



Adaptation to hydrological extremes through insurance: a financial fund simulation model under changing scenarios

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Researches from around the world relate global environmental changes with the increase of vulnerability to extreme events, such as heavy and scarce precipitations - floods and droughts. Hydrological disasters have caused increasing losses in recent years. Thus, risk transfer mechanisms, such as insurance, are being implemented to mitigate impacts, finance the recovery of the affected population, and promote the reduction of hydrological risks. However, among the main problems in implementing these strategies, there are: First, the partial knowledge of natural and anthropogenic climate change in terms of intensity and frequency; Second, the efficient risk reduction policies require accurate risk assessment, with careful consideration of costs; Third, the uncertainty associated with numerical models and input data used.

The objective of this document is to introduce and discuss the feasibility of the application of Hydrological Risk Transfer Models (HRTMs) as a strategy of adaptation to global climate change. The article shows the development of a methodology for the collective and multi-sectoral vulnerability management, facing the hydrological risk in the long term, under an insurance funds simulator. The methodology estimates the optimized premium as a function of willingness to pay (WTP) and the potential direct loss derived from hydrological risk. The proposed methodology structures the watershed insurance scheme in three analysis modules. First, the hazard module, which characterizes the hydrologic threat from the recorded series input or modelled series under IPCC / RCM's generated scenarios. Second, the vulnerability module calculates the potential economic loss for each sector¹ evaluated as a function of the return period " T_R ". Finally, the finance module determines the value of the optimal aggregate premium by evaluating equiprobable scenarios of water vulnerability; taking into account variables such as the maximum limit of coverage, deductible, reinsurance schemes, and incentives for risk reduction.

The methodology tested by members of the Integrated Nucleus of River Basins (NIBH) (University of Sao Paulo (USP) School of Engineering of São Carlos (EESC) – Brazil) presents an alternative to the analysis and planning of insurance funds, aiming to mitigate the impacts of hydrological droughts and stream flash floods. The presented procedure is especially important when information relevant to studies and the development and implementation of insurance funds are difficult to access and of complex evaluation. A sequence of academic applications has been made in Brazil under the South American context, where the market of hydrological insurance has a low penetration compared to developed economies and insurance markets more established as the United States and Europe, producing relevant information and demonstrating the potential of the methodology in development.

¹Economic sector related to the use of water and soil, e.g. water use of industrial sector, agricultural sector or urban water consumption. On the other hand, land use as residential, commercial or services areas.