

Understanding the evolution of natural hazards in the Pyrenees in face of climate change and analyzing the role of forest management



- **Description of relevant activities and collaborating partner institutions**

The main objective of the [-OPCC Natural Hazards-](#) Project is to better understand the evolution of natural risks in the Pyrenean Massif in view of climate changes pressures, and to analyse the role of forest management in the risk level evolution. This research aimed to be the milestone for the definition of a common Integrated Natural Hazards Management System shared by the 7 Pyrenean territories within the [CTP](#) (Pyrenean Work Community).



Figure 1: CTP member territories Map

The project is embedded within the [OPCC umbrella project](#) that develops in turn other projects related with key climate change sectors transversally as climate, biodiversity, forest, water resources, remote sensing and adaptation.

The partnership of the OPCC is led by the CTP, which is a cross border consortium lunched in 2010 for territorial cooperation. It is formed by institutional representatives of the 7 territories. In the other hand, the OPCC has 7 strategic partners, representing the main universities and research bodies of the 3 countries, France Spain and Andorra.

In this context and more specifically, the -OPCC Natural Hazards- project focused on several core activities listed below:

- The identification of the current forest protection situations, by overlapping the current hydrogeological risk maps layers with forest vegetation maps;



- The recognition of forest areas that are playing a significant protective role against hydro geological risks in the Pyrenees;
- The identification, mapping and monitoring of the more significant mountain hazards phenomena within the study area, helped by ALICE® tool software (Assessment of Landslides Induced by Climatic Events);
- The monitoring of the Groundwater Piezometric levels evolution;
- The development of a common methodology for the natural hazard risk level diagnosis, including climate change evolution factors.

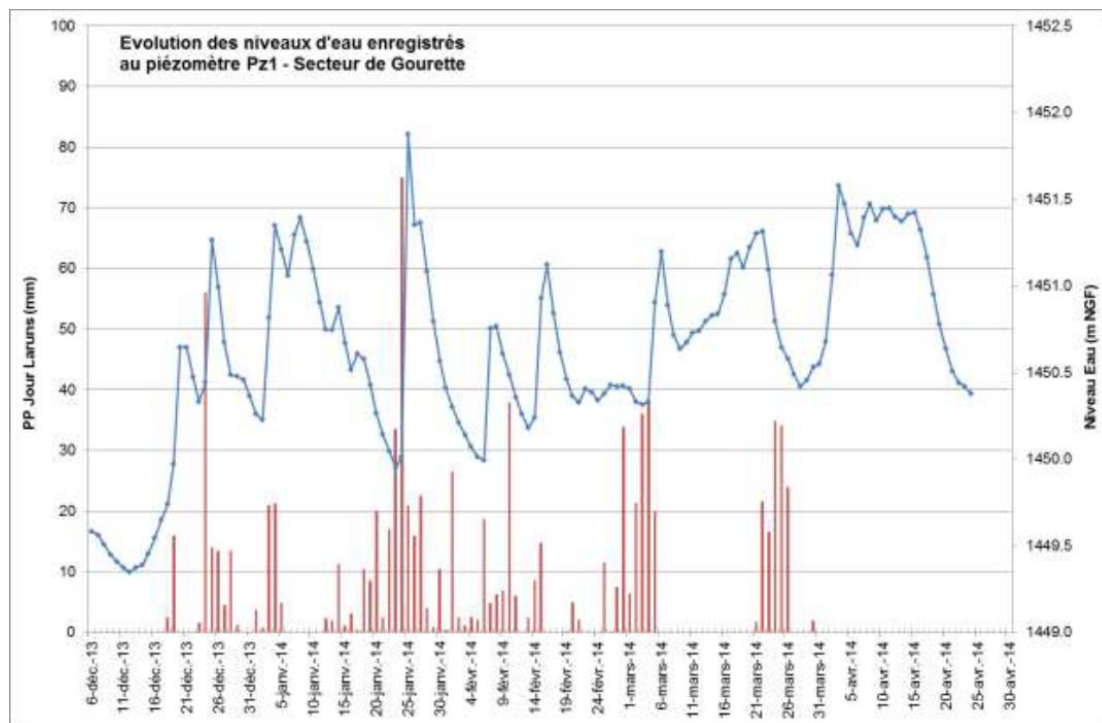


Figure 2: Evolution of groundwater piezometric level during December 2013 to May 2014 at Gourette sector in France.

• Key results

- Elaboration and launching of guidelines for technical solutions regarding Pyrenean forest management techniques to enhance its protective ecosystem services;
- Analysis report identifying the existing tools and relevant knowledge concerning mountain hazards, forest management and climate change;

- Elaboration of mountain hazard risk maps considering forest protective areas and climate change indicators;
- Creation of an indicator-based system aimed to improve monitoring, better understanding and follow up of mountain hazard phenomena:
 - o Cartographic evolution of “high natural hazard risk” areas (climate change indicator)
 - o Mountain natural hazard phenomenon evolution
 - o Groundwater piezometric level evolution
- Implementation of an Indicators Observation Network in 8 key reference sites uniformly spread along the entire territory;
- Development of tools to enhance awareness rising in the topic of natural hazards and forest management, addressed to technical forestry bodies, public institutions and other relevant stakeholders (newsletter, workshops, dissemination platform);
- Capitalisation and spread of main results through the OPCC platform and geo-portal;

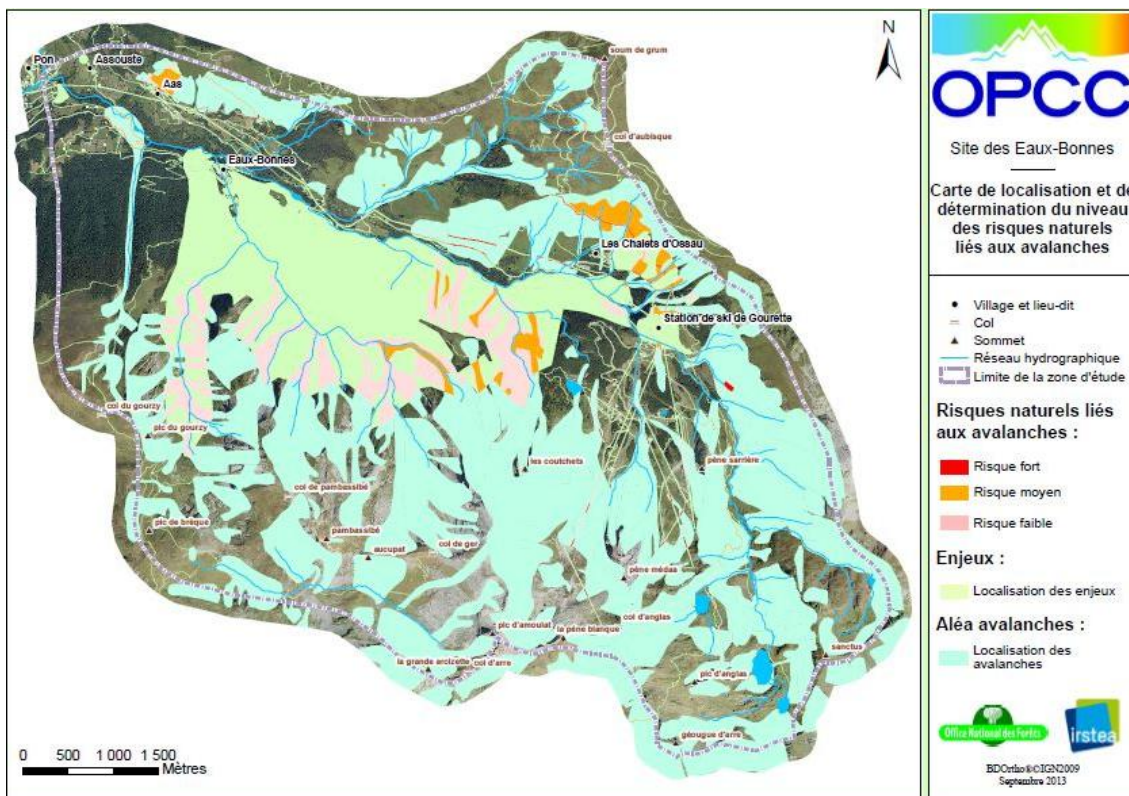


Figure 3: avalanche risk level map of Eaux-Bonnes site in France

- **Description of lessons learned and good practices**

- Cross-border cooperation in defining joint methodologies for the identification and management of natural hazards is a key factor in mountain areas
- The protective role of mountain forests against mountain hazard phenomenon is crucial to reduce the risk of goods, infrastructures and people to hydrogeological hazards
- Despite the unclear and difficult connection between climate change and the evolution of natural hazards, it is highly recommended to enhance win-win adaptation measures based on the ecosystem services offered by forests against mountain hazards
- It is highly recommended to disseminate manuals of good practices in forestry management to enhance the natural protection of forests against hydrogeological hazards
- It is necessary to continue collecting and disseminating more examples of good practices study cases on natural hazard management adaptation practices to promote their spread across the transboundary territory

- **Description of key challenges**

- To create a complete map catalogue of the socioeconomic challenging issues and infrastructures of the Pyrenees, public buildings, communication routes, distribution networks, etc.
- To harmonize the geologic map database of basic information and the forest and land use cartography of the entire Pyrenean region
- To improve the diagnose equipment needed for rainfall monitoring and the hydrogeological characterization of the most concerned areas
- To increase the Natural hazards Observation Network sites to be more representative
- To improve the early warning and risk management system