Integrating Local Data into Catastrophe Models

Lessons Learned *July 2026*

CHALLENGE

The Community Resilience Center at The Water Institute (Center) partnered with Verisk and Guy Carpenter (Marsh Re) on a project to design a Community-Based Catastrophe Insurance (CBCI) policy that integrated Louisiana's locally developed flood risk data. The question was to see if the state's available probabilistic storm set, extensive modeling of futures with and without action, and understanding of future flood conditions could be integrated into Verisk's modeling frameworks and risk products used by insurers to set prices for policies.

LOCAL DATA DETAILS

The 2023 Louisiana Coastal Master Plan (CMP) is the fourth edition of the state's ongoing coastal master planning process that aims to achieve comprehensive coastal restoration and risk reduction goals. The CMP uses a model called the Coastal Louisiana Risk Assessment (CLARA) model which, combined with a coupled ADCIRC-SWAN model that generates the atmospheric and wave conditions, is able to estimate flood depth exceedances, direct economic damage exceedances, and expected annual damages. Because of the high-resolution hydrodynamic simulations of storm surges and waves used by the CLARA model, and the Monte Carlo simulation approach to estimate risk under a range of future assumptions about environmental conditions and CMP projects, the Center sought to test if this high-quality local data could also inform insurance pricing. More information about the CLARA model and the probabilistic approaches to hydrodynamic modeling in the CMP are available online here or by navigating to Attachment E2 at this link: https://coastal.la.gov/our-plan/2023-coastal-master-plan/2023-plan-appendices/.

The CMP modeling approach uses a suite of over 500 synthetic storm events, but for evaluation of futures with projects, such as marsh restorations or structural improvements, a representative selection of 90 storms is used. This 90-storm set is an optimal sample that represents the full spectrum of risk along the coast, and it formed the basis of the work with Verisk, as one of the questions was whether future marsh restoration projects in the project location would meaningfully impact risk reduction in a way that could influence insurance pricing.

HOW THE TEAMS WORKED WITH THE DATA

The proposed CBCI policy was developed with a parametric framework, where the policy would be triggered by flood depths at three gauges in the community. The community stakeholders, supported by the Center, identified six feet of flooding as the threshold for where they would experience a loss and flood damage would impact their business operations. Further exploration led to the development of a phased attachment point structure for the policy, where lower levels of flooding could trigger the policy at a lower payout amount, with the policy exhausted at the six-foot threshold.

Compatibility and Formatting

Verisk requested data from the Institute including event footprints, formatted as rasters with a maximum flood extent, and vulnerability or damage functions that convert flood depth to building damage. The Institute prepared these as a sample using two storms at a 100m resolution. This sample allowed for working through issues such as the file size of the rasters, the associated spatial resolution, and whether files should be provided in .CSV or other formats. Making time in research partnerships to work through data exchange is important for project success, and to troubleshoot unit conversion issues, such as meters and feet, that can lead to misinterpretations of data.

Using Catastrophe Modeling for Parametric

The team's original approach, building a custom model using Verisk's Touchstone (Model Builder) software, needed adaptation once the work progressed to identifying and defining the parametric trigger. Verisk's modeling framework entails building an extensive event catalog and then applying gradations of damage to the structures within a geography, based on the probabilities of the events in the catalog.

Because this CBCI policy was structured as a parametric policy, the payout is binary; once the flood depth is exceeded, the policy pays. Thus, a traditional approach to applying depth-damage curves to a structure inventory to estimate losses is not needed to price the risk of a parametric policy.

Verisk proposed that the team instead assess the probability of events exceeding the threshold of six feet in any given year, by using information about the CMP storm events to create exceedance probability (EP) curves, an approach more suited for pricing a parametric policy.

RESOLUTION

The Center provided data on the combined probabilities of the storm components (such as surge) for each event in the CMP modeling set, shown as an annual exceedance probability, and the maximum water surface elevation for each event at the gauges under consideration for the parametric trigger. Verisk created EP curves for futures without and with projects, at the current year and two different future years.

Because three different flood gauges were under consideration, the team also looked at the differences between treating exceedances as independent or combined events. If the trigger were structured so all three locations had to exceed the threshold, the marsh projects slightly increased the probability of exceedance. If the trigger were structured so only one had to exceed the threshold, the marsh projects slightly decreased the probability of exceedance. In other words, it was more likely that all three gauges would trigger in a future with action, even if it was less likely that any single gauge would trigger in the same scenario.

To learn more about the project and the CBCI policy under development, please visit [https://thewaterinstitute.org/cbci-phase-one-pilot.](https://thewaterinstitute.org/cbci-phase-one-pilot)

TAKEAWAYS

Building parametric pricing with local data may require different approaches than traditional risk assessment policies.

A key takeaway of this collaboration is that building a parametric policy requires a different approach than assessing other kinds of insurance pricing or portfolio questions using catastrophe models. If the goal had been to build a CBCI policy that was not parametric, a modeling approach using average annual loss (AAL) could have been used, which would have benefited from Verisk's modeling platform.

There are outstanding questions to investigate that will help understand better how to leverage local data and the impact of NBS in parametric policies.

A future research question that could inform pricing for parametric policies is whether a minimum number of storms is needed for confidence in an AAL approach. The 90-storm set used for CMP modeling did not have a lot of variance in the team's focused geography. Future work could explore if a larger probabilistic set is needed, or what a minimum viable set of storms might amount to, so that communities could understand what they would need to model. Verisk's standard approach uses a 10,000-year event catalog; the minimum viable number may also depend on if a specific peril is being examined, or if multiple perils are under consideration.

Integrating NBS and/or local data has currently available pathways in a CBCI to inform pricing, but not to replace other analytics.

Finally, a conversation with reinsurance broker Marsh Re noted that this work would not be expected to replace their own internal analytics, but could be a supplement to help inform pricing. As client advocates, they would use nature-based solutions and/or local data to develop a more informed view of risk that they take to markets for underwriting, rather than solely relying on model output. This partnership with Verisk identified a way to adjust expectations of risk by using local data to create exceedance probability curves that could inform pricing of parametric CBCIs.

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