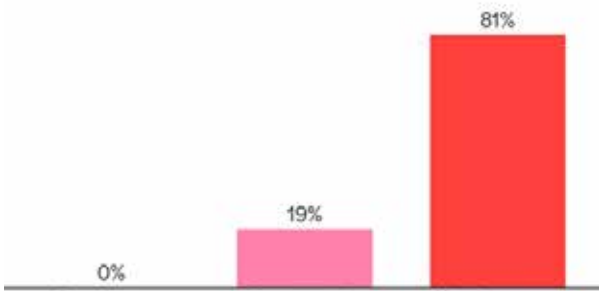
On the orientation of the strategic framework

- 21% The strategic recommendations, future challenges, and major guiding principles must take precedence
- 45% Operational recommendations to improve management must take precedence
- 34% Examples of best practices must be included



On the public objective of the recommendations that the strategic framework will include

- 25% Local political representatives
- 31% Regional political representatives
- 44% Agents
- 0% Civil society
- 0% Economic agents



On the format

- 0% A document with a “classic” structure
- 19% Dynamic website repository with different types of content (maps, video, themes, etc.)
- 81% Collecting available information

KEY CONTRIBUTIONS COLLECTED
From this evaluation, a debate is opened up

15. Deciding on the audience that the strategic framework wants to target is fundamental in order to set the document's orientation

The document's target audience and their needs and challenges must be determined. This decision will condition the document's content. For example, if the tool is basically aimed at agents, it must contain operational recommendations.

In any case, the operational recommendations that are declined in the framework document will also have to be scaled to the different target audiences.

16. The initial target audience could be a group comprised of agents and researchers

Considering that the path followed in the Alps, and the information that can be produced with this project in two years, it is deemed more realistic that the initial target audience be a group of agents and researchers. In addition, producing strategic guidelines for local politicians and other actors involved in decision-making would require a more precise assessment of the situation.

17. Agreeing on a core principles document that can be expanded to other levels later

It would be a good idea to reach an agreement on a core principles document, a starting point, a cooperation framework where partners can take over later on to expand it to other levels, since each territory's governance is quite different and it will have to be adapted specifically to each according to their own characteristics, regulations, etc.

Visit-local experience

Fire-fighting system in the province of Soria

José Antonio Lucas. Head of Territorial Environment Service of the Castile & Leon Regional Government in Soria.

Coordination by the Directorate General for Natural Heritage of the Castile & Leon Ministry of Development and Environment

The province of Soria has an average risk of fire, with 42% of its forest surface area wooded (420,000 hectares). Its vulnerability is due to its ample forest cover, which is also highly valuable.

In 2020, 533 individuals took part in fire fighting efforts in Soria. Burned were 1.8 hectares of forest, 14 hectares of grazing land, and 4 hectares of shrubland. Despite it having been a high-risk year, large surface areas were not burned.

Operation Coordination Centres

- 1 Regional Command Centre (RCM)
- 9 Provincial Command Centres (PCM)
- An Advanced Command Post (ACP) is prepared to put out fires

Objectives of the Emergency Plan to protect forests against fire (approved by Decree in 1999)

- Organisation and procedure in case of fire
- Coordination between various administrations: healthcare, emergency, military police, etc.
- Risk analysis: taking cover vulnerability into account,
  - » Potential risk = Cover vulnerability + Local risk
  - » Local Risk = Frequency + Type of cause (arson, agricultural reasons, etc.) + Fuel danger

Operations

- The State's air assets through the Army (seaplanes and tanker planes that drop up to 6,000 litres of water)
- Autonomy: Supporting air assets with helicopters

Soria has 2 helicopters, with 8 people each and 1 technician to coordinate the two.

Type of fires

- Spring. Agricultural burns
- Summer. Spike in risk between 1 July and 30 September

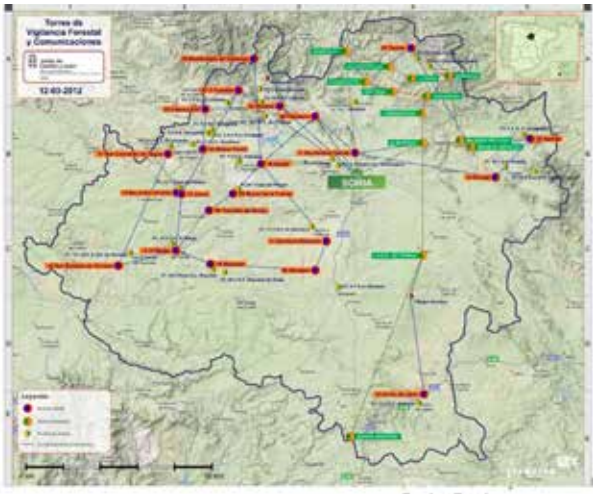
Fire danger levels

- Tier 0: Easily resolved
- Tier 1: Lasting more than 12 hours or affecting more than 30 hectares.

- Tier 2: Can be shorter or affect fewer hectares than Tier 1, but there are complications such as road closures, power lines down, or specific facilities affected. Tier 2 requires assistance from different authorities as it goes beyond forest protection.
- Tier 3: Never declared in Spain. Extremely serious because, for example, it affects various Autonomous Communities.

Assets available in Soria

- 32 manned watch towers
- 19 thermal cameras
- 28 heavy-duty fire-fighting pumps (some their own and others through agreements with other entities)
- 12 forest workers
- 7 squads
- 3 helicopters (2 from the Ministry and 1 from the Regional Government)
- 2 heavy machinery:
  - 1 to clear fire breaks and cover paths
  - Another ready to head into fires



Camera system

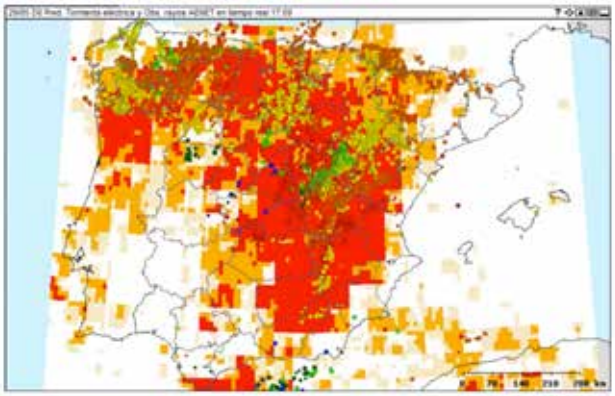
- Differentiates heat concentrations and sounds the alarm.
- The collection of images provided allows the type of service burning to be identified, even at night.
- They are located on 30m tall towers and transmit information to the Provincial Command Centre in real time.
- Each tower has a weather station to report on rain, wind, etc., in real time.

Prevention and management

- Soria is divided in 12 forest regions. The area has been mapped to determine the time it takes to reach each area in case of

fire. They strive to keep this time below 30 minutes.

- An informational brochure has been given out to farmers to avoid fires from their activity.
- The MeteoGIS application Meteorological and Geographic Information System is used to provide exhaustive weather forecast information.
  - In constant contact with AEMET.
  - A lightning map is available to monitor the areas and suppress fires from this cause.
- The SIPRO fire simulator is used to make predictions based on meteorological data and the 9 fuel models defined in Spain.
- The Emercarto application is used to locate fire-fighting assets by GPS in real time. This allows fire perimeters to be measured and communicated directly to the Command Tower.



- The SINFO application is used to monitor incoming and outgoing assets to plan relief

Summary and conclusions

The MONTCLIMA-SUDOE project's First Transnational Seminar dedicated to Natural Hazards and Climate Change in Mountain Areas allowed **reflections, experiences, and best practices to be shared in order to meet the goal of analysing and improving the prevention and management of the four hazards identified in the project** -droughts, floods, forest fires, and erosion- that are linked to climate change and faced by Southwestern Europe's cross-border mountain territories.

Over the course of two intense days, the partners, members, and registered participants came together and shared ideas and progress made with different actions taken for this purpose.

The seminar kicked off with an inspiring speech from Eurac Research's Lucca Cetara who showed how **the Alpine Convention is organised and how it is making progress with the topic of natural hazards. This journey has been under way for some 15 years, and is based on transnational cooperation.**

In the presentation, he detailed the various instruments and tools that the cooperation work is based on: the PLANALP platform, which evaluates strategy development based on a document with agreed-upon strategic principles, setting common risk management plans, and creating a complex governance scheme. In addition, Cetara presented the Alpine Climate Target System 2050 tool to implement the Alpine climate target system.

In this first exhibition, he confirmed how the work model used in the Alps, which is based on time for dialogue and pooling resources, can serve as a point of reference for other mountainous areas like those in Southwestern Europe. In addition, it is also a benchmark for the work that the MONTCLIMA project specifically hopes to carry out with these types of seminars, this being the first.

In this sense, these seminars serve to share and generate debate on the project's own products. The complexity of the topics and variety of agents involved make actions and seminars like this one necessary in order to compare and consolidate advances made while creating the desired products.

To do this, the next block was dedicated to four talks presenting progress made on the MONTCLIMA project's different actions, as well the content and focus planned for each of the project's products.

The first three speakers were partners responsible for leveraging actions, who explained how they were collecting, organising, and analysing existing information in their different areas with the goal of transforming MONTCLIMA into a benchmark project for collecting and providing the most relevant and necessary information relating to the four natural hazards in their three dimensions: experiences, cartographic information, legal instruments, and management.

Manuel Feliciano from the Polytechnic Institute of Bragança explained how **he was working on a database to collect best practices detected**, which will have to be completed with other best practices identified by the partners. Based on his knowledge and networks, work will have to be carried out to identify those that best inspire transnational strategy and action.

For their part, Nacho Campanero from CESEFOR and Rodrigo Torija from INCA Medios revealed the **MONTCLIMA map viewer** that they have been developing with graphic information available, which will let SUDOE

territory vulnerability to the study's four hazards be deeply understood. The viewer's structure design will also allow for a selection of its own practical examples and best practices to be stored.

Thirdly, Didier Felt from CEREMA, spoke about **the comparative analysis of legal and technical tools** to prevent and manage natural hazards in the SUDOE territory, which prioritises experience analysis in governance instruments on a local and supra-municipal level.

The results of all these analyses will work together to feed the transnational risk prevention and management strategic framework for the MONTCLIMA project's central results and actions.

Sébastian Chauvin from FORESPIR, the partner responsible for this strategic action, also gave a talk on the goal to capture the real need of creating a transnational risk prevention and management strategic framework in the SUDOE. In this initial stage of development, a joint decision on a good match and definition of the target audience is fundamental. Including a dialogue process with the territory's agents and potential users of this cross-border strategic framework is also planned.

This block of presentations and talks was complemented with a participatory workshop, a space for open dialogue with the goal of encouraging exchange and a contrast of opinions on the orientation of the results that MONTCLIMA must obtain.

WORKSHOP

Led by Xavier Carbonell from ARC Environmental Mediation, participants asked different questions about the previously presented products.

The **map viewer tool (viewer of the 4 hazards)** was rated as highly interesting and easy to use by the majority of participants.

The debate allowed proposals and lines of improvement to be identified to incorporate historical data and **prioritise a scale of analysis that covers the entire SUDOE territory and allows the different states to be compared.**

They also identified the collection of compatible data offering a comprehensive view of the hazards as its main function, although **it should also be considered on the longer term as an awareness-raising and analysis tool.**

The collection and analysis of legal and technical instruments was also deemed to be of great interest. The attendees believed that the ideal scale for analysing risks would be translational, although it was stated during the debate that it is actually quite difficult to identify projects in mountain areas with both a multi-risk focus and a transnational scale.

It was deemed that **the Alps experience could be particularly useful as a benchmark** for learning and establishing synergies between territories.

The **best practices** database approach was also very positively rated, and it was concluded that linking best practices in natural hazard management with the geoviewer would be of interest in order to showcase the best experiences. Also highlighted was the interest in adding best practice value to traditional practices that could be more adaptable, as well as including interesting initiatives

that analyse multiple natural hazards and phenomena despite not being in combination with climate change.

Lastly, the debate showed that the 'Transnational Strategic Framework' should be mainly aimed at agents based on the course they followed in the Alps, which could be a good proposal initially aimed at a group of agents and researchers. The content should be based on operational recommendations, and its contrast with the territory's stakeholders will be valued as fundamental.

It would be useful to agree upon a core principles document as a framework for cooperation that partners can expand upon later.

CALL FOR EXTERNAL BEST PRACTICES

This Seminar also hoped to act as a sounding board for other researchers and entities that have been developing interesting actions for some time, whose experiences with satisfactory results could be the seed for excellent leveraging. The open call was closed by selecting and inviting **six varied examples** of best practices in natural hazard prevention and management in mountain areas.

Ramón Copons from IEA-CENMA presented the CANOPEE project and a way of **managing Pyrenean forests so that they play a protective role** against natural hazards in a context of climate change.

For her part, Carmen Martín from the Extremadura regional Government pointed to the importance of **reconciling the interests of forest policy and the livestock sector** as key to preventing forest fires.

Marc Viñas, Mountain Ranger in Northern Ireland's National Trust, discussed how his conservation project for the main access trail to the summit of Slieve Donard **applied traditional techniques to fight against erosion and provide better harmonisation between conservation and tourism, along with improved habitats.** This combination helped them better prepare for the most recurrent and difficult to predict impacts and problems associated with climate change and catastrophic atmospheric events.

Next, Santiago Fábregas, manager of a cross-border connecting road at AECT Espacio Portalet, presented the actions developed in the SECURUS Project, which implements different tools to generate knowledge and allow risk levels to be assessed at all times, while also prioritising investment. A framework was able to be produced that offers greater safety guarantees for users and connection maintenance.

In a second talk, Santiago Fábregas presented the work carried out on the **Cross-Border Canyoning Network** between the Autonomous Community of Aragon and the Department of Pyrénées-Atlantiques (InturPYR Project), that showcased local knowledge and provided users with real-time information on the state of the ravines, thereby improving incident prevention.

For her part, Alejandra Morán, presented the results of a recent CTFC study using modelling that evaluates **the impact of soil loss according to vegetation coverage variability** in Catalonia. Faced with new climate scenarios, the model allows changes to the landscape caused by the effects of fires and erosion to be predicted. It also allows preventative management recommendations and measures to be proposed.

Lastly, beekeeper and forest technician Francisco Álamo closed the best practices session by presenting the results and learning outcomes from applying controlled shepherding as a forest fire protection measure. The result allows for the value of **extensive livestock farming to be highlighted as a landscape architect and ally to reduce the risk of fire, mitigate erosion, and fight climate change.**

Finally, Eva Garcia Balaguer, who is the coordinator of the Pyrenean Climate Change Observatory, an initiative of the Pyrenean Working Community Consortium (CTP), and coordinating partner of this project, closed the seminar by thanking all those in attendance that made it possible to hold this event with their dedication and desire to share experiences and overcome difficulties and risks.

This first seminar, which was held partially in-person and under exceptional circumstances due to the COVID-19 pandemic, was dedicated to mountain area natural hazards and climate change, reaching highly interesting conclusions that will certainly help move our MONTCLIMA project forward.

The interest and debate generated corroborate **that transnational cooperation is fundamental to moving forward with standardising criteria, action coordination, and achieving a greater degree of resilience based on implementing contrasted measures** that help us improve natural hazard prevention and management in SUDOE's mountain areas, in an increasingly complex climate change environment.

Lastly, this Seminar highlights the need, and confirms the interest of all our partners, to continue along the line of **agreement, dialogue, and discussion** when it comes to establishing transnational tools created by the MONTCLIMA project's partners.

All those in attendance are also invited to return in the near future for the Second MONTCLIMA Seminar to continue collaborating and contributing to the resilience and proper conservation of Southwestern Europe's mountain areas.

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In addition to the CTP, which coordinates the project, MONTCLIMA's partners include:

CTP

CREAF

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cesefor

ipb INSTITUTO POLITÉCNICO DE BRAGANÇA

Office National des Forêts

GEIE FORESPIR

Cerema

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