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Strengthening the weak link: Built Environment modelling for loss analysis

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Methods to analyse insured losses from a range of natural perils, including pricing by primary insurers and catastrophe modelling by reinsurers, typically lack sufficient exposure information. Understanding the hazard intensity in terms of spatial severity and frequency is only the first step towards quantifying the risk of a catastrophic event. For any given event we need to know: Are any structures affected? What type of buildings are they? How much damaged occurred? How much will the repairs cost? To achieve this, detailed exposure information is required to assess the likely damage and to effectively calculate the resultant loss. Modelling exposures in the Built Environment therefore plays as important a role in understanding re/insurance risk as characterising the physical hazard.

Across both primary insurance books and aggregated reinsurance portfolios, the location of a property (a risk) and its monetary value is typically known. Exactly what that risk is in terms of detailed property descriptors including structure type and rebuild cost – and therefore its vulnerability to loss – is often omitted. This data deficiency is a primary source of variations between modelled losses and the actual claims value. Built Environment models are therefore required at a high resolution to describe building attributes that relate vulnerability to property damage. However, national-scale household-level datasets are often not computationally practical in catastrophe models and data must be aggregated.

In order to provide more accurate risk analysis, we have developed and applied a methodology for Built Environment modelling for incorporation into a range of re/insurance applications, including operational models for different international regions and different perils and covering residential, commercial and industry exposures. Illustrated examples are presented, including exposure modelling suitable for aggregated reinsurance analysis for the UK and bespoke high resolution modelling for industrial sites in Germany. A range of attributes are included following detailed claims analysis and engineering research with property type, age and condition identified as important differentiators of damage from flood, wind and freeze events.