





# **PROCEEDINGS OF THE SRA-E-IBERIAN CHAPTER (SRA-E-I) CONFERENCE**

**“Interdisciplinarity in practice and in  
research on society and the environment:  
Joint paths towards risk analysis”**

Edited by:

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## INTRODUCTION

The Society for Risk Analysis (SRA) is an interdisciplinary society which addresses emerging issues in risk analysis, management and policy. It operates world-wide and it has many International Sections. SRA was established in 1980 and has grown significantly since its founding. The Society has held an annual meeting continuously since 1981. SRA's flagship journal - Risk Analysis: An International Journal – first published in 1981 and is the leading scholarly journal in the field of risk analysis. The Society encourages those interested in all aspects of risk analysis to communicate, collaborate and develop new methodologies for risk analysis and risk management.

The Society for Risk Analysis - Europe (SRA-E) aims to bring together individuals and organisations interested in risk analysis in its various facets such as risk assessment, risk management, risk governance and risk communication in Europe. SRA-E in addition to being an European wide organization, it is also composed by regional chapters – such as for example the SRA-E Nordic Chapter, SRA-E Benelux Chapter, SRA-E Iberian Chapter and other chapters currently being established. In addition, it has an official scientific journal - Journal of Risk Research – which has been published regularly since 1998.

Although independent from SRA, SRA-E shares a common purpose with it and emphasises the European dimension in the promotion of interdisciplinary research and education, and in practical application in industry and Government. It provides a platform for academics, policy makers and industrialists to discuss future directions, to understand concerns about risk from both public and scientific perspectives, to promote efficient risk mitigation and to develop effective communication about hazards.

Its annual meetings/conferences and chapter meetings are also an opportunity for risk analysts to come together to discuss issues, problems, goals and future research questions. New areas for risk analysis are emerging and new disciplines are contributing to the ongoing debate about risk analysis in its various facets. SRA-E has held an annual meeting regularly since the first one in

Luxemburg, Austria in 1988, with a total of 27 conferences held until now. The next annual conference will be in Potsdam, 23-26 June, 2019 and various Annual SRA-E Chapters meeting will also be held throughout 2019, including the SRA-E Iberian Chapter meeting to be held in Coimbra, Portugal.

Considering the various SRA-E Chapters, the Iberian chapter (SRA-E-I) in particular, was created to promote interaction between Iberian people interested in the risk domain. The SRA-E-I shares the aims of SRA-E and its mission is to:

- Promote risk research and knowledge and an understanding of risk analysis techniques within Iberian countries and their autonomous regions. These countries include Spain, Portugal, and Andorra.
- Identify and address specific issues common to Iberian countries in the field of risk, to promote debate, and to motivate decision-makers as regards the usefulness of risk research, critical analysis and risk analysis when dealing with such issues.
- Act as a focal point for communication with risk researchers and analysts in other parts of the world.
- Facilitate exchanges of information and opinions between professionals in industry, government, universities, research institutes, and consultancies, with the aim of furthering research and improving the practical application of risk analysis and risk management.
- Convene and promote scientific and educational meetings on risk research, risk analysis and risk management in Iberian countries.

The first official meeting was held in the city of Toledo and was organized by the Facultad de Humanidades, University of Castilla-La Mancha, and the Centro Cultural San Clemente, Diputación Provincial de Toledo. The programming of this conference was structured in the form of two keynote speeches by Gerardo Herrera from the Instituto Geológico y Minero de España ("*The EuroGeoSurveys strategy for landslide risk*") and Jose Manuel Mendes from the Universidade de Coimbra. ("*Forest fires, communities and the role of lived experiences*"). Three workshop sessions also took place in parallel: a) "*Why is it called risk when they only analyse*

*hazard?*” conducted by Andrés Díez-Herrero, from the Instituto Geológico y Minero de España; b) *“The discursive politics of climate change: risk, power and opportunities for democratization”* conducted by Anabela Carvalho from the Universidade do Minho; and c) *“Intrinsic risks not considered during the building process, from a gender perspective”*, conducted by Antonio Ros-Serrano (Universidad Politécnica de Madrid) and Mario Sanz-López (Universidad Europea de Madrid). The Organizing Committee would like to thank the keynote speakers and workshop leaders for their work and commitment to this conference.

The conference was attended by more than 60 people belonging to various Portuguese and Spanish organizations and linked to research and management in diverse areas of risk. Forty-two works were presented. The success as regards participation has encouraged the organizers to gather together the works presented in a book of proceedings as a network database that will serve to put researchers and managers in the field of risk in contact within the Iberian sphere. The main content of this text is, therefore, formed of the abstracts and posters presented at this conference. The compilers of these proceedings would like to thank the Scientific Committee for reviewing the abstracts presented and their suggestions as to how to improve them.

The works have been classified in six thematic areas that will serve to structure the content of the presentations in this book of proceedings. This classification has not been easy: The term “risk” is a construct of a multi-disciplinary and multi-methodology nature, since it supposes different facets of risk analysis. In the majority of the works presented, therefore, the topics (flood, climate, fire, etc.) and the processes (assessment, perception, communication, etc.) were superimposed on each other and consequently should not be considered as exclusive in any of the cases. The area containing most works was entitled “Flood Risk/Geodynamics”, since the subject most frequently dealt with was flood risk assessment, although this category also included the analysis of the geodynamic processes implied in seismic or landslide risks. This was followed by the categories “Forest Fire Risks”, “Risk Communication” and “Climate/Environment”, each of which contained six works. The first of these analysed one of the risks that poses a systematic threat to the whole of the Iberian Peninsula each year. The third most

predominant category was denominated as “Law & Economics”, which contained five works focused to a greater extent on the social impact of risk. Finally, the category of “Civil Engineering Risk Management” contained three works, which discussed risk analysis in the building sector and nuclear power plants.

All the works were presented in a poster format, signifying that, in addition to the abstracts, we also include the corresponding posters. This will allow a more graphic and exhaustive synthesis of the work presented, which is additionally favoured by its digital format. It is also necessary to highlight that during the poster session the participants were asked to vote a poster to be awarded with a special prize. This vote resulted in a tie and the two award-winning posters were “*Observing emotional states to evaluate psychosocial risk in construction environments*” by Antonio José Carpio-de-los-Pinos; María de las Nieves González-García and Carmen Carpio-de-los-Pinos; and “*Forest fires as a new form of “terrorism”? Criminal responses to a non-existent problem*” by Beatriz López-Lorca; José María Martínez-Navarro; Francisco Javier de-León-Villalba and Susana Beatriz Díaz-Ruíz.

All the works presented herein are preceded by a summary of all the conferences and workshops in which the authors who wished to participate in this publication have participated. We are grateful to all of them for their contributions.

We should not conclude this introduction to the Chapter without mentioning how grateful we are to the sponsors who have made the development of this first SRA-E-I conference possible. We should first like to thank the Society for Risk Analysis Europe, which financed practically the entire event, and its president, Seda Kundak, who honoured us with her presence. Thanks also to the Facultad de Humanidades de Toledo and the Centro Cultural San Clemente, who allowed us to use their magnificent facilities, and to the “Drainage” research project, financed by the Spanish Ministry of Economy, Industry and Competitiveness, who provided financing, and particularly for the participation of some of the members of its research team. Finally, we are very grateful to the Campus Científico y Tecnológico de la Energía y el Medioambiente (CYTEMA) of the University of Castilla-La Mancha, which contributed by publicizing the event. We trust that this conference will

suppose the beginning of a future fruitful collaboration between researchers and managers in the field of risk assessment in the Iberian sphere.

See you all in the next SRA-E Iberian Chapter meeting in Coimbra, Portugal, in 2019!

María Amérigo

Juan A. García

Rui Gaspar

Sílvia Luís

## COMITEES

### COORDINATION AND SCIENTIFIC COMMITTEE: SRA-E-I BOARD

**María Amérigo.** Universidad de Castilla-La Mancha (UCLM). Spain.

**Andrés Díez-Herrero.** Instituto Geológico y Minero de España (IGME). Spain.

**Rui Gaspar.** Universidade do Algarve & Universidade Católica Portuguesa. Portugal.

**Sílvia Luís.** ISCTE-Instituto Universitário de Lisboa. Portugal.

**Lucía Poggio.** Universidad Europea de Madrid. Spain.

### ORGANIZING COMMITTEE

**María Amérigo.** Facultad de Humanidades de Toledo. UCLM.

**Jose M. Bodoque.** Facultad de Ciencias Ambientales y Bioquímica. UCLM.

**Enrique García-Gómez.** Centro Cultural San Clemente. Diputación Provincial de Toledo.

**Juan A. García.** Facultad de Ciencias Sociales de Talavera de la Reina. UCLM.

**Fernando Talayero.** Facultad de Ciencias Sociales de Talavera de la Reina UCLM.

## PROGRAMME

### Thursday September 6, 2018

- 09.00-10.00 **Registration** (Facultad de Humanidades: Hall. Plaza de Padilla, 4)
- 10.00-10.10 **Welcome** (Centro Cultural San Clemente: Assembly hall. Plaza de Padilla, 2 (Entry by Plaza de Santa Eulalia))  
María Amérigo, Universidad de Castilla-La Mancha. Spain  
Rui Gaspar, Universidade do Algarve. Portugal
- 10.10-10.30 **Announcement SRA-E-Iberian Chapter** (Centro Cultural Clemente: Assembly hall)  
Sílvia Luís, ISCTE-Instituto Universitário de Lisboa. Portugal  
Seda Kundak, President of SRA-Europe. Istanbul Technical University. Turkey.
- 10.30-11.00 **Coffee break**
- 11.00-12.00 **Keynote 1:** *The EuroGeoSurveys strategy for landslide risk reduction*  
Gerardo Herrera, Instituto Geológico y Minero de España. Spain  
Centro Cultural San Clemente: Assembly hall.
- 12.00-13.30 **Poster platform sessions**  
Facultad de Humanidades: Hall
- 13.30-14.30 **Lunch**  
Facultad de Humanidades: Cafeteria buffet
- 14.30-18.00 **Parallel workshops**  
*1. ¿Por qué lo llaman riesgo cuando sólo analizan peligrosidad?*  
Andrés Díez-Herrero. Instituto Geológico y Minero de España. Spain

Facultad de Humanidades: Lecture room (Aula 03)

*2. The discursive politics of climate change: risk, power and opportunities for democratization*

Anabela Carvalho. Universidade do Minho. Portugal.

Facultad de Humanidades: Lecture room (Aula 01)

*3. Riesgos intrínsecos, no contemplados durante el proceso constructivo, desde una perspectiva de género*

Antonio Ros-Serrano/Mario Sanz-López. Universidad Politécnica de Madrid/Universidad Europea de Madrid. España

Centro Cultural San Clemente: Lecture room (Aula)

18.00-20.00 **Tourist visit to Toledo City Centre**

Departure from Facultad de Humanidades

20.00 **Dinner**

Restaurant "La Clandestina de Las Tendillas". Calle Tendillas 3, 45002 Toledo

## Friday September 7, 2018

09.30-10.30 **Keynote 2:** *Forest fires, communities and the role of lived experiences*

José Manuel Mendes, Universidade de Coimbra. Portugal

Centro Cultural San Clemente: Assembly hall.

10.30-11.00 **Closing & best poster award** (Centro Cultural Clemente: Assembly hall)

11.00-11.30 **Coffee break**

11.30-12.30 **SRA-E-Iberian Chapter General Assembly + Meeting 2019**  
(Centro Cultural Clemente: Assembly hall)

## PLENARY LECTURES

### THE EUROGEOSURVEYS STRATEGY FOR LANDSLIDE RISK REDUCTION

Gerardo Herrera<sup>1,2\*</sup>; Rosa María Mateos<sup>1,2</sup>; Juan Carlos García-López-Davalillo<sup>1,2</sup>; Eleftheria Poyiadji<sup>1,3</sup>; EOEG<sup>4</sup>

<sup>1</sup>EuroGeoSurveys, The Geological Surveys of Europe, Belgium

<sup>2</sup>Instituto Geológico y Minero de España, Spain

<sup>3</sup>Institute of Geology and Mineral Exploration, Greece

<sup>4</sup>Earth Observation and Geohazards Expert Group (EOEG)\*: Juan Carlos García-López-Davalillo; Juan López-Vinielles; Gilles Grandjean; Raluca Maftei; Tatiana-Constantina Filipciuc; Mateja Jemec Auflič; Jernej Jež; Laszlo Podolszki; Alessandro Trigila; Carla Iadanza; Hugo Raetzo; Arben Kociu; Maria Przyłucka; Marcin Kułak; Michael Sheehy; Xavier M. Pellicer; Charise McKeown; Graham Ryan; Veronika Kopackova; Michaela Frei; Dirk Kuhn; Reginald L. Hermanns; Kleopas Hadjicharalambous; Niki Koulermou; Colby A. Smith; Mats Engdahl; Pere Buxó Pagespetit; Marta Gonzalez; Claire Dashwood; Helen Reeves; Francesca Cigna; Pavel Liščák; Peter Pauditš; Vidas Mikulėnas; Vedad Demir; Margus Raha; Lídia Quental; Cvjetko Sandić; Balazs Fusi; Odd Andre Jensen; Jan Walstra; Philippe Steeghs; Aleksandra Gulan; Hjördis Löfroth; Boris Malyuk; being researchers and technicians from 33 Geological Surveys in Europe.

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#### Abstract

The Geological Surveys of Europe present the results of an ongoing work started in 2014 to coordinate actions with the aim of reducing landslide risk in Europe. In order to do so, the following milestones have been reached: (1) a review of the existing landslide databases in the Geological Surveys of Europe; (2) the creation of a database on damaging landslides in Europe; (3) an evaluation of the level of integration of landslide assessment maps into land use and urban planning. The results reveal heterogeneous policies across national borders, and a lack of knowledge about the actual extent of the social and economic impacts of landslides in many of the countries. This overview stresses the need for a common legislative framework for landslide hazards to support those countries that do not take landslide hazards into consideration in land-use and urban planning, along with those countries with deficiencies in their existing legislations.

## Introduction

Landslides are one of the most widespread geohazards in Europe, but are routinely underestimated and poorly evaluated, despite being responsible for significant social and economic impacts. Moreover, although landslide inventories, owned by a variety of institutions, exist in many European countries, they are not harmonized, integrated or simply fully accessible (Herrera et al., 2017). The lack of a comprehensive landslide inventory at the European level reduces the visibility of landslide events and their impact. In the last decades, urban sprawl has greatly increased the exposure to landslides. Considering the expected increase of land uptake for urban development and the more frequent and intense rainfall events owing to climate change, more landslides will occur, thus increasing the exposure to landslide risk in these areas (Gariano & Guzzetti, 2016). Framed in the Disaster Risk Reduction declaration produced by the United Nations (2015), the Geological Surveys of Europe, a not-for-profit organization representing 37 National Geological Surveys and some regional Surveys in Europe, started to coordinate landslide hazard activities in 2014. In order to do so, the following objectives were defined: (1) a review of the existing landslide databases in the Geological Surveys of Europe; (2) the creation of a database on damaging landslides in Europe; (3) the evaluation of the level of integration of landslide assessment maps into land use and urban planning. This work presents a summary of the progress made by the Geological Surveys of Europe as regards landslide risk reduction.

## Method

The Earth Observation and Geohazards Expert Group (EOEG) has, within the framework of European Geological Surveys (EGS), distributed two questionnaires to 28 Geological Surveys in order to gather information concerning: (1) the landslide database of each Geological Survey, and (2) the integration of landslide assessment maps into land use and urban planning. The EOEG has additionally compiled two databases in order to create: (1) a landslide density map of Europe; and (2) a European damaging landslide database.

The first questionnaire regarding landslide databases sought numeric information on the number of landslides, their types and information about their size, activity,

history, trigger or impact. The second questionnaire sought information related to the impact of landslides, the legislation, and landslide awareness and preparedness. The first database provides information on the number of landslide events per square kilometer in 17 European countries. The second provides information on the location, the mapping accuracy, the type, the trigger, the impact and the source of information of damaging landslides that had an impact on 19 European countries between 2015 and 2017.

## Results

### *Landslide density map of the Geological Surveys of Europe*

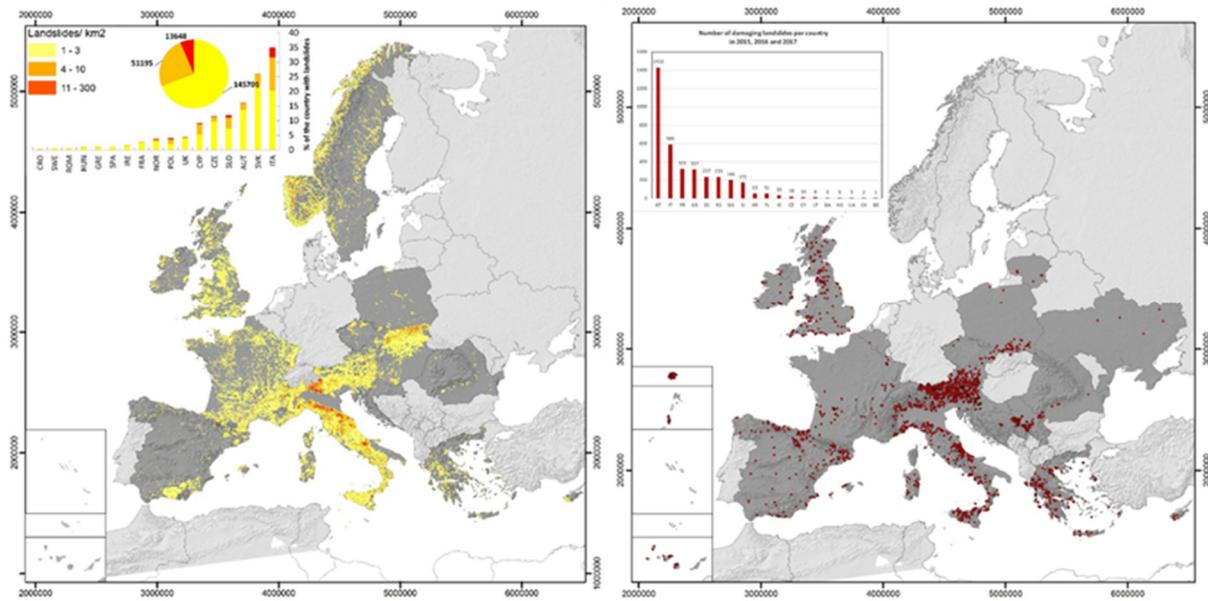
Herrera et al. (2018) reviewed the landslide databases (LDBs) of 29 Geological Surveys in Europe from 24 countries that account for 849,543 landslides (Fig. 1a), of which 36% are slides, 10 % are falls, 20% are flows, 11% are complex landslides and 24% either remain unclassified or correspond to another typology. Most of them are located in Italy (62%) and 10 other countries. These databases enabled us to create a landslide density map of the Geological Surveys (LANDEN map) for 17 countries in Europe, thus providing the first picture of the spatial distribution of landslides recorded by Geological Surveys on 3.65 million km<sup>2</sup> of the surface of Europe. This map reveals that approximately 6% are landslide prone areas, i.e., 1 km by 1 km cells in which one or more landslide has been recorded. The comparison of the LANDEN map with ELSUSv1 (the Landslide Susceptibility map of Europe) provides an indirect evaluation of the completeness of the landslide databases. As a result, the estimated completeness of the landslide databases obtained from the Geological Surveys is over 50% for Poland, Italy and Slovakia; in the case of another five countries, it varies from 10 to 30%, whereas for the remaining countries it is between 6 and 1%.

### *Damaging landslide database of Europe*

Herrera et al. (2017) collected information from 22 Geological Surveys on landslide damaging events occurring in 20 European countries between 2015 and 2017. The damaging landslide database includes 4,598 events from 19 countries (Fig. 1b). A total of eight countries, including Austria, Italy, France, Greece, Spain, Serbia, the UK and Slovenia, account for more than 90% of the total records. The most

common landslide type is the slide with 50% of the total, followed by falls (19%) and 9% for flows. In Italy, 509 landslides (14%) were not classified. This occurred because at the time of the survey, the data on landslide damaging events provided by the Italian Geological Survey (ISPRA) was obtained from the media, online news and reports. The type of movement and the cause of the event were, therefore, not available at that moment, it being the task of the regional authorities to complete and provide ISPRA in order to update the Italian Landslide Inventory every three years. With regard to the triggering factors, precipitation accounts for 69% of the records and 1% correspond to earthquakes. Recorded damaging landslides have mainly affected the road and rail networks (39%) and urban areas (15%). There were 37 fatalities (most of them owing to rock falls), and 143 people were injured. The most affected countries are Austria and Italy, with 27 fatalities and 105 injured people.

Landslides in land use and urban planning: Mateos et al. (under review) collected information from 28 Geological Surveys to identify the strengths and weaknesses in the legislations currently in force. Although the GSs generate specific data and maps focused on landslides, this information is rarely used by urban/land use planners. Moreover, 43% of the countries do not include landslide assessment in their legislation for land-use and urban planning practices. Furthermore, there is a wide range of laws across Europe and a large heterogeneity of mapping methods, scales and procedures. Residents and public managers in landslide-prone areas are aware of the risk, but usually only after a significant event. In general, policymakers underestimate the potential effects of landslides, since they are usually associated with floods and earthquakes. Half of the participant Geological Surveys have an outreach program to strengthen geohazard awareness, while only 35% of the participant countries have national prevention plans for landslides. The remaining countries only take action after a significant event.



**Fig. 1a.** Landslide density map derived from the landslide databases from 17 Geological Surveys in Europe (Herrera et al. 2018). **Fig. 1b.** Damaging landslide inventory in 2015 including 1323 events in 19 countries (Herrera et al., 2017).

## Conclusion

The ongoing analysis carried out by the Geological Surveys of Europe reveals heterogeneous policies across national borders, and a lack of knowledge about the actual extent of the social and economic impacts of landslides in many countries. This overview stresses the need for a common legislative framework for landslide hazard to support those countries (43%) that do not assess landslides as regards land-use and urban planning, along with those countries with deficiencies in their existing legislation. A European Landslide Directive should integrate at least the followings aspects:

- Landslide databases: these should be public, accessible, interoperable and periodically updated, including a minimum set of elements describing each landslide record that is compliant with INSPIRE standards.
- Landslide assessment maps: it is necessary to define the minimum requirements for the production of landslide susceptibility, hazard and risk maps for each type of landslide.

- Urban and land use plans: a common procedure for the supervision and final acceptance of urban and land use plans should be established.

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## FOREST FIRES, COMMUNITIES AND THE ROLE OF LIVED EXPERIENCES

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The forest fires that occurred in 2017 were one of the worst disasters that have ever affected Portugal, with more than 275,845 hectares burnt from a yearly total of 424,000 hectares (ICNF, 2017), 116 fatalities and hundreds of people injured. Communities and landscapes were devastated, and houses, livelihoods and businesses destroyed.

Oliver-Smith (1996, p. 309) has shown, from a sociocultural perspective, that disasters of this magnitude impact on place identity and create a sense of loss, mainly when there is a loss of formal public places, of informal gathering places, and of other physical features symbolic of community identity. The impact of forest fires on landscapes identities has been well documented (Butler, Sarlöv-Herlin, Knez, Ångman, Sang, & Åkerskog, 2018), and a multilevel approach to landscape fires as social disasters has been proposed (Gill, 2005).

The literature related to forest fires in Portugal is vast. More recent contributions have highlighted the social context of the areas affected (Oliveira, Zêzere, Queiróis, & Pereira, 2017), the reactive nature of public policies and the legislation produced (Mourão & Martinho, 2016), fire regimes and management (Mateus & Fernandes, 2014) and forest fires preparedness and community engagement (Paton & Tedim, 2013). Fernandes Guiomar, Mateus and Oliveira (2017) proposed a more complex institutional and legislative analysis related to forest fires in Portugal.

One of the most integrative and complex models employed to analyse forest fires from a territorial perspective, in both Portugal and the European Union, is proposed in the notion of the Fire Smart Territory (Tedim, Leone, & Xanthopoulos, 2016). Although the authors clearly stress that fire is a social process, the proposed model is still contained within the hazards/disaster framework, thus limiting opportunities

to develop a greater understanding of the intersections between the systems at work, the actual logic and practices of communities and of individuals and the role of the main stakeholders (Brenkert-Smith, Meldrum, Champ, & Barth, 2017).

Preliminary fieldwork carried out by the Risk Observatory (OSIRIS), Centre for Social Studies, showed that although affected individuals, families and communities were used to dealing with forest fires, their previous experience was not useful when attempting to deal with the 2017 fires in Portugal. The main factors behind this lack of preparation were:

- The direction of the wind;
- An absence of fire fighters in the field (June 2017);
- A weekend during which many outsiders were travelling on holidays (June 2017);
- The presence in the affected places of all family members, and the presence or otherwise of children as a crucial aspect as regards understanding the way in which people behaved;
- No existing evacuation routines;
- No warnings from the authorities;
- Urban and urban-rural interface fires (October 2017);
- Out of season extreme forest fires (in 2017, Charlie Phase, with the existence of maximum resources, and an alert was activated from 1 July to 30 September).

### **Two catastrophes, two different social autopsies**

In order to present the common and different factors that were present in the June and October 2017 forest fires in Portugal, I rely on the two official reports by the Independent Technical Commission (Comissão Técnica Independente et al., 2018; Comissão Técnica Independente, 2017). It is clear that Portugal's 2017 forest fires represented two catastrophes with different social autopsies (Klinenberg, 2002). The common factors were:

- The majority of the victims, either individually or in groups, were fleeing from the forest fires when they got trapped and died;
- All the victims lived or were circulating in the interior zones of the Central Region of Portugal (there were no victims on the littoral);
- The victims had no support from the authorities as regards early warnings, evacuation or avoiding forest fires (institutional seclusion, as regards both risk communication and individual, group and community safety);
- Both events were officially defined as megafires, although it must be emphasized that this definition should not be used to justify what occurred as regards the number of victims that were produced.
- The differences between the two catastrophes are as follows:
- In June, the majority of the victims died in groups, some in families (88%), as opposed to 35% in October;
- Only in June did children and adolescents die (14% of the total). June = mean age of the victims = 49.2; October = mean age = 62.9;
- In June, there was an even number of victims as regards gender. In October, the majority of the victims were male;
- In October, 25% of the victims were inside their houses, as opposed to 6% in June.
- And the biggest difference is that in October, 85% of the victims lived where they died, 11% were regular visitors and 4% were occasional visitors. In June, 50% of the victims lived where they died, 12% were regular visitors and 38% were occasional visitors;
- In June, the victims were concentrated in an area of 20 km<sup>2</sup>, while in October they were dispersed over an area of 4000 km<sup>2</sup>.

The main conclusion that can be drawn is that the victims from the 2017 forest fires in Portugal were not the result of social isolation, that is, the non-intentional withdrawal from social interaction networks (confidants, close friends and access to social support). The best indicator of social isolation is a lonely death (related

to heat waves and cold waves), and in the June and October 2017 forest fires in Portugal, the number of people who died alone was low and as the result of illness, reduced mobility and physical or mental disability.

The main reason why the 2017 forest fires resulted in so many victims was the material, symbolic and political distance to decision centres and to those responsible for citizens' safety. This was a consequence of what we have, in our studies with disaster victims' associations, denominated as invisible citizenship. The concept of invisible citizenship (Mendes & Araújo, 2016, pp. 12-13) is related to all those things that, although biopolitically integrated into official statistics and population policies, do not count, are not heard, are of no interest for the State project or do not acquire media relevance. Invisible citizenship affects all those who are victims of indifference. This results in the absence of dignified belonging and the "right to have rights" (Hannah Arendt).

However, the response from civil society was very relevant as regards attempting to provide this invisible citizenship with assistance. There was an unprecedented wave of solidarity by citizens, corporations and other institutions that raised more than 18 million euros in donations (although the support process for victims was dispersed among various entities, resulting in accountability issues). Moreover, thousands of spontaneous volunteers converged on the affected regions, alongside structured volunteer networks set up by corporations, non-profit organizations and NGOs (disorganisation and accountability issues).

But, most importantly, there was the immediate creation of victims' associations in a society with a low civic mobilization after catastrophes or extreme events, namely the Association of the Pedrógão Grande Fire Victims, the Association of Victims of the Biggest Fire in Portugal and the Associative Movement for the Support of the Midões Fire Victims.

These victims' associations foster citizenship rights and "the right to have rights", along with the production of collective memories and personal identities that will allow the commemoration of the traumatic event and the creation of "affective communities" that are visible in the public arena (Heinich, 2011). They additionally strive for memorialisation processes and narrative building in the relation between

the personal experience of the forest fires and the ongoing formation of a social, collective memory (Das, 2007).

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## WORKSHOPS: PARALLEL SESSIONS

### WHY IS IT CALLED RISK WHEN THEY ONLY ANALYSE HAZARD?

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#### **Introduction**

Despite the fact that there has, for decades, been an agreement on the terminology associated with risks and their analysis, even at the international level (Aven, 2015; UNISDR, 2009), an inadequate use is still made of concepts such as risk and hazard. The causes of this incorrect use may be the scientific-technical community's ignorance of the fundamentals of risk analysis, but it may also be the intentional misuse of these terms in order to achieve propaganda interests with an economic purpose.

It is still, therefore, common to find studies with titles that include the word "risk", in which in reality only aspects of the hazard are analysed, or even only of the susceptibility to the unleashing of phenomena. They do not analyse either exposure or vulnerability, and often not even the severity of the phenomenon, its space-time dimension or the probability of occurrence.

The objective of this workshop is to combat this terminological confusion and homogenize the use of terms and procedures by exploring not only the terms, but also their practical application, in greater depth in the search for data sources and the presentation of results. All this will be done using examples obtained principally from the countries in the Iberian Peninsula (Spain, Portugal, Andorra and United Kingdom-Gibraltar) and focusing on flood risks as paradigms of this problem.

#### **Creating true flood risk analyses and maps**

The creation of true flood risk maps begins with socioeconomic analyses and assessments of risk, which is accurately approached on the parcel or building scale (for example, see methodology in De Mora-Jiménez & Díez-Herrero, 2008, or Garrote, Alvarenga, & Díez-Herrero, 2016) in order to later interpolate the values

until continuous distributions (raster), or points, isolines and polygons maps, are obtained from them.

As occurs with hazards, a specific flood risk zone is created by separating the types of risk into social risks on one side and economic risk on the other. This is done because legally different treatments are required owing to the fact that the protection of human life is, according to the Spanish Constitution of 1978, more prescriptive for public administrations.

With regard to the social risk, class boundaries are established with criteria used by different international organizations for the categorization of an event as a disaster or a catastrophe (10 fatalities) and based on media impacts (100 affected):

- Low social risk zone (yellow): less than or equal to 1 fatality, or less than 10 injured or affected (displaced) annually.
- Medium social risk zone (orange): between 2 and 10 fatalities, or between 11 and 100 injured or affected (displaced), annually.
- High social risk zone (red): greater than or equal to 11 fatalities, or more than 101 injured or affected (displaced) annually.
- In the case of economic risk, classes that can be established should not be absolute, in other words, from the total number of losses expected, but relative, as long as this number assumes a percentage that is more or less raised for insured property or the total of assets of the community. This proposal links risk maps to the concept of resilience, established at the Kobe, Sendai and Hyogo conferences. The classes would be:
  - Low economic risk zone (yellow): annual damages predicted between 50 and 100% of insured assets and services.
  - Medium economic risk zone (orange): annual damages predicted between 50 and 75% of total assets and services.
  - High economic risk zone (red): annual damages predicted between 75 and 100% of total assets and services (complete destruction).

In fact, a much more interesting analysis with its consequent map would be not only social and economic risk maps, but also the difference in both cases between the preoperational situation (before the scheduled urban project or action) and the post-operational (after the execution of the urban project or action). This would, therefore, make it possible to evaluate the socioeconomic impact by using this action on the risk status, and to study its acceptability with a cost-benefit analysis. This proposal links to the final risk maps developed in France using the “flood risk method”, in which the level of exposure and vulnerability are compared, parcel by parcel, and with or without preventive actions, so as to extrapolate conclusions as regards prioritizing measures.

Of particular interest when planning for future land use are Specific Risk Maps, which reflect the merging of hazard and vulnerability in areas in which there is currently no risk exposure. These make it possible to redirect future cases of risk exposure to persons and properties to areas with less specific risk in view of achieving optimal prevention.

### **International flood hazard mapping experience references**

Internationally, there are many mapping plan and project experiences, not so much in the way of flood risk maps but rather as flood likelihood and flood hazard maps. Although not the first of their kind, the maps associated with the National Flood Insurance Program (NFIP) in the US and the Flood Prevention Plan (PPRi) in France have always been considered paradigms and models for many others. Also noteworthy are the central European experiences related to large trans-boundary rivers, such as the ELLA project concerning the Elba and Labe river basins (<http://www.ella-interreg.org>), Germany’s mapping of the Rhine basin (<http://www.iksr.org>), the mapping of the Danube basin (<http://www.icpdr.org>), and the mapping carried out in Mexico (National Civil Protection System).

Among the many technical committees and groups of experts brought into existence as part of European Union’s efforts to monitor and introduce the Water Framework Directive, and now the EU Floods Directive, there is the EXCIMAP (European Exchange Circle on Flood Mapping), which has generated a considerable volume of discussion reports, a handbook on good practices for flood mapping and

an atlas of examples of flood maps from 19 European countries, the United States and Japan.

**Flood Mapping experience references in Spain**

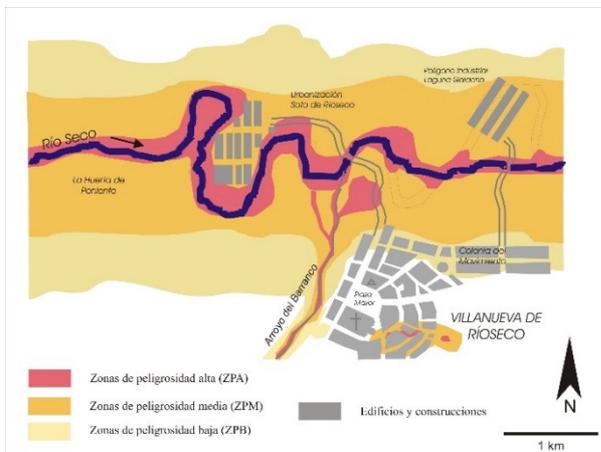
As is the case in the other European countries, flood hazard maps are preponderant and more frequently used in Spain, with different scales, objectives and elements represented. A few examples are standard flood hazard maps for different flows and associated return periods, iso-depth maps or digital models of maximum depths attained during flooding, and iso-velocity maps or digital models of flow velocities (see Figs. 1, 2, 3 and 4; Díez-Herrero, Laín-Huerta, & Llorente-Isidro, 2009).



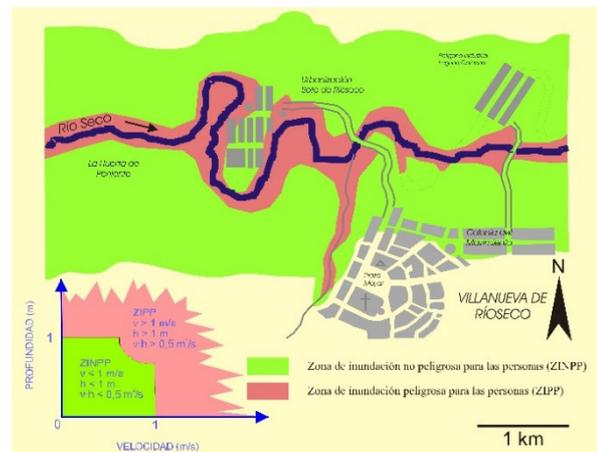
**Fig.1.** Topographic map of the municipality.



**Fig.2.** Floodable area map for discharges corresponding to different return periods.



**Fig. 3.** Qualitative flood hazard map.



**Fig. 4.** Flood hazard map for residents.

The Spanish Ministry of the Environment has, since 2007, managed the National Flooded Areas Mapping System (SNCZI), which compiles flood-related projects already carried out and those on the horizon, and which introduces a visor designed to facilitate their consultation and management, even via the Internet. The cartography database includes both flood hazard maps (flooded areas and depth for three return periods) and an approach to flood risk maps (type of land-uses and population under risk).

Risk mapping, in the strict sense of the term (considering exposure -Fig. 5-; vulnerability -Fig. 6-; and resulting from economic loss and personal injury -Figs. 7 and 8-), has not been widely used in Spain, it being limited to pilot experiences in specific locations (De Mora-Jiménez & Díez-Herrero, 2008; Ballesteros-Cánovas, Sanchez-Silva, Bodoque, & Díez-Herrero, 2013; Garrote et al., 2016) and its application to land-use planning studies (PATRICOVA), basin management and civil protection (Díez-Herrero, Garrote-Revilla, Baílo-Calvo, Laín-Huerta, Mancebo, & Pérez-Cerdán, 2008). See compilation in Olcina-Cantos and Díez-Herrero (2017).



Fig. 5. Map of exposed elements to flooding.



Fig. 6. Vulnerability map to flooding.



**Fig. 7.** Social and economic risk map, using annual risk isolines.



**Fig. 8.** Economic flood risk map for a scenario of the discharge of 500 years return period.

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## THE DISCURSIVE POLITICS OF CLIMATE CHANGE: RISK, POWER AND OPPORTUNITIES FOR DEMOCRATIZATION

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The speed and scale of human impact on the planet have, in the last few decades, reached unprecedented levels. As the composition of the atmosphere itself is rapidly modified, climate change has become the most severe threat to both biophysical systems and human security, thus demanding a fundamental rethinking of its root causes. Despite much expectation regarding the Paris Accord and other developments, most socioeconomic practices and structures remain unchanged. In this short paper I will argue that, despite much focus on (inter)governmental policies in media(ted) discourses, climate change has been depoliticized in various ways, and that a radically democratic approach is needed to address it.

Anthropogenic climate change is riddled with inequities (across countries, social groups/classes, generations, etc.) and is tied to multiple matters of power at the levels of both causation and (potential) responses. The following are among such key issues: the differential historical responsibility for the generation of greenhouse gases (GHGs); disparities in per capita ratios of GHG emissions; the various geographies of production and consumption of goods (and their associated GHGs); the highly differential vulnerability of countries and social groups to the impacts of climate change; its numerous and entangled spatial and temporal scales; and, more generally, the incomparable capacities of different states, communities and groups to shape debates, agendas and decision-making processes on climate change.

In most forms of action that are in place to mitigate climate change or prepare for its impacts, power systems and relations remain unchallenged. Most often, they are not even acknowledged; in other words, they are obscured and naturalized. It is obviously necessary to point out that the United Nations Framework Convention on Climate Change refers to countries' 'common but differentiated responsibilities'

and that the governments of 'developing' countries have struggled within the respective Conferences of the Parties to get some of those unbalances redressed. However, the institutional constructs that have emerged from those processes, such as the Clean Development Mechanism and the Green Climate Fund, have led to various forms of bias and injustice, either at the inter- or intra-state levels.

What, then, does 'risk analysis' mean for climate change politics? Whereas a risk lens 'implies control, manageability and accountability' (Pidgeon & Butler, 2009, p. 676), there are numerous – and often incommensurable – values and perspectives at play as regards climate-related risks: for whom, assessed by whom, for what, when...

The meanings of climate change (along with those of the social and biophysical realities it is embedded in) are constituted in and through discursive processes that involve various types of texts (be they political speeches, activist communication, news and other media (ted) texts, etc.). The discursive politics of climate change also encompass the production and consumption (or 'social circulation') of texts and their interplay with multilevel contexts – other texts, social structures, culture, etc. The discourse(s) that is (are) dominant at a given time are institutionalized (i.e., translated into legal norms, policies, entities, etc.) and certain power relations are consequently constructed or reinforced. A given social order is, therefore, constantly reproduced or transformed in discursive processes. Within this social order, some aspects may be open to debate, while others are not.

In the words of Edkins (1999, p. 2), the political, as opposed to politics, 'has to do with the establishment of that very social order which sets out a particular, historically specific account of what counts as politics and defines other areas of social life as not politics'. Maesele and Raeijmaekers (2017, p. 4) maintain that depoliticization 'concerns not only the concealment of those particular politico-ideological values, perspectives and choices that underlie a social order and shape its politics, but also – and more importantly – the misrecognition of the fact that any social order is always the provisional product and expression of a particular configuration of power relations.' Depoliticization is about concealing 'the

contingency of social reality' and obscuring 'discursive struggle by silencing alternative views'.

Several scholars have argued that climate change has been depoliticized over the last few decades. Drawing on their analyses, I shall briefly discuss some of the discursive processes (and their corresponding institutional and material practices) that have contributed to this depoliticization, namely technocratization, carbonification and commodification.

Technocratization is a highly sedimented logic of global climate governance (Methmann, Rothe, & Stephan, 2013). As noted by Rothe (2011, p. 341), over time, there has been a progression towards a 'post-political condition in climate politics where policies are chosen by economic and scientific technocrats rather than by a democratic decision-making process'. In the words of Methmann et al. (2013, p. 250), 'scientists and 'carbon professionals' (...) make climate change countable, visible, understandable and hence malleable (...). And they are legitimated as inventors of solutions to the problem – solutions, which again, are merely technical ones.' In the process, other voices and other views are excluded: 'The discourse on climate politics so far is an expert and elitist discourse in which peoples, societies, citizens, workers, voters and their interests, views and voices are very much neglected.' (Beck, 2010, pp. 254-5).

Carbonification refers to discursive processes that reduce climate change to a problem of excessive CO<sub>2</sub>. Tons of the equivalent of carbon dioxide are promoted as a commodity and the unit of measurement against which technologies and individual actions are evaluated (Mert, 2013). One ton of CO<sub>2</sub> emitted by a coal-fired power station in the USA becomes equivalent to and interchangeable with a ton of CO<sub>2</sub> sank through planting trees in, say, a deprived local community in Brazil. According to Swyngedouw (2018, p. 137), 'while the socio- and political-ecological framings of these two processes are radically different and incommensurable, monetizing CO<sub>2</sub> renders them fully interchangeable and commensurable.' Using this logic, what have been termed as 'luxury emissions' of the rich and 'survival emissions' of the poor become equivalent. With carbonification, all the problematic structures and practices at the root of climate

change are reframed in terms of one substance, and all social divides and tensions associated with emissions-producing practices are suppressed. Carbonification also justifies responding to climate change with mere displacing problems. Nuclear power, for instance, becomes accepted within this logic of analysis of climate change while creating a series of other concerns.

Through commodification, CO<sub>2</sub> becomes amenable to be managed via 'the market'. Promoted by many liberal economists as the best way in which to deal with climate change, via mechanisms such as emissions trading, commodification advances analyses of climate change in terms of economic risks and opportunities for private investment. Via public finance mechanisms, the state features primarily in the role of the facilitator of capital accumulation rather than the guarantor of security and the equal rights of all citizens. Paterson (2014) argues that commodification has numerous consequences that should be resisted, such as the creation of different forms of carbon colonialism and the development of mechanisms that obscure the failure of markets in dealing adequately with climate change.

Functioning as an overarching hegemonic discourse, 'sustainable development' has apparently reconciled all aspirations to economic development, social justice and environmental protection and has arguably had a significant depoliticizing effect: 'the sustainability argument has evacuated the politics of the possible, the radical contestation of alternative future socio-environmental possibilities and socio-natural arrangements, and silences the radical antagonisms and conflicts that are constitutive of our socio-natural orders by externalizing conflict.' (Swyngedouw, 2010, p. 228).

Where do we go from here? Are there possibilities for the (re)politicization of climate change? What would that entail? While critical, answers to these questions cannot be explored in detail in the limited scope of this paper. I will simply maintain that a transformation towards socially just and environmentally balanced futures requires a radically democratic debate and decision-making process. This means looking into – and making visible – the roots of the social and political systems that have produced climate change, bringing alternatives to light and cultivating inclusive debates and political processes. The Climate Justice movement and the

Energy Democracy movement are examples of social developments that offer opportunities for the democratization of climate change. They both bring power and difference to the fore.

And with respect to the concept of 'risk, in the words of Pellizzoni (2014, p. 206), 'the destiny of risk as an instrument of critique, that is, as a means for opening up spaces of discussion, contestation and change, is (...) unclear.' (...) The critical leverage of risk (...) rests on its connection with political agency, which means using the concept to reorient our attention to problems of choice and distribution against issues of safety and efficacy; to questions of 'whether or not' or 'for the benefit of whom', against questions of 'how'.'

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## POSTER PLATFORM SESSIONS ABSTRACTS

### FLOOD RISK/GEODYNAMICS

**27490**

#### **A FLOOD RISK ASSESSMENT MODEL BASED ON A MULTI-HAZARD APPROACH FOR SEMIARID ISLANDS AND COASTAL TOURISTIC REGIONS**

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In arid and semi-arid climates, such as those of the Mediterranean, islands and coastal areas that are highly oriented towards tourism can be affected by a series of natural hazards, notably those of a hydro-meteorological nature. In these areas, in which long periods of drought can be interrupted by moments of intense, highly concentrated rain, irregular rainfall increases the level of vulnerability as regards the context of risk. Furthermore, several climate change scenarios suggest a permanent rise in sea levels or changes in the frequency and intensity of rainfall.

This paper puts forward the possibility of improving disaster risk management and the resilience of these regions. This is done by developing a methodology with a suitable level of detail, which is able to combine several sub-models within a comprehensive risk assessment model. The objective of the first sub-model is to identify the normal pattern of marine storms and the conditions surrounding them in order to determine their daily and hourly occurrence. The second sub-model will assess the probability of flooding during a given timeframe, for which the relief and vegetation cover of the different areas being studied will also be analysed. The third sub-model will simulate a particular climate change scenario based on the permanent rise in sea levels. Finally, the last sub-model will allow vulnerability and exposure to be evaluated. This is primarily based on a detailed observation of land

use and is focused on analysing the possible consequences of a series of socio-economic factors. This will be achieved by analysing the damage caused in the recent past by disasters associated with this type of hazard.

The regions chosen as case studies are areas heavily geared towards tourism, and are located along the coasts of the Canary Islands.

**Keywords:** flash flood risk; multi-hazard risk assessment; hazard; climate change; coastal touristic regions

**27773****FLOOD RISK MAPS AND URBAN DESIGN IN TOURIST AREAS: A CASE STUDY OF THE PUERTO RICO-AMADORES RESIDENTIAL AREA (GRAN CANARIA, CANARY ISLANDS, SPAIN)**Francisco José Macías-González<sup>1\*</sup>; Emma Pérez-Chacón-Espino<sup>1</sup>; Pablo Máyer-Suárez<sup>1</sup><sup>1</sup>Universidad de Las Palmas de Gran Canaria, Spain\*E-mail: [francisco.macias@ulpgc.es](mailto:francisco.macias@ulpgc.es)

There are many tourist residential areas on the coast of the Canary Islands which have, owing to their location in the mouth of a valley, suffered from frequent flooding over the past decades. This study aims to understand whether this is the result of increased rainfall intensity or whether it is linked to the design of these residential areas, particularly with regard to infrastructure organisation and maintenance. The objective is, therefore, to compare river flood risk maps, created by the government, with the layout of the areas genuinely affected, in order to draw up a new risk map. This study focuses on the tourist residential area of Puerto Rico-Amadores, located on the island of Gran Canaria.

The methodology employed links the study of rainfall between 1947 and the present day with a historical and spatial analysis of the causes, characteristics and consequences of flooding. This is combined with information regarding the characteristics of the valleys' water conduits, the drainage system and the water treatment system. This information was obtained by studying development projects and questioning local experts. All the aforementioned data was used as input in a GIS to enable a spatial analysis and the creation of a flood risk map. These results are compared with the maps drawn up by different governments and show that the issue of flooding in the area being studied is primarily the result of urban design problems and the inadequate maintenance of infrastructures. These issues should be included on future flood risk maps, which should not be limited to evaluating the existing risk to open spaces, as is the case of some current documents. Instead, these maps should also show the risk to those areas in which buildings have been constructed, particularly regarding underground sections.

That is because these areas often bear the brunt of damage to property and touristic facilities.

**Keywords:** flood risk maps; touristic areas; Canary Islands; risk assessment

27795

## **CARTOGRAPHIC SOURCES FOR FLOOD RISK ANALYSIS - SPANISH AND PORTUGUESE FRAMEWORKS**

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The perception of flood risk by the authorities responsible for flood disaster management and mitigation strategies should be based on an overall evaluation of the procedures employed for hazard assessment, legislation and mapping production. This contribution presents the results obtained after studying the flood maps produced in Spain and Portugal, during which process we evaluated the sources of flood risk mapping and their implications for Civil Protection management.

The methodology used proposes that flood risk mapping be evaluated in two phases, the first of which comprises evaluating the differences in national resources so as to assess the data sources that are available in both countries, the availability of free access to geodata and the spatial and temporal scales of baseline data; complementary spatial information for the modeling of risk analyses is also required, such as population, cadaster, buildings, economic activities, loss values, etc. The second phase consists of evaluating the mapping and data results in each country according to the information available, within the Community legislative framework, by complying with the transposition of 2007/60/EC Directive.

Different flood risk maps have been evaluated as a result of the application of several flood risk assessment methods and data sources used in each country. The resulting flood risk maps are influenced by several factors, including input data, statistical frequency functions used during hydrologic and hydraulic modelling and, in particular, uncertainty in DEM (vertical accuracy and consequently the accuracy of the population, economics and activity input data on the flood risk maps eventually proposed).

The differences observed could cause serious problems as regards hazard management, resulting in different perceptions of the severity of the flooded areas by the authorities of each country. Not only is it necessary to establish a standardized mapping pattern in all the countries in the European Union, but also to represent the management of flood risk in transboundary areas on a smaller scale. It is important to coordinate the preparation of these maps in cross-border partnerships in order to improve the results obtained.

**Keywords:** risk analysis; risk mapping; floods; hydrology modelling

**27794**

## **ESTIMATING THE BEST FIT FLOOD FREQUENCY DISTRIBUTION FUNCTION FOR THE EVALUATION OF UNCERTAINTIES IN FLOOD HAZARD MAPPING**

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The selection of a flood frequency distribution function and its associated parameter estimation procedures is an important step in flood frequency analysis. This is, however, a difficult task owing to problems when selecting the best fit functions from the large number of distribution functions and parameter estimation procedures that are available. The goal of this study is to develop an objective methodology with which to estimate design floods, the flood peak discharge with a return period of  $T$ , in an ungauged urban river catchment in Santo Tirso, Portugal.

This study evaluates the best fit distribution function, using a generalized extreme value, Gumbel and log-Pearson type 3 as representatives to model at-site annual maximum discharge series using rainfall data from three stations near the catchment area.

We evaluated the best distribution by applying several statistical tests, such as homogeneity, randomness, stationarity and trend tests, with a limit of a confidence interval of 99%. Of all the candidate distribution functions, the generalized extreme value distribution best represented the statistical characteristics of the observed data. Comparisons of distribution functions were based upon the maximum likelihood method and the selection of the best distribution using different adhesion tests, such as the Chi square, Kolmogorov-Smirnov and especially the Anderson Darling method, which is suitable for extreme distributions.

The return periods obtained have a large variation according to the distribution used in their estimation. They can fluctuate in low return periods by up to 20%,

and in high return periods by up to 14,5%, which causes great uncertainty in the floodable areas and consequently on the resulting hazard maps. The proposed methodology is very suitable for an analysis of the extremes used in flood hazard mapping, and contributes to the reduction in errors and uncertainties of cartography, thus making it more similar to the reality of natural processes.

Knowledge of the uncertainties and errors in hydrological modelling makes a significant contribution to the improvement of flood hazard management, such as spatial planning and emergency plans.

**Keywords:** hydrology modelling; hazard mapping; floods; uncertainties; flood hazard management

**27902****LESSONS FROM HISTORY: PERCEPTION AND RISK MANAGEMENT IN AN ALLUVIAL URBANIZED FAN IN A SEMI-ARID REGION**

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The analysis of historical events of an extraordinary nature is a fundamental tool with which to not only correctly assess risks, but also understand a local population's process of evolution as regards its perception of and adaptation to certain natural risks. In this respect, alluvial fans represent geomorphological units of great interest owing to their high degree of risk and human occupation, often many times in a century, thus converting them into an object of global study.

This paper presents the case of the town of Callosa de Segura (Alicante), whose urban area occupies more than 80% of an alluvial fan attached to the Sierra de Callosa mountain range. Episodes of debris flow occurred between 1788 and 2018 and the two most catastrophic events occurred in 1793 and 1987. The 1793 episode generated an interesting technical debate on the causes that produced debris flow and led to the adoption of modern measures of urban adaptation to natural risk. In 1987, this perception of risk had disappeared: the city spread to the most dangerous areas, houses once again occupied the channels and the measures implemented at the end of the 18th century disappeared. The study compares both episodes in detail and analyses the population's current situation in terms of both the adaptive measures undertaken (channelling and check dams) and their perception.

**Keywords:** historical data; risk management; alluvial fan; debris flow

**27810****FLOOD RISK ASSESSMENT IN PAJARES DE PEDRAZA (SEGOVIA, CENTRAL SPAIN). EXPERIENCES AND RESULTS OBTAINES AFTER A DECADE OF FLOOD RISK RESEARCH**Julio Garrote-Revilla<sup>1\*</sup>; Andrés Díez-Herrero<sup>2</sup>; Nestor Bernal<sup>1</sup>; Jose M. Bodoque<sup>3</sup><sup>1</sup>Universidad Complutense de Madrid, Spain<sup>2</sup>Instituto Geológico y Minero de España, Spain<sup>3</sup>Universidad de Castilla-La Mancha, Spain\*E-mail: [julioq@ucm.es](mailto:julioq@ucm.es)

The village of Pajares de Pedraza is located in the municipality of Arahuetes, in the central-eastern foothills of the Guadarrama Mountains and occupies the floodplain of the Cega river. The location of this small village, which has barely 50 buildings and fewer than 20 registered inhabitants (although there are more than 250 inhabitants in the summer holiday period) has provoked interferences between past flood events and human activities for centuries. Analyses of flood frequency and flood magnitude have been developed in Pajares de Pedraza for almost a decade, by combining and integrating hydrologic-hydraulic, historic-documentary, botanic-dendrogeomorfological and geomorphological methodologies. This information provides a lot of technical reports and ultra-detailed flood cartographies of hazards, exposition, vulnerability and economic risk, obtained from specifically designed magnitude-damage functions. A cost-benefit analysis of the potential risk mitigation measures of a structural (levees, dredging, flood storage tanks, bridge augmentations, clearing of riparian vegetation, etc.), non-structural and self-protection type is also available.

While carrying out these studies, we were confronted with numerous problems arising from the scarcity and uncertainty of the available data used. These problems were: the availability and quality of peak flow data, and their relationship with the estimation of the flow values associated with different return periods (Tyear); the representativeness of the LiDAR data with respect to the real terrain morphology, especially in urban areas; the development and calibration of bidimensional (2D) hydraulic models, and the sensitivity of the model to the

Manning roughness coefficient; the definition of the elements exposed (at all levels, from house type to furniture and electronic devices) and their economic valuation; the selection of the appropriate magnitude-damage functions (using generic functions or the development of specific detail functions) that would best represent the unique characteristics of the study area, and an economic evaluation of each risk mitigation measure used in the cost-benefit analysis.

However, as a conclusion, by simply carrying out hazard and detailed exposition and vulnerability analyses that incorporate all the different sources of information and methodologies, it is possible to achieve a precise flood risk analysis, which could be applied to land management for risk reduction.

**Keywords:** flood risk assessment; magnitude-damage functions; economic flood risk

27782

## **ASSESSING FLOOD RISK PERCEPTION FOR THE EDUCATION OF RISK ACTIVITIES AT THE VENERO CLARO CHILDREN'S CAMP (CENTRAL SPAIN)**

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The increase in and improvement to flood risk perception is a very effective tool by which to reduce the damage produced by floods, as has been demonstrated in several studies in scientific literature. But despite this, risk perception is often forgotten during the implementation of Flood Risk Management Plans. Advantage has, therefore, been taken of the didactic workshops to increase risk perception, which have been held for several years at the Venero Claro summer camp, to design a study that can be used to quantify the impact that these workshops might have on children's risk perception.

The study contained two rounds of surveys, the pre-workshop survey and the post-workshop survey, both containing the same 20 questions divided into 4 blocks with closed answers or with different levels of acceptance. The first block contained sociodemographic variables, such as age, gender, number of previous participations in the summer camp and place of residence, along with the existence or otherwise of a flood hazard in that area, in order to see the relation among these variables and the variability and permanence of risk perception. The other three blocks in the survey were focused on the knowledge of the camp and its surroundings, natural hazards and the scientific study of floods, and the self-protection measures taken during them. The study covered 540 children of between 8 and 12 years of age, in three shifts of around 180 children each.

The results of the statistical analysis of these surveys allowed us to compare the knowledge and perception with the sociodemographic variables.

After this study, we observed a clear improvement in the children's risk perception and knowledge when the results of both surveys were compared, in addition to the preservation of this knowledge in those children who had come to the summer camp in previous years.

These results will, therefore, help us to design some similar education strategies with which to increase children's flood risk perception in the Significant Flood Risk Areas (ARPSIs) in the Duero river reach between Toro and Zamora, the area on which the DRAINAGE-3-R-Project and future studies are focused.

**Keywords:** risk perception; flood risk; risk education; psychological surveys

27796

**IMPROVING CHILDREN'S RESILIENCE TO FLOOD RISK THROUGH NON-FORMAL EDUCATION IN SUMMER CAMP ACTIVITIES: SIX YEARS OF EXPERIENCE IN VENERO CLARO (SPAIN)**Andrés Díez-Herrero<sup>1\*</sup>; Carlos Carrera<sup>2</sup>; Mario Hernández-Ruiz<sup>1</sup>; Jose M. Bodoque<sup>3</sup><sup>1</sup>Instituto Geológico y Minero de España, Spain<sup>2</sup>Fundación Ávila, Spain<sup>3</sup>Universidad de Castilla-La Mancha, Spain\*E-mail: [andres.diez@igme.es](mailto:andres.diez@igme.es)

Education in risk is one of the most effective preventive measures against flood risk for both adults (particularly technicians and politicians) and children. Nevertheless, there are few experiments involving children being educated in risk that are continuous over time (several years, at least) in order to be able to evaluate the results as regards improving risk perception and children's resilience.

One of these limited experiences is the non-formal educational activity programme developed for the last six years at the Venero Claro children's holiday camp (Navaluenga, Ávila, Central Spain). Each summer, more than 540 children spend 11 days at a multi-adventure and sports camp and on one day, several scientists and technicians from the Geological Survey of Spain and the University of Castilla-La Mancha teach the basic concepts of flood risk analysis, flood forecasting networks and self-protection measures.

All the activities consist of participatory games, the practical management of scientific instruments and quizzes and answers, grouped in three blocks of double questions: i) "Where is my summer camp?" and "What kind of natural disasters could take place in this camp?"; ii) "How do the experts study the risk of flooding? How can they prevent flood disasters?", and iii) "How can I protect myself against floods?", "What can I do during a flood?". Several educational materials are used, such as DIN A-3 size posters, hydrometeorological instruments (velocity flowmeters, pluviometers, limnimeters, meteorological stations, dendrochronological kit, etc.), local rock samples...

The results are being assessed through the use of surveys carried out both before and after the activities, and these activities are among those best valued at the camp.

These activities are included in the DRAINAGE (“Design of a methodology to increase flood resilience compatible with improved status of water bodies and sustainable management of water resources”) research project, which is funded by the Spanish Ministry of Science, Innovation and Universities (CGL2017-83546-C3-R, AEI/FEDER, UE).

**Keywords:** flood risk; resilience; education at risk; risk perception; Spain

**27912****APPLYING THE CONSTRUAL LEVEL THEORY TO FLASH-FLOOD RISK  
PERCEPTION AMONG RESIDENTS IN POTENTIAL DANGER**

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Environmental hazards and their consequences suppose population risks. Being aware of what is or might be happening could be a key aspect as regards avoiding dangerous effects. Environmental psychologists have focused on understanding people's perceptions of risks in order to prevent behaviour that may put people in danger. In this respect, the Construal Level Theory (CLT) suggests that people experience their surroundings and represent them mentally. By evaluating, predicting and planning real and hypothetical situations, people transcend certain dimensions of what it is called the psychological distance. The CLT establishes four dimensions regarding the psychological distance: temporal distance, spatial distance, social distance, and uncertainty. Issues that are mentally represented as being further away (temporarily, geographically, socially or hypothetically) will, therefore, be perceived as more dangerous than those that are closer.

In this line of research, the CLT might be applied to understanding people's perceptions of risks and how effective communication strategies might be. The specific objective of the present research is to explore flash-flood risk perception (RP) and awareness of the Civil Protection Plan (CPP) in the case of flash-floods among residents who are in danger of this phenomenon after being shown a risk communication strategy (RCS). In order to achieve this aim, a longitudinal study was conducted with 254 residents in a flash-flood risk area in Spain. All the participants completed a questionnaire in two moments (before and after the RCS was implemented) in a one-year period. Several ANOVA analyses were run, which

showed low levels of RP and CPP awareness. However, RP was higher when taking into consideration neighbourhood versus home; and long-term versus short-term consequences. The results additionally showed that those participants who were more involved in the RCS activities increased their CPP awareness. Upon considering these results and the CLT approach, it is possible to highlight the appearance of psychological bias. The participants considered that the risk of suffering the consequences of flash-floods was greater when it occurred further away than when it was closer to them. Nevertheless, the RCS also appeared to impact on the participants' awareness, thus making them more competent.

**Keywords:** psychological distance bias; risk perception; civil protection plan; communication strategy

**27806****STUDY OF THE RISK OF FLOODING AND SLIDING, WITH MEASURES OF MITIGATION IN THE QUEBRADA SAN LUIS MANIZALES, COLOMBIA**Beatriz Galindo-Miguel<sup>1\*</sup>; Rafael Sumozas<sup>2</sup><sup>1</sup>Universidad Politécnica de Valencia, Spain<sup>2</sup>Universidad de Castilla-La Mancha, Spain\*E-mail: [beaymiguelfalindo@gmail.com](mailto:beaymiguelfalindo@gmail.com)

This paper studies the stabilization of slopes and mitigation measures in the Quebrada San Luis in the Andean city of Manizales, for which the natural, geological and anthropic factors that detonate risks owing to landslides are obtained. An additional perspective was employed when planning the implementation of the project, since an informal settlement with the threat of landslides is located in this area. This study aims to provide a global view of the actions and interrelations between the different agents that trigger landslides in Manizales and the perception of the actors who participate in public administrations: the National Unit for the Management of Disaster Risk in Colombia NGRD, CorpoCaldas, IDEA, the Official Body of Firefighters of Manizales and various researchers from the University of the Andes and the National University of Colombia, along with the residents in these sectors. This work is, therefore, of interest to professionals, scientists and the politicians who work in the area of Risk Analysis. With regard to the methodology followed, it considers the stabilization of a hillside or the restoration of a system. It does not consist exclusively repairing the damaged infrastructure or stabilizing it, but is rather about improving a public service, which entails a great interaction between neighbors, technical studies and local authorities. In many of these places, maintenance costs are also a problem, because in more advanced countries we frequently assume that our services will sustain themselves. Everything related to risk is consequently fulfilled, from its evaluation, perception-communication, management and governance. With regard to the results, this cooperation project is a useful tool for future interventions, since it shows the study of all the different interactions, and not only the techniques themselves and how all of them affect climate change with the dynamics of rainfall. By way of a conclusion, within the Latin American context,

the extreme devastation caused by events of natural origins is remarkable. The frequency of disasters and the economic level of the countries affected shows a strong relationship between the occurrence of disasters and underdevelopment.

**Keywords:** landslide and flood risks; informal human settlements; risk assessment in natural disaster; climate change; sustainability

**27825****A MONITORING AND ALERT PROTOCOL FOR THE CRACKS FOUND IN THE SANTOS MORCILLO LAKE (RUIDERA LAKES NATURAL PARK)**Marina Moya<sup>1\*</sup>; Vicente Navarro<sup>1</sup>; Juan Alonso<sup>1</sup><sup>1</sup>Universidad de Castilla-La Mancha, Spain\*E-mail: [marina.moya@uclm.es](mailto:marina.moya@uclm.es)

In 2007, two families of cracks and a sinkhole were detected in the Santos Morcillo Lake, one of the 15 staggered lakes that constitute The Ruidera Lakes Natural Park in Central Spain. This caused great alarm in the community, which feared the possible collapse of the tufa barrages separating the lakes.

After studying the situation for almost two years it was possible to measure levelling points for the identification of settlements, using crackmeters on the bottom of the lake to measure the aperture of the cracks and a diverse type of electronic limnigraph to measure the evolution of the water level of the lake. An electrical tomography survey and field and laboratory research were then carried out. This information made it possible to develop a model of the opening of the crack based on the anthropogenic distortion of the hydrologic regime.

Work management, risk assessment and the control of access to the natural environment were not simple in this scenario. A monitoring and alert protocol was, therefore, applied during the study (Navarro et al., 2014), which was based on the levelling, lake water level and crack aperture measurements. Various warning stages were designed to be triggered when there was a deviation between the measurements and the expected values of the model. The activation of a warning involved a thorough analysis of the data to identify possible reading errors. If the anomalies detected were not associated with possible measurement errors, then an alert level was activated. The three alert levels designed gradually restrict access to the different areas of the RLNP and required a series of actions: increased measurements, expert assessment and the participation of agencies responsible for ensuring the security of the area.

This work presents a proposal for a monitoring, warning and alert procedure with which to allow safe access to the Santos Morcillo Lake, which may be useful for the management of similar problems in natural environments.

**Keywords:** alert system; cracking model; monitoring

**27903****LEARNING BY RESEARCHING: ANALYSING THE CAUSES AND CONSEQUENCES OF A LANDSLIDE IN AN URBANISED AREA**

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The Master's degree in the Planning and Management of Natural Risks offered by the University of Alicante has now been run 9 times and is the oldest postgraduate degree in Spain to be exclusively dedicated to natural risks. Based on the European Higher Education Area framework relating to teaching innovation, a project-based learning method is being implemented in some of the Master's degree subjects.

In the case under study, we present the results of the "Mass Movement and Erosion" subject (2017-2018 academic year). Research was undertaken to explain the causes of a complex landslide in the "Bella Orxeta" (Orxeta, Alicante) residential development that occurred in March 2017, affecting five houses and two streets.

The didactic methodology consisted of identifying two groups of conditioning factors: the geomorphological factors (slopes and lithology favourable to landslides) and the changes in land use derived from the urbanization process and alteration to the slopes (since 1970). Both current and historical cartographic sources (LiDAR and aerial photography) were used for this purpose, along with interviews with the local inhabitants who had been affected. Field work was also undertaken. The main triggering factor was three successive rainfall episodes, between December 2016 and March 2017, resulting in almost 300 mm of rain in the study area. Finally, the morphology and dynamics of the landslide, which are still active, were analysed.

The conclusions reached demonstrate the virtue of applying the theoretical body of a university subject to a concrete case of analysis: the underlying causes of danger and increased vulnerability owing to an unplanned urbanization process were established.

**Keywords:** landslides; urban risks; land use-land cover change; higher education

**27829**

## **A GIS TOOL FOR SEMI-AUTOMATIC HAZARD ASSESSMENTS OF EARTHQUAKE-TRIGGERED LANDSLIDES**

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A new GIS code with which to analyse hazards as regards seismically induced slope instabilities has been developed in order to obtain maps showing areas with the greatest level of risk. A semi-automatic programme was written in Python, using ArcGIS software and fed with geologic-geotechnical data.

The code consists of an implementation of Newmark's method on local and regional scales, with the objective of obtaining Newmark displacement maps and critical accelerations. It was, therefore, necessary to use an infinite-slope limit equilibrium model by means of a geographic information system.

It is important to emphasize that the code obtains the safety factors and critical acceleration values for circular and non-circular failure surfaces based on different limit equilibrium methods, such as those of Bishop or Janbu and Morgenstern-Price.

In order to feed the programme, we required a lot of empirical data, such as, geologic-geotechnical data from lithological classification, which show the type of materials that are present.

This data can be obtained from the standard penetration test (SPT), which is attained from a field study, if the terrain is soil. Nevertheless, a rock substratum may exist, and it is, therefore, always necessary to know the strength parameters that are present in rock discontinuities, for example the cohesion or frictional angle.

It is also necessary to take the slope maps into account. These are essential for instabilities, depending, fundamentally, on lithology, hydrologic conditions and another external factors, such as the level of intensity of the earthquake.

The safety factor is the expression that represents stability in aseismic conditions. It is expressed as the relationship between the forces opposed to the failure of the slope and the forces that favour the rupture and movement of the slope. It is possible to assume that the safety factor acquires a value greater than one when the stabilizing forces take precedence over the non-stabalizing forces, namely when we are in scene in which there are stable conditions.

**Keywords:** earthquake-triggered landslides; seismically induced slope inestabilities; GIS code; ArcGIS software

**27833****SEISMIC RISK PERCEPTION AND HOUSEHOLD PREPAREDNESS FOR EARTHQUAKES IN S. MIGUEL ISLAND (AZORES, PORTUGAL): PRACTICAL IMPLICATIONS**Isabel Estrela Rego<sup>1</sup>; Mariana Paim Pacheco<sup>1\*</sup>; Sofia Morgado Pereira<sup>1</sup><sup>1</sup>Universidade dos Açores, Portugal\*E-mail: [marianapaimpacheco@gmail.com](mailto:marianapaimpacheco@gmail.com)

Populations may have no assistance in the first hours after a disaster, with limited or no access to external resources. Household preparedness is, therefore, vital as regards ensuring populations' security. Despite its importance, studies indicate low levels of preparedness, and leading researchers consequently wish to attain a better understanding of preparedness. Because recognizing a risk is a requisite as regards being prepared, the association between risk perception and preparedness has been extensively studied, providing mixed results and emphasizing the need to address other variables. Risk communication often attempts to promote preparedness by providing information concerning threats, thus resulting in ineffective communication efforts owing to the fact that other variables related to preparedness are addressed insufficiently, hence the practical implications of this study field. The Azores are a Portuguese volcanic archipelago comprising nine islands, located at a triple junction of tectonic plates. Owing to this complex framework, the area is characterized by high seismic activity, with medium to low magnitude. This study is part of a broader research project, and its objective is to characterize the seismic risk perception and preparedness of families on S. Miguel Island, in addition to addressing the association between the two concepts, with the aim of providing scientific and practical knowledge. Interviews were conducted with representatives of 145 families. Current preparedness was addressed and those participants with low/inexistent levels were asked to construct new preparedness measures. A second interview was conducted with these people a few days later. Mixed methods were used, as quantitative data was analysed through the use of descriptive and inferential statistics and classic content analysis, while intercoder agreement was used for the qualitative data for reasons of reliability. The results point to moderate levels of risk perception, and low levels

of current and constructed preparedness were also noted. Only one significant correlation was found between a risk perception measure and having current preparedness. Since this is a weak correlation, it is argued that risk perception insufficiently explains preparedness. Nevertheless, significant correlations were found between risk perception and types of measures, such as survival and mitigation. Planning measures were predominant. The results provide valuable insights into preparedness on the island, stressing the need to better adjust the risk communication efforts in order to achieve a more disaster resilient community.

**Keywords:** risk perception; household preparedness; earthquake hazard

**27661****THE RISKNAT CONSOLIDATED RESEARCH GROUP: 17 YEARS OF RESEARCH IN GEODYNAMIC HAZARD AND RISK ASSESSMENT**Glòria Furdada-Bellavista<sup>1</sup>; Marta Guinau-Sellés<sup>1\*</sup><sup>1</sup>Universitat de Barcelona, Spain\*E-mail: [mguinau@ub.edu](mailto:mguinau@ub.edu)

RISKNAT is a Consolidated Research Group acknowledged by the Government of Catalonia. It came into being in 2001, and was originally entitled Research Group on Surficial Geodynamic Processes. It is currently formed of 17 researchers (11 PhDs, 5 pre-docs and 1 technician), affiliated to the Departament de Dinàmica de la Terra i de l'Oceà (Facultat de Ciències de la Terra, Universitat de Barcelona) and to the Laboratori d'Estudis Geofísics Eduard Fontserè (Institut d'Estudis Catalans).

RISKNAT focuses on a broad range of geodynamic processes involving natural hazards and on their associated risk. The research topics cover three main phenomena: i) Mass movements: snow avalanches, rock falls, slides, mud flows and debris flows; ii) Floods: flash and riverine floods; and iii) Earthquakes: seismicity and palaeoseismology. In order to help characterize geological risk, the main aim of the group is to improve hazard assessment, with a view on the exposure factor of vulnerable elements at risk. Hazards must be evaluated by detecting and mapping natural phenomena, characterizing their dynamics, extent and magnitude, and estimating recurrence.

RISKNAT is also strongly focused on developing and implementing advanced field experimentation, monitoring methods and testing techniques. These include: i) the acquisition and processing of LiDAR (terrestrial or airborne), photogrammetry, and geodetic (TS and GNSS) data; ii) remote sensing and GIS analysis, thematic mapping and hazard zoning iii) analogue and numerical modelling of natural phenomena; iv) the deployment of seismometers, accelerometers and infrasound sensors, including data processing and software development for seismic signal analysis; and v) combining a range of geochronological tools.

The interdisciplinary nature of the RISKNAT team, whose members include geologists, physicists, engineering geologists and geophysical engineers, in strong

collaboration with a number of institutions and researchers from abroad (Europe and America), reinforces the integration of different scientific scopes for an effective understanding of the phenomena.

One of the main challenges confronted is a search for efficient ways in which to transfer scientific knowledge to society, which include bidirectional exchanges with decision makers and the development of outreach initiatives. Introducing our research group into the Iberian Chapter of the Society for Risk Analysis – Europe could, therefore, be an opportunity to do this.

**Keywords:** mass movements; floods; earthquakes; hazard; risk

## FOREST FIRE RISKS

**27904**

### **THE GEOGRAPHICAL INFORMATION ON LAND USE / LAND COVER TO ANALYZE EXPOSURE TO WILDFIRE HAZARD IN RESIDENTIAL AREAS**

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Geographic information on land use / land cover (LU/LC) has strategic importance in studies on wildfire hazards in residential and urban areas (WUI). The Information System on Soil Occupation of Spain (SIOSE) is a reference database built upon an object oriented data model which provides massive volumes of high quality LU/LC data. However, this database has drawbacks for experts in natural hazards, who are usually desktop GIS users and often lack the knowledge required to navigate its data model.

As a consequence, users resort to alternative data sources, such as CORINE Land Cover (CLC), which is a simple reclassification of SIOSE itself. As a consequence of being confronted with this kind of usability problems, the National Project SIOSE-INNOVA (CSO2016-79420-R), which sponsors this research, aims to increase the accessibility and usability of the SIOSE geodatabase, whose potential is hidden from non-expert database management users.

In this study, the use of SIOSE data in order to assess exposure to the wildfire hazard in Wildland-Urban Interface Zones (WUI) has been undertaken by employing a massive processing approach, thus enabling the comparison of different geographic areas in Spain (such as Navarra in the Pyrenean Mountains and Castellón on the Mediterranean coast). A PostGIS geodatabase and a PostgreSQL extension that implements methodologies used in the reference bibliography have been built for the spatial determination of exposure risk. The results have subsequently been verified either on a desktop GIS or through

fieldwork, and by contrasting the results with those that the use of the CLC would lead to.

The SQL algorithms designed to identify exposed areas, packaging in the form of a PostgreSQL extension and software distribution as Docker images, will allow the reproducibility of the research and its application in other areas of interest. The coupling of SIOSE with Docker technology and the packaging and deployment of results obtained from the PostgreSQL extension using the Geopackage format will also encourage the use of free software and open geographic data formats.

**Keywords:** wildland-urban interface; GIS; SIOSE; CORINE; PostGIS

**27913****DEPOPULATION AND FOREST FIRE RISK**José María Martínez-Navarro<sup>1\*</sup>; Carmen Vázquez-Varela<sup>2</sup>; José Antonio Montero-Álvarez<sup>2</sup><sup>1</sup>Independent Consultant, Spain<sup>2</sup>Universidad de Castilla-La Mancha, Spain\*E-mail: [josemaria.martineznavarro@gmail.com](mailto:josemaria.martineznavarro@gmail.com)

In current scientific literature there is a broad consensus among scholars (Seijo, 2009; Pyne, 1977) and experts (Vélez, 2005; Castellnou, Nebot & Miralles, 2007) that the main factor as regards understanding the increase in the flammability of forest land since the last third of the 20th century is the rural exodus, which results in the abandonment of land and traditional uses, and is worsened by economic policies aimed at reducing agricultural surpluses. These realities lead to accelerated scrubbing processes that generate highly flammable continuous surfaces, with or without tree cover, which are the cause of large forest fires that are extraneous to the traditional mosaic landscape.

However, the causal relationship between the level of depopulation in a given territory and the increased risk of fire in that territory has not been conclusively proved in an empirical manner.

Our hypothesis is, therefore, that there is a clear lack of empirical evidence verifying the cause-effect relationship between aging, depopulation and increased forest flammability, paying special attention to the evolution of the scrubbing processes and the evolution and behaviour of uncontrolled ignitions. We shall attempt to verify this by comparing these factors in the areas of the region that have maintained agricultural activity and populations in the last 25 years and those that have not, which are basically those included within the High Risk Fire Zones (ZAR) in our region.

The research period defined for the region of Castilla-La Mancha region is from 1990 to 2015, a time interval for which we have complete data from the three main sources employed: the Continuous Population Register (INE), from which we have quantified the level of depopulation, the General Forest Fire Statistics (EGIF) from which we have taken the rates of uncontrolled ignition, the averages of

burned areas and the percentage of fire outbreaks and the Corine Land Cover (for the years 1990-2006) and the Spanish Information System on Land Cover (SIOSE, 2005-2015), which we have employed to analyse the changes in land use that imply the modification from agricultural to forest uses, analysing the correlations between the three sources and their cartographic representation.

**Keywords:** depopulation; bushing processes; forest fire risk; landscape; Castilla-La Mancha

27905

## **SOCIALGIF PROJECT: ANALYSIS OF SOCIOTERRITORIAL FACTORS FOR THE INTEGRATED MANAGEMENT OF FIRE IN CASTILLA-LA MANCHA. A RESEARCH APPROACH**

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The poster outlines the presentation, for discussion, of an interdisciplinary research project design that addresses the problem of forest fire prevention in Castilla-La Mancha in an innovative manner.

The research project is framed within the paradigm of Integrated Fire Management, a planning concept and risk reduction policies that require social, economic, cultural and ecological assessments with the aim of minimizing the damage caused by forest fires by maximizing the benefits, for their prevention, of the artificial use of fire.

These policies, which are widely implemented in other European countries but very infrequently in Spain, combine prevention and extinction strategies with techniques that integrate the technical management of fire, while promoting adequate traditional burning. The paradox of fire is that it can be both harmful and beneficial, and that its use is necessary for the correct balance of our ecosystems.

For all these reasons, the general hypothesis of our project could be expressed in the following way: Integrated Fire Management policies may, in the social sphere, represent several practical problems or obstacles, in addition to several applicable knowledge deficits that can be correctly addressed by the Social Sciences in an interdisciplinary manner.

In accordance with this approach, the general objectives proposed in our research, which is clearly of an research-action nature, are summarized as follows:

a) To generate scientific and practical knowledge, from the perspective of fire ecology, regarding the socioeconomic and political factors that have contributed to

the increase in flammability that characterizes the problem of forest fires at present, in order to facilitate policies aimed at reducing said flammability;

b) To detect the foreseeable difficulties for the implementation of rural and forest policies based on Integrated Fire Management; and

c) To make proposals, based on the Participatory Action Research (PAR) methodological approach, with the objective of reducing these difficulties.

Based on this hypothesis and the three-fold general objective, five thematic lines of research are articulated and presented for discussion in the poster.

**Keywords:** forest fires; integrated management of fire; fire ecology; Participatory Action Research (PAR); social sciences

**27906****FOREST FIRES AS A NEW FORM OF "TERRORISM"? CRIMINAL RESPONSES TO A NON-EXISTENT PROBLEM**

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Last year, in October 2017, forest fires swept Galicia. This was a tragic event (up to 125 simultaneous outbreaks were reported), which is already viewed as the most devastating wave of fires in Spain in recent times. While national and regional authorities admitted that the situation was out of control, the regional leader stated that the wave of fires was not "a matter of forest management" but rather a question of "public order" (1). However, this statement implies an inadequate understanding of forest fires that clashes with current scientific knowledge. Twenty years ago, Pérez Vilariño argued that "using armed gangs and other similar forms of plots or mythic imaginary to just simply prosecute a poor man, is the strongest evidence of the blurring causality-culpability model" (2). In the same vein, scholars usually refer to the so-called symbolic use of Criminal Law in this context when describing the continued hardening of the penalties for forest fires (3). The environmental Public Prosecutor also rules out the idea of generic intentional action: "none of the three elements common to forest fire imaginary have been identified: wood, urbanism and fire economy" (4). Against this background, our working hypothesis is that intentional forest fires are rare in Spain, signifying that the hardening of prison penalties, as the main response to forest fires, can be regarded as a symbolic use of criminal standards in order to avoid political responsibility for the lack of an appropriate and comprehensive public forest management policy. According to this working hypothesis, the aim of the poster is two fold. Firstly, it provides an overall view of intentional forest fires in Spain based on a quantitative analysis of the data published by the National Public Prosecutor and EGIF data base. Secondly, it explores the criminal response to the phenomena,

taking into consideration existing jurisprudence in article 352.1 of the Criminal Code.

**Keywords:** forest fires; forest management; public policy; criminal law; criminal policy

**27692****STRESS: A RISK FOR PORTUGUESE FIREFIGHTERS?**Natália Vara<sup>1\*</sup>; Cristina Queirós<sup>2</sup><sup>1</sup>Escola Superior de Saúde do Instituto Politecnico de Bragança, Portugal<sup>2</sup>Universidade do Porto, Portugal\*E-mail: [vara.natalia@gmail.com](mailto:vara.natalia@gmail.com)

As first responders to an increasing number of natural and manmade disasters, firefighters are at an increased risk of suffering from physical and psychiatric impairments, as is reflected by high rates of posttraumatic stress disorder. Last year, Portugal was the victim of large-scale fires that constituted real disaster situations, and had multiple repercussions in society and a profound effect on communities and first responders. The country had to deal with not only human and material losses, but also the consequences related to infrastructures, hazards, communications and political implications. Moreover, volunteer firefighters serving rural areas and small communities often respond to calls involving friends and relatives, which adds a personal element to a traumatic incident (Jahnke, et al., 2014), or, as occurred last year, had to confront the deaths of colleagues and relatives, and material losses. The stress of the job often gets taken home and affects family members (Regehr, 2005). Simultaneously, firefighters are not immune to the everyday stressors confronted by everyone, and stress at home can compound the stress experienced at work (Regehr 2009). Thus, owing to the regular contact with traumatic events, firefighters are more susceptible to experiencing high levels of stress, which compromise their physical and emotional well-being. This study employs a probabilistic sample, composed of 191 firefighters (68% men and 32% women), with an average age of 33 ( $SD=8,6$ ) and an average professional experience of 12 years ( $SD= 8,6$ ), who fulfilled the Perception Stress Scale (Trigo et al., 2010) and the Firefighter Coping Self-Efficacy Scale (Lambert et al., 2012; Vara & Queirós, ongoing). The results identified a prevalence of moderate levels of stress (mean 15,7 on a scale of 0-40,  $SD=5,84$ ) among firefighters, and the self-efficacy to cope with stress was high (mean 105,6 on a scale of 20-140,  $SD=16,98$ ). Regression analyses showed that stress seems to be a predictor of the ability to cope with stress (13,7%) among firefighters. These

results contribute to extending our knowledge on the implications of the ability to cope with stress among firefighters, and to highlight the relevance of intervention studies aimed at promoting the development of resilience skills. These skills prepare individuals to resist the negative effects of stressful events and situations, and support overall well-being (Sanford et al., 2017).

**Keywords:** stress; firefighters; self-efficacy; questionnaires

27910

**TWEETING A TRAGEDY: A QUANTITATIVE-QUALITATIVE ANALYSIS OF APPRAISAL AND COPING EXPRESSIONS, DURING AND AFTER THE PEDRÓGÃO GRANDE FOREST FIRE**

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Mostly described as intense and unpredictable, natural catastrophes have become more frequent (Felix et al., 2015). Last year, a violent forest fire ravaged the Portuguese municipality of Pedrogão Grande, resulting in immeasurable damage to both the forest and its inhabitants. The need to provide solid psychological preparation has, therefore, occurred. One way in which to do this is through the promotion of resilience. However, it is first necessary to understand how the general population perceives the social and personal resources that are available in order to enable them to cope with such events (Gaspar et al., 2016). To do this, we conducted an exploratory qualitative study with the objective of collecting and identifying different expressions indicative of resource perception – how they cope with said catastrophe. Owing to its growth and regular use to express identity, Twitter was revealed as the prime contender for this data collection goal (Cho et al., 2003). We used the Linguistics Category Model (LCM) and its versatile nature to categorize Tweets so as to develop a better understanding of citizens' coping mechanisms in order to support the development of better coping tools and strategies. We shall present the results obtained in this respect and shall derive the implications for risk communication.

**Keywords:** forest fire; coping strategies; Twitter; Linguistics Category Model; appraisal

## RISK COMMUNICATION

27841

### **IMPROVING HEATWAVES RISK COMMUNICATION THROUGH SCIENTIFIC EVIDENCE: YOUNG AND ELDERLY ADULTS' APPRAISALS OF DEMANDS AND COPING RESOURCES**

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The physical impacts of climate change have a profound influence on not only human systems (e.g. infrastructures, economy), but also human health (mental, physical, social; Clayton et al., 2015). In this respect, heatwaves are particularly worrisome owing to their impacts (WHO, 2015). Understanding how different groups (e.g. young and elderly people) appraise the demands associated with these events and the available coping resources may serve as an important driver by which to improve risk communication and promote adequate attitudes and behaviour.

We, therefore, implemented a mixed-method study with the goal of exploring and comparing young and elderly citizens' appraisals of demands and resources. A sample of 48 participants was collected: 28 young adults aged between 18-29 ( $M=19.8$ ;  $SD=.41$ ), and 20 elderly adults aged between 65-88 ( $M=75.4$ ;  $SD=1.58$ ). The participants answered a questionnaire focused on their appraisals of the levels of demands and resources as regards heatwaves, and took part in a semi-structured interview focused on their discourse about sub-categories of demands (danger; effort; uncertainty) and the resources (knowledge, abilities, and skills; dispositions; support) that can be used to cope in situations of this nature.

Compared with younger adults, elderly adults appraised significantly higher level of demands ( $F(1, 46)=6.703; p=.013; \eta^2p=.127; \pi=.717$ ), and approximate levels of resources ( $F(1, 46)=.151; p=.699$ ). A ratio analysis suggested that older adults appraise these situations as being more threatening than do younger adults ( $F(1, 46)=4.077; p=.049; \eta^2p=.081; \pi=.507$ ). Likewise, elderly adults made more references to "danger" ( $F(1, 46)=7.982; p=.007; \eta^2p=.148; \pi=.790$ ), while making a similar number of references to "effort" ( $F(1, 46)=1.014; p=.319$ ), in addition to "knowledge, abilities, and skills" ( $F(1, 46) =.236; p=.630$ ). Interestingly, both groups made few mentions of "uncertainty", "dispositions" or "support".

Our results suggest that elderly adults may need more resources to cope with the demands posed by heatwaves. Moreover, they indicate the need to promote the importance of dispositional resources (e.g. being attentive, being preventive), along with the availability of external support resources (e.g. institutions that can provide protection during heatwaves) in both groups. Overall, the findings suggest practical implications for risk communication and interventions.

**Keywords:** heatwave adaptation and resilience; appraisal; demands and resources; risk communication

**27916****TWITTER COMMUNICATION PATTERNS RELATED TO RISK: THE PARIS  
ATTACKS AS A CASE STUDY**Pedro Simões<sup>1\*</sup>; Rui Gaspar<sup>2,3</sup>; José Manuel Palma Oliveira<sup>1</sup><sup>1</sup>Universidade de Lisboa, Portugal<sup>2</sup>Universidade do Algarve, Portugal<sup>3</sup>Universidade Católica Portuguesa, Portugal\*E-mail: [pedro.carcho@gmail.com](mailto:pedro.carcho@gmail.com)

The present study assesses the phenomenon of terrorism, particularly in the specific case of the attacks in Paris, assessing how people evaluate these acts, and identifying possible cases of negative affect, the coping strategies used, the presence of threats, fear and anger in people's conversations, and the reactions and solutions encountered by them to deal with these events. Data collection was obtained by means of Twitter messages in a sample of 1319 tweets, all in the French language, with the objective of discovering possible categories of reaction to the present events, and the temporal order of this reaction, namely possible changes as regards the discourse, justifications for and solutions to the attacks in the French capital. The results indicate that there are significant differences in how people reacted to the Attacks in Paris and the temporal distribution of tweets. It is thus possible to observe 5 categories with significant differences, and in the following temporal order: "Feelings of fear, panic, shock", "Anticipation of Danger / alert / concern and deliberation about the event", followed by "compassion / sadness / homage and hope" and finally "Patriotism, values / social identity and appeal / homage to Paris" Demonstrative tweets of "Feelings of Anger, Revolt and Discouragement" tend to emerge at the same time as those of anticipation of danger and expressions of support. The discussion focuses on these differences in categories and on the time difference between them, in order to optimize risk communication and prevention models in relation to the phenomenon studied herein, for which the present study indicates feelings of loss of control (McArdle et al., 2012), such as the presence of fear, anger, sadness, worry and fatalism (e.g., Fischhoff et al., 2000; Lerner et al., 2003; McArdle et al., 2012).

**Keywords:** terrorism; stress; coping; risk perception; social media

**27915****SHARE MORE TO FEEL LESS: SOCIAL SHARING OF EMOTION AS A STRATEGY TO COPE WITH THREATENING HEALTH RISKS INFORMATION**Cristina Camilo<sup>1\*</sup>; Maria Luísa Lima<sup>1</sup>; Bernard Rimé<sup>2</sup><sup>1</sup> ISCTE-Instituto Universitário de Lisboa, Portugal<sup>2</sup>Université Catholique de Louvain, Belgium\*E-mail: [cristina.camilo@gmail.com](mailto:cristina.camilo@gmail.com)

Threatening health-risk communication is emotion-eliciting and can become ineffective by causing avoidance. A natural strategy used to transmute this emotional barrier is to share emotions. We propose that, after being exposed to threatening health risk communication, individuals feel the need to share their emotions with others, and that emotional sharing buffers the negative emotions experienced. We also suggest that more severe health risks elicit more intense emotional responses, in addition to producing a greater need to share and more intense sharing behavior. In order to test these predictions, 120 graduate students were randomly assigned to one of six experimental conditions: 3 health risk information (cancer vs. diabetes vs. cold) x 2 sharing conditions (sharing vs. non-sharing). The health risk information conditions were selected and pretested in order to simulate different levels of threat and to elicit different levels of emotion. In the sharing condition, the participant was shown a video containing information about one of the health risks. A colleague was then taken to the video room and the interaction between the participant and his/her colleague was observed for five minutes. The non-sharing condition was equivalent but the interaction between the participant and the colleague was restricted by a secondary task. We assessed the elicited emotion and the need to share. According to our hypothesis, the results revealed that the information regarding cancer elicited a more negative emotion than that related to diabetes or colds. The risk information concerning cancer also caused a higher need to share and a greater sharing behavior (for those in a sharing condition) than that regarding diabetes or colds. This result indicates that people seek to decrease the intensity of the emotion associated with the threat via interaction with others. In fact, sharing emotions with others had a beneficial

effect. Those who had the opportunity to share felt less upset after doing so than the participants in the non-sharing group.

**Keywords:** health risk; health information; emotion; social sharing of emotion

27690

## ENVIRONMENTAL INFORMATION IN THE SPANISH MEDIA AND SOCIAL MEDIA IN 2018

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Scientific reports, along with protocols and political actions adopted at the international, national or even local level, indicate not only that there is a negative climate change but also that the main cause of it is man.

Climate Change and the environment are issues that should involve all social agents with a capacity for action because of their vital importance for human subsistence. The media is one of them, but it is hesitant and little focused on the matter.

The study sample was delimited to 2018 with the objective of identifying the frequency and space or time devoted by the media to this subject, in addition to the environmental issues covered in the media and how the media transmit the information related to the environment to their public. We also attempted to locate informational differences in coverage between traditional and digital media.

The methodology used was an analysis of the quantitative content of journalistic pieces that are disseminated in the media. It was focused on the study of: two printed newspapers, El País and El Mundo; two radio news programmes, Radio Nacional España and Cadena Ser, and two television news programmes, Televisión Española and Telecinco, as traditional media. We also analysed two exclusively digital newspapers, Eldiario.es and El Confidencial, along with carrying out a transversal study of the impact that all these media make through two social media: Facebook and Twitter.

The intention of this research is to obtain a diagnosis of environmental journalistic coverage for citizen awareness concerning the risk of environmental impact.

**Keywords:** environment; risk; media; social media; environmental journalism

**27911****NATIONAL OBSERVATORY FOR EMERGING RISKS - A NEW CHALLENGE**

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It is generally recognized that there is a gap in consumers' knowledge and awareness with respect to emerging food safety matters. The development of media communication and the use of social networks to highlight previous food safety incidents have helped increasing consumers' awareness of these issues. However, there is a need for sustained risk analysis, risk management and risk communication within a reliable chain of trusted players. Most consumers obtain information from web pages and the media, and rarely from local authorities, whose wording is highly technical or simply non-existent as regards daily life issues.

We attempt to fill this gap by providing a report on the creation of the Portuguese National Observatory for Emerging Risks (ONRE), whose aim is to identify emerging risks early in the food chain, in close cooperation with EFSA, the Emerging Risks Exchange Network and the Spanish Network (Red Nacional de Riesgos Emergentes). EFSA defines an emerging risk as: "A risk resulting from a newly identified hazard to which a significant exposure may occur, or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard." ONRE will challenge this definition by including a risk perception value in order to support risk managers as regards anticipating risks and taking effective and timely prevention measures to protect consumers. Identifying emerging risks

will also help to improve the ONRE's ability to meet future risk assessment challenges if supported by early warning and foresight systems.

ONRE seeks to educate consumers in food safety by targeting various settings, including schools and certain segments of the population who play a direct or indirect role in food preparation and/or have increased vulnerability to emerging issues.

ONRE intends to employ the effective networking of key players at national and international levels in order to strengthen platforms on which to share experiences and best practices, and to work on preparedness, which will help in the management of emergency situations that arise as the result of the extreme weather events that are expected to be more frequent owing to climate change.

Some of the key features will be nutriviigillance systems and risk communication strategies. It will initially be necessary to manage the risk assessment findings, but the subsequent communication of risks should be a priority, since this is a powerful yet underused tool.

**Keywords:** emerging risks; ONRE; risk analysis; risk communication; risk management

**27908**

**UNITED AGAINST THE TERROR: INDICATORS OF THE NORMATIVE  
DEVIATION, DEMANDS AND RESOURCES PERCEIVED IN THE  
PSYCHOLOGICAL ADAPTATION TO TERRORIST EVENTS**

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The phenomenon of terrorism is one of the greatest humanitarian crises with which contemporary civilizations are confronted and it is, therefore, imperative to explore how citizens cope with the demands posed by terrorist attacks, along with how they estimate that they will react to an event that they may witness in the future. Scientific literature suggests that citizens generally perceive a higher level of demands, in contrast to the number of resources available to them to cope with potentially stressful events. The terror that is generated by terrorist attacks consequently makes it urgent to explore these coping mechanisms, along with the resources, (e.g. social support), that are most effective as regards managing different levels and types of stress and, ultimately, the possible post-traumatic stress to which individuals may be subjected. To this end, the objective of this research is to obtain a multi-method approach that will allow the exploitation of resources and perceived requirements: 1) during a terrorist attack (Study 1), and 2) retrospectively based on a past reaction and prospective, by estimating the future possibility of witnessing a terrorist attack (Study 2). Study 1, in which a qualitative method was employed, aimed to explore the implicit and explicit indicators of appraisal in the process of psychological adaptation to terrorist events, specifically at the level of the perception of normative deviation. This study relied on a sample of citizens' online Twitter messages during the terrorist attacks of November 2015 in Paris. Study 2, in which a quantitative method was employed, had the objective of exploring the predictors of the psychological impact of terrorist attacks perceived by individuals, with the main focus being indicators of the appraisal process, in the form of perceived demands and available social resources. The results obtained from the qualitative analysis of twitter data and from the

analysis of a sample of responses after the application of a questionnaire made available to the general Portuguese population will be both presented and discussed in the poster presented.

**Keywords:** terrorism; stress; coping; appraisal; crisis communication

## CLIMATE/ENVIRONMENT

**27900**

### **RISK ANALYSIS IN CLIMATE CHANGE: HUMANS' ROLE IN THE 5TH ASSESSMENT REPORT OF IPCC**

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The IPCC (Intergovernmental Panel on Climate Change) is the international reference body when discussing climate change (CC), which is open to all member countries of the United Nations (UN) and WMO. Currently, 195 countries are Members and thousands of scientists from all over the world contribute to the work of the IPCC.

The Fifth Assessment Report (AR5), which is the most comprehensive assessment of scientific knowledge regarding CC since 2007, includes a consistent evaluation and assessment of uncertainties and risks; integrated costing and economic analysis; regional aspects; changes, impacts and responses related to water and earth systems, the carbon cycle, including ocean acidification, cryosphere and sea level rise, in addition to the treatment of mitigation and adaptation options within the framework of sustainable development.

The AR5 Synthesis Report (SYR) confirms that human influence on the climate system is clear and growing, with impacts observed across all continents and oceans. Many of the changes observed since the 1950s are unprecedented over decades to millennia. The IPCC is now 95 percent certain that humans are the main cause of current global warming. These and the other findings of the SYR have undoubtedly and considerably enhanced our understanding of some of the most critical issues in relation to climate change: the role of greenhouse gas emissions; the severity of potential risks and impacts, especially for the least developed countries and vulnerable communities, given their limited ability to cope, and the options available to us and their underlying requirements to ensure that the effects of climate change remain manageable. As such, the SYR is calling

this matter to the urgent attention of both policymakers and citizens of the world so as to tackle this challenge.

The negative influence of humans on the climate system is shown by means of a content analysis of the most relevant chapters and terms in AR5. The term “Human” appears 165 times, while the words most frequently associated with the term human are: system (59), which is neutral, and others with negative connotations, such as influences, contributions, interventions, pressures, activities, or induced warming, degradation or land-use change (57). The terms that refer to the effect of climate changes on humans are more scarce: human health (24).

**Keywords:** climate change; health; human system; risk; vulnerability

**27812**

## **METAPHORS ON CLIMATE CHANGE AND ITS INTERPRETATION BY CITIZENS**

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Climate change is an environmental risk that is widely covered by the media and is the subject of numerous scientific and political controversies. Unlike other environmental risks, it is not directly observable by the majority of the population, who usually lack direct experience of its effects. The social communication of this phenomenon, therefore, requires a high use of narrative devices and linguistic abstractions, among which are metaphors. A growing body of studies on media metaphors used to address climate change can be found in international literature. Here, we present the results of a study on the use of metaphors on climate change in the Spanish press, but focusing on Spanish citizens' interpretations of them. The research design is twofold: first, we have analysed the metaphors that appeared in the press during the celebration of the Climate Change Summit in Paris (December 2015); , after which we have carried out studies of two focus groups (8 people in each, one containing climate skeptics and the other containing concerned people), following a methodology based on a "reconvened focus group" and designed to capture citizens' perceptions and practical reasonings, called the STAVE (Systematic Tool for Behavioural Assumption, Validation and Exploration) method, which was developed in a former European project (PACHELBEL-FP7). Each group met three times over a month, a period which coincided with the aforementioned Paris Summit, and in between all the participants filled in a diary with their reflections about the news and its metaphors. Our research allowed us to explore how these people referred to climate change, identifying their common metaphors and confronting them with the press news on this subject, in an iterative process over a month that forced the group to reflect on the meanings of

the metaphors used. The results show how the population used its own metaphors and those emitted by the media, but adapted their meanings to their respective life contexts and experiences. This shows how the frames intended by the media are rebuilt by citizens and modified in everyday contexts.

**Keywords:** climate change; metaphors; risk perception; STAVE method; discourses

27670

## PSYCHOMETRIC PROPERTIES OF AN INSTRUMENT TO MEASURE PSYCHOLOGICAL DISTANCE OF CLIMATE CHANGE

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Climate change is a real threat whose effects are global in scope. Despite the evidence of this risk, a large part of the population perceives it as something uncertain or distant that will appear in the future, or that affects other people, in other countries. Psychological distance is a variable to be taken into account when studying the psychosocial factors that are involved in the risk perception of environmental problems, concern about climate change and the intention to act to mitigate this threat and its causes. A questionnaire was administered to 134 people, with the intention of validating an instrument that can be used to measure psychological distance. Factorial analyses were carried out, as the result of which two models were proposed. The first one did not have good internal consistency, and the corrections recommended in the second were, therefore, applied after modifying its factorial structure to obtain better reliability and validity results. Significant relationships were found between the psychological distance scale, according to Model 2, and the other variables studied.

**Keywords:** psychological distance; climate change; risk perception; psychometric properties; skepticism

**27842****DECODER: A FRAMEWORK FOR ASSESSING DEMANDS AND RESOURCES PERCEPTIONS ABOUT EXTREME WEATHER EVENTS**Samuel Domingos<sup>1\*</sup>; Rui Gaspar<sup>2,3</sup>; João Marôco<sup>1</sup>; Hugo Fonseca<sup>4</sup><sup>1</sup>Instituto Universitário de Ciências Psicológicas, Sociais e da Vida, Portugal<sup>2</sup>Universidade do Algarve, Portugal<sup>3</sup>Universidade Católica Portuguesa, Portugal<sup>4</sup> ISCTE-Instituto Universitário de Lisboa, Portugal\*E-mail: [samuel.domingos@sapo.pt](mailto:samuel.domingos@sapo.pt)

Environmental and social changes (e.g. the occupation of previously inhabited areas) have led to an increase in reports of extreme weather events (e.g. heatwaves, droughts, storms, floods) with consequences for human populations (IPCC, 2014; WEF, 2017). It is, therefore, necessary to accurately communicate the demands created by these events and the protective resources that are available to deal with them, on the basis of scientific evidence from research that will make it possible to understand adaptation and mitigation strategies for these events (Clayton et al., 2015; Swim et al., 2011; IPCC, 2014; WEF, 2017). Understanding the perceived existing demands and resources of the different people and organizations involved or affected by these events (e.g. citizens, civil protection agents), associated with different extreme weather events occurring in different geographical locations, may, therefore, serve as a step by which to improve risk communication (e.g. between and from different organizational structures).

In order to achieve this goal, we propose a theory-driven data collection and coding framework (DeCodeR) with which to assess perceptions of demands and resources as regards extreme weather events, grounded on the Biopsychosocial Model of Challenge and Threat (e.g. Blascovich & Mendes, 2000). The framework, therefore, allows a multidimensional assessment of reported demands (perceptions of associated danger; effort; and uncertainty) and resources (perceptions of associated knowledge, abilities and skills; traits and states; and external support).

Overall, the proposed framework is sufficiently flexible to be adjusted to different target populations/samples and different extreme weather events. This allows comparisons to be made between populations/samples and the creation of different typologies of existent (e.g. prevalent) perceptions of demands and resources. For example, studies can be developed to explore civil protection agents' (e.g. police, firefighters, decision makers) and citizens' (e.g. lay people) perceptions of specific extreme weather events, thus allowing the comparison and identification of communication and intervention needs.

Data collection and coding procedures, will be presented together with category definitions and examples. The implications and advantages of using this framework in research and practice will be discussed, focusing on risk communication and the promotion of adaptation and resilience to extreme weather events.

**Keywords:** data collection and coding; extreme weather events; beliefs; demands and resources

**27914****ON PHARMACEUTICALS IN THE ENVIRONMENT: COMBINING EXPERT  
AND LAY PEOPLE RISK PERCEPTIONS**

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Pharmaceuticals in the environment are an emerging risk. Although risk assessments indicate negligible risks for most pharmaceuticals, there are many uncertainties and knowledge gaps that challenge risk management and communication, and it is consequently fundamental to understand the risk perception of both experts and lay people. In this study we, therefore, applied the psychometric paradigm to not only to lay people, as usually occurs, but also experts. The goal was to find a common ground for risk management. The results obtained from samples of lay people and experts from three Southwestern European countries (Portugal, Spain, and France) as regards the hazards of pharmaceuticals in the environment in general, in waste water, in fresh water and in crops, evidenced two factors, which explained most of the variability of the data, as expected. Factor 1, dread, combined with the immediate effects, the dreadful nature of the hazards, and the severity of consequences. Pharmaceuticals in crops and fresh water scored higher in this factor. Unexpectedly, the experts scored higher than the lay people. Factor 2 clearly distinguished between the assessments made by lay people and experts. These evidenced that, for lay people, the risk was more known, voluntary, and controllable by those exposed, although unknown to science. The environmental risk perception of the four hazards was explained by this factor only. The health risk perception, however, was not explained by any of the factors. This suggests that it is more complex to understand the health risks related to exposure to pharmaceuticals in the environment, possibly not only

because of its indirect path, but also because of the undisputed benefits of pharmaceuticals to health.

**Keywords:** risk perception; pharmaceuticals in the environment; lay people; expert; psychometric paradigm

**27817****RISK PERCEPTION OF PHARMACEUTICALS RESIDUES RELEASED TO THE ENVIRONMENT IN SENIOR RESIDENCES**Lucía Poggio<sup>1\*</sup>; Juan Ignacio Aragonés<sup>2</sup>; Sílvia Luís<sup>3</sup>; Maria Luísa Lima<sup>3</sup>; Audrey Courtier<sup>4</sup>; Benoit Roig<sup>4</sup><sup>1</sup>Universidad Europea de Madrid, Spain<sup>2</sup>Universidad Complutense de Madrid, Spain<sup>3</sup>ISCTE-Instituto Universitário de Lisboa, Portugal<sup>4</sup>Université Nimes, France\*E-mail: [luciapoggio@psi.ucm.es](mailto:luciapoggio@psi.ucm.es)

The consumption of pharmaceuticals can lead to a decrease in water quality and could, as a result, represent a threat to people's health and the environment and to people's quality of life. Pharmaceutical waste appears every day by means of the metabolization of the drugs themselves, which are transformed into highly polluting chemicals that reach river waters without being subject to any debugging. In the European context at least, there is a high consumption of drugs at residential homes for the elderly, leading to high amounts of pollution resulting from the sewage that originates there, and it is, therefore, necessary to carry out an urgent technological intervention in order to prevent the pollution of these waters. This issue has not, however, been addressed by technology, nor has an assessment been made of the risk perceived by the managers, technicians and residents in these homes. When confronted with a potential technological intervention, a situation like this requires knowledge of the perception of risks as regards the treatment of drugs in the environment, and of the treatment of the pharmacological effluent produced by the residents at homes for elderly people.

In order to improve the quality of the aquatic environment, the Innovec'EAU Project (SOE1/P1/F0173) is conducting a study of the wastewater discharges of establishments for elderly people, and particularly retirement homes, located in the Southwest of Europe, in order to implement pilot technologies with which to treat and monitor drugs residues. This project is part of a sustainable development strategy and will integrate environmental, sociological and economic issues. These

actions will be facilitated with the engagement of institutions specialized in care for elderly people in the consortium as associated partners and, more precisely, SYNERPA (France), SCML (Portugal), L'Onada and Sant Joan de Deu (Spain), which are potential users of this technology.

**Keywords:** pharmaceuticals; pollution; wastewater; senior residences

## LAW & ECONOMICS

**27907**

### **IS THE SPANISH LEGISLATION SUITABLE FOR PREVENTING NATURAL HAZARDS?**

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Natural hazards are increasing the socio-economic losses all over the world, usually owing to erroneous land use planning. The Sendai Framework for Disaster Risk Reduction is prioritizing both urban planning and sectoral laws and regulations as preventive tools. However, the latter are not enforced in Spain, and master plans are not considering natural hazards. Public Administrations should be liable for socio-economic losses if they do not take into account the scattered legislation regarding natural hazards. The specific legislation dealing with floods has recently been updated in accordance with European Directives, although legislation concerning earthquakes and ground movements has not been implemented, probably because of the low socio-economic impact of the former and the minimum impact linked to a single landslide. The prevention of natural hazards is difficult in Spanish urban planning owing to the scarce remission from laws to regulations and standards, which should establish methodologies and procedures for natural hazard reports and maps. The existence of extra-legal concepts and undefined legal concepts or the complexities of establishing the competence among different administrations make it difficult to enforce the legislation. This communication, therefore, presents a review of the Spanish legislation related to natural hazards and how to improve it in order to prevent the damage triggered by them.

**Keywords:** legislation; natural hazards; prevention; urban planning

**27831****CRIMINAL LAW AND RISK ASSESSMENT, THE FUTURE IS NOW**María Pilar Marco-Francia<sup>1\*</sup><sup>1</sup>Universidad de Castilla-La Mancha, Spain\*E-mail: [pilar.marco@uclm.es](mailto:pilar.marco@uclm.es)

Risk management and risk assessment are not frequently applied in the area of Criminal Law. On the contrary, violence and crime assessment in our country are characterised by clinical judgement. However, issues such as dangerousness, the risk of re-offending, the imposition of post-criminal security measures, i.e. freedom under surveillance, probation, parole, and deciding whether or not to apply aggravating circumstances such as recidivism or according (or not) a restraining order, are very topical issues in Criminal Law, and it is difficult to come up with adequate solutions to the problem of risk assessment. The purpose of this communication is to envision and advocate the implementation of complementary actuarial techniques in our judicial system. These techniques are likely to be a valid tool with which to help us to assess the risk of re-offending. To this end, we examine previous issues related to criminal dangerousness, -although the concept of dangerousness itself is considered to be old fashioned, and we should, therefore, really refer to the risk of violence- and then proceed to analyse the following approaches for risk prevention: clinical judgment, tools for structured clinical judgment and a description of the most widely used actuarial models, paying particular attention to sexual violence.

**Keywords:** dangerousness; re-offending risk; risk of violence; actuarial techniques; criminal law

**27676****THE REGISTRY OF ACCREDITED FIRMS IN THE CONSTRUCTION SECTOR  
IN SPAIN: AN ADMINISTRATIVE INSTRUMENT FOR RISK-PREVENTION  
CONTROL**

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This research provides evidence as to the level of compliance and observance with the Registry of Accredited Firms among Spanish public administrations. The REA was established for the purpose of risk-prevention control and is defined in the legislative framework of Law 32/2006 regulating subcontracting in the Construction Sector. This research brings to light a situation of “bureaucratic double-standards” with regard to all the demands and requirements that firms within the private sector are expected to fulfil. On the basis of a quantitative analysis of the data obtained from public entities registered with the REA, it was decided to limit the study to those public authorities defined as: city councils and provincial councils. The inscriptions in the REA of both types of public authorities were, therefore, analysed at a nationwide level, specifically, the 50 provinces and 2 autonomous cities that form part of the 17 Autonomous Regions of which the national territory of Spain is composed. Data management tools that are available to the public were used in conjunction with publicly available documentation, and particularly the List of Employment Positions [Relación de Puestos de Trabajo] (Spanish acronym: RPT) of the corresponding public authorities under study, so as to compare and to validate the data and the level of reliability. The results highlight the bureaucratic hurdles that private firms in the Construction Sector have to negotiate, as opposed to the scant or even null compliance with the REA by Public Administrations.

**Keywords:** Registry of Accredited Firms; prevention; subcontracting law; public administration; construction

**27811****THE RELATIONSHIP BETWEEN THE VARIABLES “ MAIN FLOOR OF HOUSES WITH RESPECT TO THEIR URBAN SURROUNDINGS” AND MODELS FOR THE ESTIMATION OF ECONOMIC LOSSES OWING TO FLOODS**

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There is a generalized consensus as to the influence of the representativeness of the digital elevation models used in the two-dimensional (2D) hydraulic modeling of urban areas on the estimation of the economic losses associated with floods. However, once a precise DEM has been obtained, the economic damage is determined by crossing the results provided by the hydraulic models with the situation of the goods exposed. Little attention is, however, paid to another singular factor, such as the relation in the topographic variable “Z”, between the level of the main floor of the house and the land surrounding it that is not built on. In order to assess the influence of this variable, the relationship between these two variables was estimated in the locality of Navalunga (Avila, Central Spain). This information, together with the hydraulic models for water flows with different return periods and the corresponding magnitude-damage functions (structure and content USACE functions for houses with one or more storeys and with or without a basement), allowed the estimation of economic damages when considering or not considering this variable.

The results cannot be considered homogeneous, and they show that the constructive model of houses will have a decisive influence on the economic losses linked to the different scenarios considered. Economic damage reduction is, therefore, higher for houses with a basement, in which case the percentage of reductions ranges from 30% to 68%. For houses without a basement, the

reductions in damage are always lower, and range from 12-24%. These differences are owing to the mean over-elevation value for houses with a basement (higher than houses without a basement), and the characteristics of the different magnitude-damage functions used for each house type. The results obtained in Navaluenga show an average value of up to 30 % of over-estimation of economic losses owing to floods (regardless of the return period or the type of housing), which can be directly associated with the variable being analysed. In the absence of detailed studies such as this one, these percentages regarding over-estimation could be taken into account for flood risk estimation in other localities with the same characteristics as Navaluenga village.

**Keywords:** floods; magnitude-damage functions; economic losses model; main floor of a house; 2D hydraulic model

**27792****RISK ANALYSIS AS A TOOL FOR PRIORITIZING INVESTMENTS**Álvaro Galán-Alguacil<sup>1</sup>; Carmen Castillo-Sánchez<sup>1\*</sup>; Luis Rodríguez-Romero<sup>1</sup><sup>1</sup>Universidad de Castilla-La Mancha, Spain\*E-mail: [mariacarmen.castillo@uclm.es](mailto:mariacarmen.castillo@uclm.es)

Many countries worldwide have already made a great economic effort as regards the construction of infrastructures. However, the recent financial crisis has led to a situation in which most of the efforts are currently devoted to their conservation and maintenance, rather than building new ones.

The evaluation of risks, especially of those associated with climate change, is a very useful tool to help in decision making.

A key point in this decision making process is how to prioritize investments when deciding on adaptation or mitigation alternatives.

The objective of this work is to provide a proposal containing tips that will help to select from among the possible alternatives based on the previous implementation of a risk analysis and budget availability. Several economic scenarios can be considered: full availability and different budget constraints.

The starting point for the proposal includes a risk register comprising descriptions of the risks and their associated risk levels. It also requires the risk response plan, with each of the alternatives and their main features: cost and the reduction in risk level achieved when implementing it. For each alternative, a new quantitative risk analysis must be undertaken in order to obtain the reduction in risk level.

Finally, the alternative selection is performed on the basis of how each one modifies the risk level when compared to the do-nothing alternative, the cost involved in implementing it and the remaining available budget.

Prioritization can be applied to several scales: a small scale (e.g. focussing on one risk and comparing only those alternatives affecting that risk level), a medium scale (e.g. considering a single element or part of the infrastructure and comparing those alternatives that affect any risk levels related to that element or part) or a

large scale (e.g. considering the structure as a whole and, therefore, including all alternatives and risks). In all cases, the cost-efficiency relation (in terms of risk level reduction) is the key point for alternative selection.

**Keywords:** risk-based design; prioritizing investments; risk levels; climate change; decision making

## CIVIL ENGINEERING RISK MANAGEMENT

**27791**

### **APPLYING RISK MANAGEMENT PROCESSES TO CIVIL ENGINEERING SYSTEMS**

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It is currently necessary to consider the situation as regards the maturity of the infrastructure management of many civil engineering systems worldwide. Civil engineers and managers are, therefore, forced to focus on phases such as the conservation, maintenance, restoration or dismantling of these infrastructures. Risk evaluation may be a very useful tool with which to help decision making as regards where to start dealing with these phases.

The objective of this work is to describe a methodology that will allow the application of risk management processes from the Project Management Institute to the different types of civil engineering systems under study. These processes are: identifying risks, performing qualitative risk analyses and performing quantitative risk analyses.

The first step involves understanding how the system works in order to identify risks, potential responses and stakeholders. New risks may arise at any time during the analysis process and they should all be included in a risk register.

The qualitative analysis is then applied to all of them by combining the results from the probability and impact matrix in a severity calculation and concluding which of them are prioritized risks and must, therefore, undergo a quantitative risk analysis.

Finally, the Montecarlo simulation technique is used to carry out the quantitative risk analysis, since both the loadings and the responses of the system are stochastic in nature. Understanding how the system works is a key factor for this final process. The results of this final step are risk levels ranging from 'No risk' to 'Very high risk'. Four terms are combined to provide risk levels: the probability of each risk occurring, risk intensity, vulnerability and exposure (which, when

combined with vulnerability, defines the consequences if a risk of a given intensity occurs).

The methodology has been applied to two case studies: Dique del Oeste, a rubble mound breakwater located in the Port of Palma (Mallorca, Spain) and a coastal sanitation system (sewage treatment plant and marine outfall) in the province of Málaga (Spain).

**Keywords:** civil engineering systems; decision-making tools; risk levels; Montecarlo simulation

**27182****OBSERVING EMOTIONAL STATES TO EVALUATE PSYCHOSOCIAL RISK IN CONSTRUCTION ENVIRONMENTS**

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When improving prevention systems in building processes, the fundamental characteristic parameter employed to evaluate occupational hazards on construction sites is the participation of all building agents and workers. This is achieved by contributing to the improvement of the physical and geometric design characteristics within building process documentation, by enhancing material and human resources, together with onsite prevention systems in the building environment, and by improving cooperation and satisfaction levels among workers.

Learning to observe people on various construction sites and in their workplaces is crucial as regards discovering unsafe or unsatisfactory practices, since accident prevention and risk management are a priority in the construction industry. In this context, accident rates are very high and psycho-social sciences take into account different factors, such as work control, the usage of protection equipment, personal responsibility, security training, social support, commuting accidents and psycho-social discomfort.

Our risk evaluation method, which has been adapted to construction work and is denominated as Level of Preventive Action (Lpac), comprises the following key environments in building processes: documentation, construction and social interaction. The psychosocial risk evaluation derived from this method, when applied to a social interaction environment, implies the following parameters: participative interest, which analyses individual and group behaviour and attitudes, and satisfaction level, which evaluates staff's direct interaction through the use of a psychosocial survey that measures workers' subjective perceptions of their

satisfaction levels. The results obtained during the implementation phase of the aforementioned method are shown in two categories: on the one hand, coherence between the answers obtained from workers and evaluators, and on the other, the evolution over time of both participative interest and satisfaction levels. The foundation of this procedure is the different emotional states with which onsite workers identify themselves during data acquisition.

**Keywords:** mood; perception; health and safety; risk assessment; building

**27797****FUKUSHIMA: BLACK SWAN OR NORMAL ACCIDENT? TOWARDS HROS**María Francisca Casado-Claro<sup>1\*</sup><sup>1</sup>Universidad Europea de Madrid, Spain\*E-mail: [francisca.casado@universidadeuropea.es](mailto:francisca.casado@universidadeuropea.es)

An earthquake that reached level 9 on the Richter magnitude scale struck the North Eastern coast of Japan on March 11, 2011, and was the largest ever to be registered in the country since measurements began. The tsunamis that it provoked went inland, sowing devastation and causing a serious accident at the Fukushima Nuclear Power Plant. On a par with Chernobyl, the accident reached level 7 on the IAEA's International Nuclear and Radiological Events Scale .

The Japanese coast had experienced tsunamis before, but never of this kind. At some points on the coast, waves reached 40 meters in height and penetrated up to 6 kms. inland. It was a rare phenomenon of the kind that only occurs once every thousand years, and is referred to by some experts as a "black swan", whereas the owner and operator of the damaged nuclear power plant (Tokyo Electric Power Corporation, TEPCO for short) described it as "souteigai" (out of all that was foreseen, unpredictable).

Furthermore, the report that the Japanese Diet commissioned from the Nuclear Accident Independent Investigation Commission (NAIIC) defines it as a "Made in Japan" disaster, attributing it to certain aspects of Japanese culture. What at first sight seemed to be an accident caused by the conflation of two natural phenomena (earthquake and tsunami), proved to be the result of a series of human mistakes.

Fukushima better falls into the "na-tech" category, which encompasses technological accidents triggered by natural forces, which will become increasingly frequent in our "risk society". Applying the concept coined by Charles Perrow in the wake of the Three Mile Island nuclear accident, this poster will explore the reasons why Fukushima can be categorised as a "normal accident". It will also identify the organizational cultural shortcomings that led to the lack of security that caused the accident and it will offer congress participants some insights into

how to foster a true safety culture, which in turn contributes to generating High Reliability Organizations (HRO) and systems.

**Keywords:** Fukushima; na-tech; black swan; normal accident; nuclear accident

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