



## Editorial

Risk-AquaSoil starts his second year. It was thought to rest on local climatic events to explore our behavior toward climatic extremes. The Forest Fires in Portugal during the summer of 2017 are sadly an example to explore how our societies are vulnerable to climatic events we thought under control.

We have asked our Portuguese partners to allow us to go deeper in the explanations of what has occurred dramatically in their area. Our thinking is that the way it has happened there will be similar in other places of Atlantic Area with other climatic scourges. The key seems to allow ourselves to think collectively that something unimaginable is possible. It opens the door to be more prepared to fight. Next climate induced hazard we have never spoken about is for me the rise of ocean level!

**Dr. Jean François Berthoumieu**

*(ACMG, Project Leader)*

### Contacts

**Project leader:** Association Climatologique de la Moyenne Garonne et du Sud-Ouest (ACMG)

✉ ACMG, Aérodrome Agen, 47520. Le Passage d'Agen, France

**Representative:** Jean François Berthoumieu

@ [acmg@acmg.asso.fr](mailto:acmg@acmg.asso.fr)

## CLIMATE CHANGE

### Local Resilience & Global Scenarios

The Climate Change Local Resilience & Global Scenarios international conference, held in the UNESCO heritage city of Guimarães, was design to promote awareness for the territorial impacts of the climate change. Focused on the rural areas and their actors some innovative experiences and good practices were presented. Key agents on governance, innovation, risk management and climate changes were invited in order to promote a multi-framework discussion and an effective dissemination of adaptation and mitigation measures. As mentioned by the co-organizer Alexandre Tavares, the conference promoted the co-creation of strategic guidelines for climate change challenges, supporting the dissemination and capitalization goals of the Risk AquaSoil project.



RiskAquaSoil - Atlantic Plan for Risk Management in Soil and Water, co-financed by the European Regional Development Fund (ERDF) through the INTERREG Atlantic Area Cooperation Program, under reference EPA\_272/2016

## HIGHLIGHTS

### ***Forest Fires 2017 in Portugal in the context of climate change***

Domingos Xavier Viegas

(DEM-UC & Association for the Development of Industrial Aerodynamics)

### ***Integration the Climate Change Adaptation in the sectorial policies and in the various territorial scales***

José Paulino

(Portuguese Environment Agency - Department of Climate Change)

### ***Climate Change is making unimaginable weather real: How can you be proactive with Risk-AquaSoil?***

Jean François Berthomieu

(Association Climatologique de la Moyenne Garonne et du Sud-Ouest/RiskAquaSoil - Project Leader)

### ***Changing land management to protect us from floods, droughts and pollution***

Laurence Couldrick

(Westcountry Rivers Trust)

### ***Quantifying the soil erosion risks in agriculture fields by means of on-the-ground and remote sensing tools***

Diego Intrigliolo

(Agencia Estatal Consejo Superior de Investigaciones Científicas)

### ***Erosion risk variation over the 4 river basins of lot-et-Garonne. Preparation of the winter work***

Julia James

(Association Climatologique de la MoyenneGaronne et du Sud-Ouest)

### ***The influence of forest fires on the geochemistry of superficial waters in the context of climate change***

Mário Sequeira

(Centre for Social Studies of the University of Coimbra/DCT-UC)

### ***Global operational monitoring of changing forest ecosystems***

Vasco Mantas

(University of Coimbra/Project FOCUS)



### ***Climate Services for Water and Agriculture Sustainability***

Cláudia Pascoal

(University of Minho/Project CLIMALERT)

### ***Climatological study***

Patrick Debert

(Association Climatologique de la MoyenneGaronne et du Sud-Ouest)

### ***Actualization of local scenarios of Climate Change in Andalucía in the 5th report of IPCC, and its application in the adaptation policies***

Juan José Álvarez

(Agencia de Medio Ambiente y Agua de Andalucía)

### ***Determining farmers preferences for climate change action***

Edel Doherty

(National University of Ireland, Galway)

### ***AquaBioScape - Monitoring of Urban Waterlines - Guimarães***

Ricardo Martins

(Landscape Laboratory)



## The Fire Events of 2017 in Portugal in the context of climatic change

Domingos Xavier Viegas<sup>1</sup>

<sup>1</sup> ADAI-LAETA, Department of Mechanical Engineering, University of Coimbra, Portugal

Forest fires are recognized as one of the major risk problems in Portugal. During the past decades the extension and degree of damage of fires has increased due to several factors including climatic change.

In 2017 Portugal was badly affected by wildfires particularly in two episodes, on the 17<sup>th</sup> of June and on the 15<sup>th</sup> of October. Under unusual weather conditions fires became quickly out of control and destroyed more than 300 kHa, killing 117 persons. The climatic and meteorological conditions associated to these fires will be described as well and the circumstances of some of the major fatal accidents.

After these disasters great efforts are being taken by Government and local agencies to improve the resilience of the rural communities and of the critical infrastructures.

## Integrating Climate Change Adaptation into sectoral and territorial policies and instruments in Portugal

José Paulino<sup>1</sup>

<sup>1</sup> Agência Portuguesa de Ambiente (APA)

Under the Paris Agreement, countries should ensure the implementation of actions and report their efforts and/or adaptation needs.

Portugal is potentially one of Europe's most affected countries by climate change, facing a variety of potential impacts.

The National Strategy for Adaptation to Climate Change aims to promote the integration of adaptation to climate change in the various public policies and operational instruments, namely of a territorial nature, in order to contribute to the development of a resilient, competitive and low carbon economy.

The Action Program for Adaptation to Climate Change complements and systematizes the work carried out in the context of ENAAC 2020 with a view to the objective - to implement adaptation measures, identifying lines of action for direct intervention in the territory and in the infrastructures, responding to the main impacts and vulnerabilities identified for Portugal until 2030.

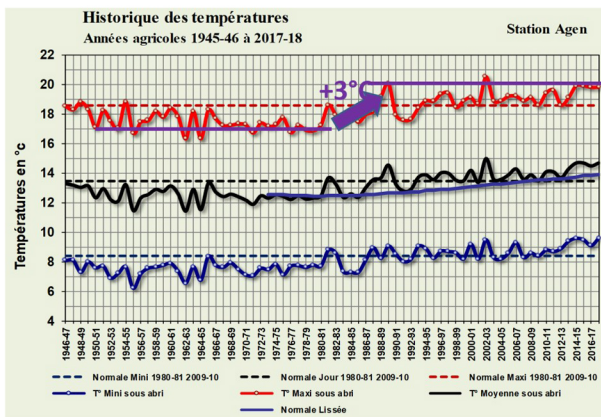


## Climate Change is making unimaginable weather real: How can you be proactive with Risk-AquaSoil?

Jean François Berthomieu<sup>1</sup>

<sup>1</sup> Association Climatologique de la Moyenne Garonne et du Sud-Ouest/RiskAquaSoil - Project Leader

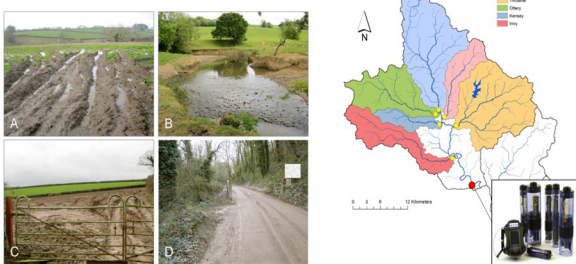
In Agen, South-West of France, the number of hot days (>30°C) has doubled during the last 30 years. While our perception of the impacts of climate change is depending of our way and place of life, I am very pessimist for the reduction of fossil use for the next 30 years in our Atlantic area.



Temperature records in Agen, France.

We have to adapt our societies to these climate conditions where the available energy will amplify the natural convective phenomenon. I propose to base our ways for adaptation on water and vegetation as we know that 200 mm of stored rain allows, through transpiration, a 4°C reduction of diurnal thermal amplitude. We need to apply principles of water management that Romans and Arabs where applying based upon Mediterranean principles of ecology. With Risk-AquaSoil we anticipate what is unimaginable.

Intervenções de segmentação – monitoramento  
Targeting interventions - Monitoring



Monitoring of the Tamar River Catchment Basin.

## Changing land management to protect us from floods, droughts and pollution

Laurence Couldrick<sup>1</sup> & Adrian Dowding<sup>1</sup>

<sup>1</sup> Westcountry Rivers Trust

Soils are a vital asset as they allow us to grow food, store water, protect from flooding, sequester carbon and many other services. However, in the United Kingdom over 38% of our soils are severely degraded and the consequence is we are losing soil faster than it is regenerating and it takes more nutrients to grow the same amount of food. Alongside this unsustainable approach for the farmer it is unsustainable for society as it is increasing run off which is flooding our towns and polluting our rivers and beaches.

The Westcountry Rivers Trust have been working with farmers for the past 25 years to help them adapt their farming business to protect soils – arguably their greatest asset - for both their private benefit as well as the public benefits. Understanding how this natural asset generates a flow of ecosystem services has been a crucial part of creating sustainable change.

## Quantifying the soil erosion risks in agriculture fields by means of on-the-ground and remote sensing tools

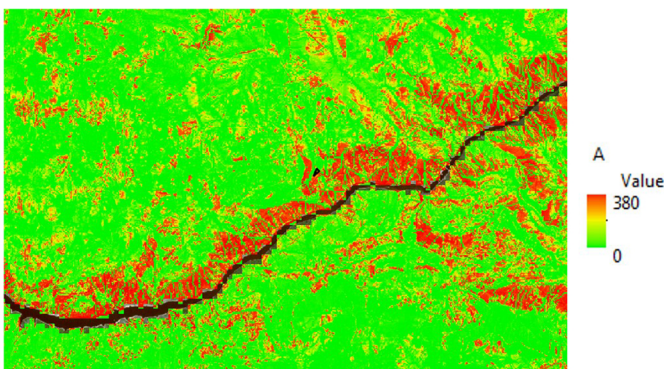
Diego S. Intrigliolo<sup>1\*</sup>, Juan M. Ramirez<sup>1</sup>, Javier Cancela<sup>2</sup> & Jose M. Mirás<sup>2</sup>

<sup>1</sup> Spanish National Research Council (CSIC), Center for Applied Biology and Soil Sciences (CEBAS)

<sup>2</sup> Universidad de Santiago de Compostela, Escuela Politécnica Superior de Lugo

Soil conservation is important for ensuring a sustainable agriculture. The talk will summarize tools for quantifying soil erosion risks using remote sensing technologies and for determining soil erosion rates with on-the-ground tools and proximal remote sensing. The RUSLE model was implemented in a ARCGIS in order to automatize the process of incorporating satellite images into the erosion risks algorithm.

To mitigate soil erosion in the Atlantic area, management practices have to be tested and their usefulness has to be quantified with specific on the ground sensors. In order to gain a complete understanding of the system, the effect of soil management practices on crop physiology will have to be assessed. Practices that in the long-term might promote benefits for soil conservation, could have occasional detrimental effects on the crop physiological status. The need for long-term assessments is highlighted.



Erosion rates ( $t\ ha^{-1}\ yr^{-1}$ ) in Study area located in Doade (Lugo, NW Spain).

### Erosion risk variation over the 4 river basins of Lot-et-Garonne. Preparation of the winter work

Julia James<sup>1</sup>

<sup>1</sup> Association Climatologique de la Moyenne Garonne et du Sud-Ouest

Improving resilience within watersheds requires knowledge of the natural environment itself and the local visions concerning this environment impacted by climate hazards; soil erosion is our example. We identify and quantify it by using satellite RADAR images from Sentinel 1; bare soils on slopes above  $6^\circ$  are prone to erosion during spring rains. As a second step, sociological work analyses local approaches to the increase in climatic hazards and improves coordination between the local groups: farmers, residents, politicians, industries and scientists. During the fall of 2018, farmers were asked about their methods of adaptation, the obstacles they find to act. During the winter of 2018 and spring of 2019, the other groups in the territory are interviewed to select local solutions.

### The influence of forest fires on the geochemistry of superficial waters in the context of climate change

Mário Sequeira<sup>1,2</sup>, Alexandre Oliveira Tavares<sup>1,2</sup>, Ana Castilho<sup>2,3</sup>, Pedro Dinis<sup>2,4</sup>

<sup>1</sup> Centre for Social Studies of the University of Coimbra

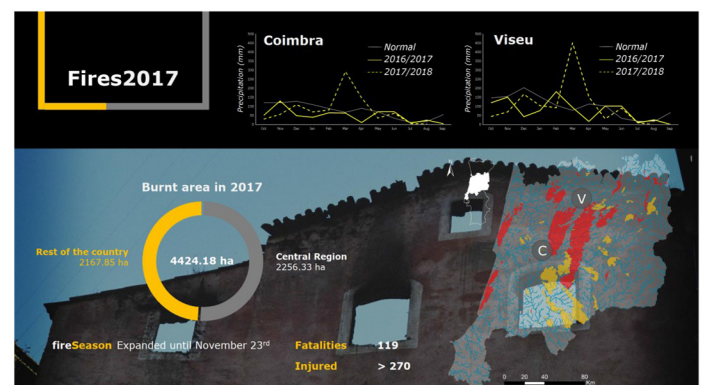
<sup>2</sup> Department of Earth Sciences, University of Coimbra

<sup>3</sup> Geosciences Center, University of Coimbra

<sup>4</sup> Marine and Environmental Sciences Center, University of Coimbra

Following the major forest fires in the Portuguese Central region in 2017, a watercourse geochemical monitoring campaign was initiated in the Mondego River basin starting in November of 2017 to determine changes in water in a post-fire scenario, and, if any, the persistence of these effects. From 6 watercourses, 10 sampling locations were chosen based on the size of the watershed and the percentage of burnt area.

Evidences of the influence of the fire were visible during the first campaigns, however the most compelling evidence was a higher erosion of the soils with mobilization of materials and an increased concentration of iron, manganese and aluminium, associated with clay minerals. During all the campaigns, no Polycyclic aromatic hydrocarbons were above the quantification, and no parameter seems to have concentrations that can put at risk the public health.



Burnt areas of the Portugal's Fires of 2017.

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## PROJECT EXCHANGE

Leaders from other projects linked to the research on Climate Change also shared their work with the public and the Risk AquaSoil team during the Climate Change Conference.

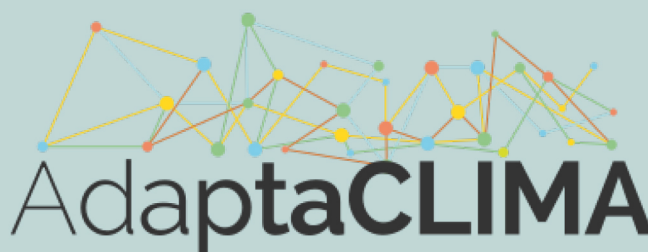
### Global operational monitoring of changing forest ecosystems

Vasco M. Mantas<sup>1</sup>

<sup>1</sup> *Department of Earth Sciences, University of Coimbra*

Forest ecosystems worldwide are under increasing pressure from multiple natural and anthropogenic drivers. Understanding change patterns is critical to design policies promoting sustainable forest management and conservation. Earth Observation (EO) data from programs such as Landsat and Sentinel-2 provide adequate temporal and spatial resolution to monitor forest health and disturbances globally (e.g. biotic agents, fire, storms).

Project FOCUS (Forest Operational monitoring using Copernicus and UAV data) incorporates satellite, Unmanned Aerial Vehicle (UAV), and airborne (APEX) data into an integrated solution to map damage to forests caused by biotic agents. The new mapping products are designed to meet the requirements and needs identified by the network of stakeholders supporting the project.



### Climate services for water and agriculture sustainability

Cláudia Pascoal<sup>1</sup> & Giorgio Pace<sup>1</sup>

<sup>1</sup> *Centro de Biologia Molecular e Ambiental, Univ. Minho*

In this lecture we will present the CLIMALERT project (ERA4CS), which aims to develop innovative tools (web and mobile applications) to predict and mitigate the extreme impacts of climate events by implementing action plans to reduce risks and vulnerabilities to the agricultural and water management sectors. The development of the project will allow i) to strengthen the link between climatology, water resources and the agricultural sector to assist in the management of natural resources; (ii) improve the tools used to incorporate meteorological and climatic information into risk assessment and decision-making in the agriculture sector; and (iii) contribute to assist decision-makers in the application of adaptation and mitigation strategies.

### Climatological study

Patrick Debert<sup>1</sup>

<sup>1</sup> *Association Climatologique de la Moyenne Garonne et du Sud-Ouest*

A study of temperature and rainfall evolution within Risk-Aquasoil sites helps to quantify and to compare the changes along the Atlantic area. Since 1951 Twenty-four sites (4 in Ireland, 2 in the United Kingdom, 7 in France, 5 in Spain, 6 in Portugal) provide rainfall and temperature data. Annual average evolutions, over the past 10, 20 and 30 years, were used for comparing the changes between the sites. It is verified everywhere a continuous warming trend. On the other hand, rainfall remains stable in most places with a light decrease on places where temperatures are higher and an increase in places near the sea where rain amounts are already high. The variation of dry and saturated days indicates a reduction of soil saturation condition. Extreme events of droughts followed by heavy rains were detected.

### Determining farmers preferences for climate change action

Edel Doherty<sup>1</sup>, Sinead Mellet<sup>1</sup> & Sinead Nee<sup>1</sup>

<sup>1</sup> *National University of Ireland, Galway*

This presentation explores farmer's perceptions of severe weather conditions and their willingness to adapt farming practices in response to changing climate conditions. Data were generated from the "sheep farm to fork 2018 event" in Ireland in 2018. In Ireland environmental threats such as biodiversity loss, water pollution, greenhouse gas emissions and soil degradation pose a problem for many of the sectors including agriculture. According to the results, it was evident that farmers in Ireland are concerned about severe weather events, and the effects on their farm. The research finding also showed that the majority of farmers are willing to adapt compulsory measures to better adapt their farm to climate change. The results will inform a larger survey, conducted on behalf of RiskAquaSoil, to determine farmers' perceptions and attitudes towards climate change.

### Actualization of local scenarios of Climate Change in Andalucía in the 5th report of IPCC, and its application in the adaptation policies

Juan José Guerrero Álvarez<sup>1</sup>

<sup>1</sup> *Department Red de Información Ambiental de Andalucía. Agencia de Medio Ambiente y Agua. Junta de Andalucía*

A communicative presentation, where four stories related to the important relationship that exists between energy, water and vegetation lead to territorial issues. From the beginning of this relationship to the use done by man and the threats to which it is subjected.

### AquaBioScape - Monitoring of Urban Waterlines - Guimarães

Ricardo Nogueira Martins<sup>1</sup>

<sup>1</sup> *Laboratório da Paisagem*

The AquaBioScape project, through a multidisciplinary work in between different scientific areas - Ecology, Geography and Hydraulic Engineering - studies the sustainability of the main water lines of Guimarães, namely, the Costa/Couros stream, the Selho river and the Vizela river. Right away, it allowed sampling points of physical, chemical and nutrient parameters and metals according to the classification scale of surface water for multiple purposes, according to the national information on water resources (SNIRH); in a second instance, it allowed the evaluation of the ecological quality of water with respect to the biodiversity of benthic macroinvertebrate communities and bacteriological analysis; finally, it allowed the identification, characterization and geo-referencing of potential sources of pollution and hydromorphological degradation. In order to infer the impact of the natural environment, the project has as its ultimate goal the restoration of the ecological state of the water lines, whose methodological application gauged and identified impacts and risks, as well as provided proposals for mitigation measures.





## FACING THE REALITY POST-2017 WILDFIRES

### Visit to Portugal's Central Region

A visit to Portugal Central Region was conducted. This area was severely affected by forest fires in 2017, and was chosen by the Centro de Estudos Sociais da Universidade de Coimbra to conduct the pilot action WP4.6 Land use change trajectories and forces.

Across AutoRoute 1, crossed the National Forest of Leiria, which helped to stabilize the dunes of the Portuguese West shoreline, preventing erosion from the sea. The removal of the vegetation, by the forest fires, creates a worrying scenario for this coastline. Along with the burnt area, the partners were able to see the effects of the Leslie storm that had passed through Portugal a few days before.

With a first stop near the Pobrais village, on route 236-1, most known as Death Road, where 43 people died in the Forest Fires of July of 2017. Inside of the Pobrais village it is possible to view the monument to the victims, and the water tank were some of the survivors stayed during the passage of the fire.

The members of Risk AquaSoil also meet with the Victims Association of the Forest Fires of Pedrogão Grande at their headquarters, exchanging experiences on the impact that climate change has on forest fires, and how local communities can become more resilient to this changes.



*Grief-related tribute flowers for the fire victims.*



*Monument to the victims of the fire of Pedrogão.*

*Risk AquaSoil members visit route 236-1.*

