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# Exploration of the long term sustainability of the French Risk Management

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## Abstract

Public flood risk management (FRM) in France, as in other countries like USA, Great Britain, relies on a combination of tools dealing with the negative consequences of flood. Spatial scale of those tools differs: insurance is defined and managed at national scale, land use regulation is defined at national scale but implemented at local scale, protection against flood may be implemented at local or even individual scales. The objective of this communication is to build a model for the analysis of the sustainability of the French FRM. For this, we used a simple but contextualized agent-based model (Cat-Nat ABM).

In Cat-Nat ABM, three different agents are defined: individual agents (inhabitants that decide to settle in or leave some territories), collective agents (collectivities managing one territory, trying to make it attractive, resisting to land use regulation, correcting some consequences of flood, implementing collective protections), and national agent (State, managing the Cat-Nat fund, which is basically seen as a public flood insurance, ruling land use occupation). Though, three levels of vulnerability are interlinked: inhabitants may suffer direct and indirect damage from flood, collectivities may see their development in danger because of inhabitants leaving (because of flood) or not settling (because of land use regulation), State may be in trouble if the Cat-Nat fund capacity is not sufficient for big events. The national territory is divided in independent catchments, on which flood events are simulated as stochastic events. Catchments are divided in different territories, each being rules by a collectivity.

We demonstrates how the exploration in the long term (about one hundred years) the sustainability of the Cat-Nat fund, collectivities' budget can give insights on the resilience of the whole system. We particularly discuss the influence of initial exposure to risk, options in FRM, influence of Climate Change on flood occurrence.

**Keywords:** *Flood risk, Insurance, Sustainability, Agent-based model, Scale, Exploration*