A formalization of threat for dealing with natural and industrial risks - Integrating Sen's capability approach in an evaluation of loss and protection within a population

Supervisors
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Motivation and background
In his thesis "Facing threats by sharing information: case studies and multi-agent simulation", Nicolas Paget, PhD student at LAMSADE, introduced the notion of threat for actors, in a context where producers can lose assets, but also see their ability to produce be reduced.

The goal of this PhD proposal is to explore the links between the notions of threat and of risk in order to obtain a novel approach to natural and industrial risks assessment and management (see Bedford and Cooke, 2001; Wakker, 2010, Douglas and Wildavski, 1983). Our idea is that a threat should be defined as a reduction on the capabilities of some actors rather than directly on their goods/assets (endowments). Sen's capability theory (Sen 1992, 1993) is a normative framework that aims at evaluating individual well-being as well as social arrangements. In Sen's approach, people's well-being is assumed to depend on their capabilities, like the opportunities that are available to them. The focus is not on the possessed goods, but rather on the freedom of action that people possess thanks to the goods they possess, as well as their social environment.

Different types of threats can be defined, like natural hazards, misbehaviour of an agent, unwarranted behaviour of an agent, and strategic behaviour of an agent. Individual actions can be seen as a defence performed by an agent against an event that menaces its assets. A defence can take two dimensions, as studied in insurance theory: either self insurance (reducing the negative impact of an event) or self protection (reducing the probability of occurring of an event) (see Ehrlich and Becker, 1972).

The principal aim of the thesis is to contribute in establishing a theory of "collective risks" (threats to a population, a territory etc.) without necessarily making references to individual risks or computing them. Among the interesting research questions that such approach would raise, we mention the following ones: How to aggregate the goods/assets for a given collective setting (public goods, common
pool goods etc.)? How to establish the loss of capabilities for groups? Can we define Pareto optimal defences, fair defences, following the repartition of initial capabilities of the agents in a group?

**Candidate’s profile**

The PhD is pretty theoretical and interdisciplinary. We are looking for brilliant students with strong background in one among Computer Science, Mathematics or Economics and willingness to enhance knowledge in the other ones. Motivated candidates should get in touch with Juliette Rouchier, juliette.rouchier@dauphine.fr, before 7th June 2016.

**References**


