

Climate Risk Modeling and Management

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Rationale

Losses from extreme weather events increased over the last decades globally. (Re)Insurance has proven a successful measure in supporting a quick and resilient recovery of communities affected by extreme weather events. The present Working Group (WG) aims at addressing some of the challenges associated with modeling risk from extreme weather events and the design of insurance products, spanning from how to improve simulation models, to the design of new and innovative insurance products, to the definition of new frameworks for assessing systemic risk. In particular, the WG focuses on:

1. *Improving natural catastrophe models.* The design of (re)insurance policies relies on the estimation of risk, which nowadays more and more involves the use of simulation models known as *natural catastrophe models*. The value of these tools for risk assessment and management improved over the years thanks to increasing research, data availability and computational power. Yet, significant gaps are identified, which relate to many research opportunities, such as:
 - a. Establishing a framework for the treatment of model uncertainties (via a global sensitivity analysis) and disagreements between outcomes of different models
 - b. Providing a comprehensive modeling of indirect impacts
 - c. Thoroughly modeling climatic and socioeconomic changes, including feedback mechanisms
 - d. Expanding from single to multi-hazard modeling
 - e. Benchmarking and evaluation of models, based on an assessment of available observational data, involving methods of data-driven science or machine learning

2. *Designing new and innovative insurance products which consider the value of ecosystems.* Most (re)insurance policies fail to recognize the value of insurance for ecosystems, i.e. the role of insurance and other risk transfer and economic instruments in protecting and restoring ecosystems and their services. With the increasing recognition of the value of nature-based solutions as protection measure against natural hazards, insuring ecosystems and their services could be a valuable solution. Some efforts from the (re)insurance industry already point towards this direction. For example, a parametric re-insurance product has been created for the sake of protecting

the Mesoamerican Barrier Reef System from hurricanes. This allows strengthening the resilience capacity of the region as the coral reef prevents beach erosion and proves crucial in sustaining the tourism and fishing industries.

3. *Modeling spill-over mechanisms from insurance to the public sector.* In the late 90s, after cyclones Lothar and Martin, some primary insurers did not have the capacity to pay out settlements for the damage. When this happens, the burden of providing financial support falls on the public. It is paramount to better study and analyze these scenarios also in light of climate change.
4. *Modeling of systemic risk.* Emerging and systemic risks arise from the interaction of phenomena in a complex system, they are poorly understood and do not have a track record which can be used to estimate likely probabilities and expected losses. When faced with such risks, commonly used statistical techniques may fall short and thus new methods to risk quantification may be needed.

Activity

The group's main goal is to carry out and disseminate scientific research in the areas above. This includes activities like 1) organizing workshops or sessions in scientific conferences, 2) fostering research collaborations between group members and 3) holding a series of webinars from experts in the field.

So far, the group has organized a number of webinars and a [three-day online workshop](#). Videos of webinars and of most workshop's presentations can be found on the group's [YouTube channel](#).

If you are interested in actively joining the group, please get in touch with the Group Lead. If you would like to stay informed about the group's activities, please subscribe to the mailing list via <https://www.risk-kan.org/>.