PhD offer in Geosciences at Université de Lorraine, Nancy, France

Title of the PhD thesis: ***Multidisciplinary risks assessment of the mining sector for territorial planning. Development of a prototype decision-making tool based on the example of gold mining in French Guiana.***

Offer description / Abstract: Mining is a source of positive and negative impacts of different natures, that generally exceed the perimeter of mines sites, and that may have consequences on the wider socio-ecological systems in which they are located. On the other hand, mining projects also usually suffer from other types of risks caused by the surrounding human and natural environment.

We claim that mining projects should be considered as a matter of land-planning rather than simple industrial objects. Consequently, mining risk and impact assessments should include a holistic understanding of mining projects at a larger scale, showing how these activities possibly interact with the external environment.

In a previous PhD thesis (2020), by Ottone Scammacca (https://videos.univ-lorraine.fr/index.php?act=view&id=12637), the theoretical grounding of a methodology for risk assessment of mining projects at the territory scale was developed on the example of French Guiana (FG), where gold exploitation plays a critical role within the dynamics of the territory, as this activity takes a great variety of forms and techniques. A multi-criteria classification of gold mining projects in FG was proposed, with the objective to develop a standardized gold mining typology for further risk assessment purposes at the territory level. For each mining project type, an overview of the main potential impacts at the territory level was presented. A first series of maps was produced, showing the negative impacts of different mining development scenarios in the Mana River watershed, taking the failure of a mining dam as the main central event.

The objective of the future PhD project is to continue and develop this preliminary work by extending the approach to both positive and negative impacts, considering other generating events than the failure of a mining dam, and also taking into consideration the ordinary impacts caused by normal activity of projects. A special attention will be given to illegal gold mining projects and also to the definition and evaluation of the territory vulnerability components. A prototype of a decision-making tool will finally be developed in order to simplify the application of the developed methodology and to automate the cartographic

impact assessment processes currently carried out manually. The objective is thus to be able to compare different development scenarios of the mining sector, by considering their potential positive and negative impacts on the territory. Application of such a tool in FG and elsewhere would allow a better integration of the mining sectors in the local socio-economic and ecological context.

The main tasks of the future PhD thesis will be as follows:

- A thorough literature review on: mining project and territorial risk management, the French Guiana context, and the mining projects (legal and illegal) on the territory, the vulnerability assessment and resilience at the territorial level, methodologies of environmental and social risk assessment, multi-agent simulation based on GIS data.
- At least two long stays in French Guiana: the objective will be to meet and discuss with various stakeholders involved in mining projects (population, administration, mining operators, etc.) and collect the necessary data.
- Identification and classification of major risks caused or suffered by mining projects, with the consideration of other triggering events, not only tailings dam failure. The risk assessment method initially developed by O. Scammacca will have to be improved and enhanced by considering the risks related to other important events.
- Integration, within the analysis, of the risks related to the ordinary functioning of gold mining projects (positive and negative chronic risks) and comparison of mining development scenarios.
- Definition and evaluation of the territorial vulnerability components regarding the direct and indirect impacts of the mining sector.
- Identification or development of operational methods to evaluate the impacts of mining projects, using quantitative and/or qualitative scales. This step concerns in particular the environmental and societal risks.
- Development of a prototype of a decision-making tool designed to simplify the application of the developed methodology and to automate the cartographic impact assessment processes currently carried out manually. Multi-agent simulations based on GIS data could be a suitable solution. Development of an agent-based model will centralize GIS data as well as information related to: mining projects, the vulnerability of targets (at different scales: from the project to the territory), the potential consequences on targets (positive or negative at different scales), and the project risk assessment results. Such a tool, with a user-friendly interface, will make the developed methodology more precise and more operational. Thus, a dynamic analysis considering the interactions defined between different agents present on the territory (mining projects, population, natural environment, etc.) will make it possible to study the evolution over time of the consequences induced or suffered by mining projects.

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Researcher profile: First stage researcher (R1)

Research field: Geosciences, Geography, Environmental science

Type of contract: Temporary, full time (35 hours a week)

Deadline for submitting your online application: 07 March 2021 12:00 PM (Paris time)

Start date of the project: May/June 2021

Duration: 3 years

How to apply: https://forms.gle/bLmKREZWgYEFKg6C7

Hiring organisation: Université de Lorraine – GeoRessources lab, campus Artem, Nancy, France (http://georessources.univ-lorraine.fr/fr)

Sources of funding: "Ressources21" Laboratory of Excellence (http://ressources21.univ-lorraine.fr) and "Mining industry and Territorial Dynamics" Chair (http://www.industrie-minerale-territoires.fr)

Required education level: Master degree or equivalent, in Engineering, Environmental science, Geography or Geosciences

Required languages: French (excellent), English (Excellent)

Eligibility criteria: as our laboratory is classified as a "sensitive laboratory with reinforced protection", the final recruitment of the selected candidate will be subject to the acceptance of his/her administrative file by the Security and Defense Project Manager.

Selection process: Application pack is: a resume + abstract of your MSc thesis. An interview of selected candidates will be organized in March 2021.