

24 months post-doctoral position: Development of methods and tools for the representation of multirisk scenarios in the Mediterranean area

The post-doc is part of the MIRIADE project (Representation of multirisk scenarios for decision-support and communication to a wide audience) funded by A*MIDEX. The inter and transdisciplinary project involves 3 research teams (RECOVER, CEREGE and LIEU). The project specifically concerns flood, forest fire and earthquake risks. The Mediterranean area is the privileged study territory.

Context

In recent decades, disasters related to natural hazards have continuously increased, in particular due to the growing exposure of the world's urban population. The consideration of technological risks further aggravates these figures. A natural risk can also lead to a technological one in the same geographical area and result in a "NaTech" event. Finally, global change is likely to increase the exposure of populations through changes in the magnitude, frequency and spatial distribution of hazards. Multirisk can be defined as a complex system composed of different hazards (natural and/or technological), which can act in combination – with or without coincidence in time – and impact on potentially dependent issues. Indeed, under certain conditions, different combinations of natural and technological hazards are likely to occur: *e.g.* earthquake followed by a tsunami, flooding impacting facilities, domino effect between industries, cascade effect between infrastructures. These hazards threaten the same natural and/or man-made issues, each presenting economic, social, technical, human and environmental vulnerabilities. Risk management measures are typically put in place to reduce the impacts. Disasters caused recently by flood in Pakistan, or Hurricane Katrina in the United States in 2005, or Hurricane Matthew in 2016 affecting the population of Haiti which had not yet recovered from the 2010 earthquake, or the earthquake, tsunami and accident at the Fukushima power plant in Japan in 2011 (NaTech) are emblematic examples of multirisk events. However, smaller events are also likely to lead to cascades of events highly damaging to communities. The Mediterranean basin is unfortunately not immune to this type of event: for example, the Aquila earthquake in Italy in 2009; the mega-fires in Greece in 2018; the floods in south-eastern France and northern Italy in October 2020. Their impacts affected populations, infrastructure (road network, electricity, etc.). However, smaller events are likely to result in a highly damaging aftermath for communities.

To better understand and prevent this type of event, a major challenge lies in the formalisation of knowledge and the representation of scenarios, from the triggering of the initiating event to the return to normal. The MIRIADE project focuses on this theme: it aims at developing an innovative approach and a toolbox for the representation of complex, dynamic and dependent multi-risk events that can occur in a given geographical area. More precisely, the challenge is to identify, build and represent dynamic and potentially multi-scale models in a way that is intelligible, at the right level of detail, and appropriable by the different actors involved.

Objectives

The post-doctoral fellow will contribute to the different WPs structuring the project:

1- Conceptual analysis for the characterization of hazards and elements at risk, data collection and formatting. More specifically, the post-doctoral fellow will (1) propose a matrix for analysing the characteristics of the risks (hazards addressed in the project, corresponding issues and safety barriers); (2) collect and format the data gathered on the various case studies: from the international literature, from current or past projects carried out by members of the MIRIADE team, from lessons-learned performed by stakeholders

2- Development of a collaborative framework. The main expectation here is to collect the expectations and needs of the stakeholders regarding the multi-risk issue, based on interviews, questionnaires or workshops. The information practices of the stakeholders will be collected in order to determine the methods used to acquire information on risks (documents, websites, public meetings, etc.) and their preferences regarding these methods. These stakeholders may come from different backgrounds: local authorities, infrastructure managers, emergency services, research and educational institutes, the general public, associations, etc. Data on past cases in particular could also be collected from these stakeholders.

3- Modelling of multirisk scenarios integrating spatial and temporal dimensions. The objective is to develop a prototype tool based on cause-effect chains (use of methods derived from dependability analysis such as event trees) and a tool for the cartographic representation of these chains (based on a geographic information system). Validation on case studies will be carried out.

In addition, the post-doctoral fellow will be strongly involved in the supervision of the trainees planned during the project. He/she will also be able to participate in the construction of the teaching module planned in MIRIADE.

Supervision

The post-doc will be supervised by Corinne Curt (RECOVER) and Lionel Siame (CEREGE). The candidate will work in collaboration with all the members of the MIRIADE team (specialists in decision support, fire ecology, geography, hydrology, risk management, seismology).

Location: Aix-en-Provence

Period: June 2023 - May 2025 (24 months)

Requirements and skills

Candidates must hold a PhD and have strong skills on at least one natural and/or technological hazard or risk and its management.

Skills:

- Ability to work in groups
- Ability to work in an interdisciplinary and transdisciplinary context
- Writing skills, especially in English

- Fluency or good knowledge in French is important for the cooperation with local authorities
- Experience in conducting interviews or workshops would be a plus
- Knowledge of dependability approaches or spatial mapping methods would be appreciated

How to apply

Please send a cover letter indicating how you meet the criteria outlined in the job description and CV by e-mail to Corinne Curt (corinne.curt@inrae.fr) and Lionel Siame (siame@cerege.fr). The closing date for receipt of applications is 19th March 2023. An interview will be organised with the selected candidates after examination of the CVs and cover letters.