



## **Using a capital stock model to inform insurance cat model building - Lessons learned from the development of a fully probabilistic inland flood model for continental China**

Florian Elmer (1,2), James Daniell (3), Steffi Uhlemann-Elmer (1), Barbara Nix (4), and Richard T. Scales (4)

(1) Aspen Insurance Ltd, Switzerland, Zürich, Switzerland (florian.elmer@aspen-re.com), (2) Odermatt & Brockmann GmbH, Zürich, Switzerland (flo.elmer@gmail.com), (3) Center for Disaster Management and Risk Reduction Technology, Karlsruhe Institute of Technology, Karlsruhe, Germany (j.e.daniell@gmail.com), (4) JBA Risk Management Ltd, Skipton, United Kingdom (Barbara.Nix@jbarisk.com, Richard.Scales@jbarisk.com)

For the insurance industry, the lack of catastrophe models for emerging markets is hampering efforts to assess risk and provide appropriate insurance schemes for these regions and thus reduce the protection gap. A crucial point in the development of such models is developing an understanding of the insured values. For China, as for other immature markets, portfolio information is at present displaying no aptitude for state-of-the-art flood risk modelling as it provides limited detail on the risks insured and is often spatially highly aggregated. Further, substantial uncertainty is introduced along the chain of risk information transfer from the policy holder to the insurer, broker, and reinsurer.

In the recent development of a probabilistic China inland flood model (EGU2019-8557), providing appropriate input data was a key task. We present an innovative way of adapting economic exposure information to inform and amend insurance portfolio location information, disaggregate portfolio information to higher spatial resolution, and of using “economic” (i.e. using the value of the built environment as input) model runs for validation against national loss history. We use a capital stock model, derived from census data on population density, investment data, data on economic output etc. to

- create an appropriate model geometry (aggregation levels) that balances the detailed hazard modelling and the aggregate exposure information.
- develop suitable approaches and weighting schemes for disaggregating portfolio risks to the aggregation levels.
- derive a test portfolio of economic values.

The test portfolio allows to validate the model against a newly developed economic CATDAT flood loss database for China (EGU2019-17044). We demonstrate the impact of the improved portfolio information on the modelling results and illustrate the (China) specific sources of uncertainty in the portfolio information that need to be investigated before model use.