



Perils aren't confined by territory boundaries. Are you?

How to underwrite and price every individual property according to its specific hazards

The P&C insurance industry's combined ratio rose from 99.5% in 2021 to an estimated 105.6% in 2022, according to the Insurance Information Institute. This increases the pressure on insurers to find better ways to assess, underwrite, and price risk—and more accurately, select and price policies in line with the actual risk of a property.



Growing losses, in part, can be attributed to the frequency and severity of large natural disasters—and population shifts to more catastrophe-prone areas. However, decreased profits also stem from a lack of granular, accurate information about potential hazards and exposure to loss at each insured location.

Pricing by Territory is Insufficient

Underlying the challenge—and the need for change—is the fact that typical territory-based definitions and ratemaking methods are insufficient and inefficient. Insurers have the difficult task of balancing the need to create territories large enough to be credible from a statistical perspective—yet small enough to represent homogeneous regions where exposure to loss is relatively uniform. Although traditional territory ratemaking has been a part of the actuarial tool kit for decades, it poses major issues and challenges to product managers, actuaries, underwriters, and information technology teams:

- 1. Perils don't respect boundaries:** Most perils are not correlated with zip codes, state, or municipal boundaries, yet territories are often underwritten and defined by these boundaries. When is the last time you saw a hailstorm or wildfire stop at a municipal or state line?
- 2. Perils are inconsistent within boundaries:** Risks can widely fluctuate within territorial boundaries. Consider that a zip code may include homes in wooded areas which are highly susceptible to wildfires, as well as homes in urban areas surrounded by miles of asphalt which may never experience a wildfire threat. Under current systems, the territorial base rate was the best we could do to reflect the loss propensity of a property.
- 3. Territory boundaries are constantly changing:** Territorial boundaries—including county, municipal, census block, and zip codes—also are undergoing regular change and revision. Carriers, of course, have no control over how or when these boundary changes occur. However, they must adjust systems and territory-based definitions along with these changes. Carriers often need to adjust territory-based definitions to better align with marketing objectives or loss performance. Changing territory-based definitions can be extremely disruptive for the policyholder and difficult for the carrier to explain.



The single biggest issue with historical territory-based definitions is that they are not sufficiently correlated with propensity for loss.

- 4. Territories systems are high maintenance:** Administration of territorial-based systems is inefficient and costly. In addition to IT spend, underwriters and actuaries must constantly manage territory-based definitions and revisions across their work processes.
- 5. Concerns over potential for discriminatory pricing:** territory-based definitions also can invite concerns over bias and discrimination. When neighbors fall on different sides of the territorial boundary and realize the extreme price differential that exists between two similarly situated risks, they may allege unfair pricing or red lining. Red lining is the setting of uncompetitive rates in undesirable areas or restricting new business in high-risk areas.
- 6. Territorial systems introduce bias:** Every individual peril has a unique geographic distribution. Defining territories according to actual loss distributions requires unique sets of territorial boundaries/definitions for every peril. Using the same territory boundaries for groups of perils precludes homogeneity inhibiting pricing accuracy and possibly introducing bias into the ratemaking process.

The New Era of Geospatial Hazard Rating

The limitations of territorial rating will inevitably become a thing of the past due to significant advances in Geographic Information Systems (GIS), Geospatial Artificial Intelligence (GeoAI), and greater access to the location-specific data and risk scores they can provide.

Geospatial Hazard Rating leverages satellite technology and advanced GIS systems to provide location-specific data and hazard scores. These scores rely on complex calculations, made rapidly with the assistance of Geospatial Artificial Intelligence (GeoAI) and delivered in real-time through Application Program Interfaces (APIs). Geospatial Hazard Rating is produced for each individual address by aggregating historical data and events for a given peril within a specific geographical radius instead of relying on much larger, arbitrary, and less accurate territorial boundaries.

Insurance plays an important macro function as the “oil of the global economy,” underpinning and enabling almost any transaction, event, or investment. As climate-related risks grow, this economic and societal function will become even more important as individuals and businesses seek financial protection against heightened uncertainty.

There are a broad range of benefits in using Geospatial Hazard Rating over traditional territorial ratemaking methods, including:

- **Accuracy in Risk Assessment:** Geospatial Hazard Rating can isolate the geographic distribution of risk at the individual residential or commercial property level, as opposed to the much larger area municipal, zip code, and census block boundaries used in territorial methods. As such, insurers can precisely understand, underwrite, and price a specific property's risks.
- **Increase Premiums without Rate Changes:** Another benefit to using Geospatial Hazard Rating instead of territorial rating, is the ability to respond to changes in risk levels without rate changes. When a specific area starts to see more damaging events, the corresponding hazard scores for those specific addresses will increase over time and result in a corresponding increase in premium at renewal, making some rate changes for an entire territory unnecessary.
- **Fairness and Accuracy in Pricing:** With such accuracy, comes the ability to tie higher risk probabilities to higher premiums—and lower risk probabilities to lower premiums automatically when Geospatial Hazard Rating factors are updated at acquisition or renewal.
- **Supporting Data for Rate Changes:** Although Geospatial Hazard Rating will make it less necessary to seek rate changes for geographic changes in risk, in the event a rate change is needed, insurers will have the very detailed data needed to target higher increases for the highest risk areas and justify the change to regulatory authorities .



Geospatial Hazard Rating provides a much more accurate hazard score based on the risk to each peril at specific property locations.

- **Speed and Efficiency of Risk Assessments and Policy Quotes:** With specific hazard ratings for every peril for every customer and prospective customer address, geospatial applications and Geospatial Hazard Rating enable insurers to greatly increase the speed at which they undertake property assessments and policy quotes.
- **Enhanced Customer Service:** By generating more accurate and quicker risk assessments and quotes, insurers are creating a better customer experience and can drive improved customer conversion rates.
- **Screening and Pre-Underwriting Potential Customers:** Another promising application of geospatial data is the ability to prefill customer and prospective customer applications and use it for pre-underwriting. Insurers who have access to geospatial intelligence could potentially use it to identify and target more highly sought-after customers or isolate those needing physical inspection due to extreme natural hazards in the area.
- **New Risk Insights:** Because geospatial data is highly structured, highly objective, and collected at a high scale, insurers gain increased abilities to analyze data and identify new risk insights that are not possible with traditional territorial rating.
- **Proactively Preventing Losses:** As geospatial data can help discover trends and patterns in specific locations, this enables insurers to help customers better understand their risks and ways to mitigate them. By providing risk insights, carriers are able to engage customers in the risk management process and build relationships, while at the same time promoting loss avoidance.



- **Reduce Losses and Expense Ratios:** Although it is early in the adoption of geospatial data, the business use cases for such applications point to a real and significant opportunity to reduce losses and improve combined ratios by better aligning price with risk— and eliminating the burden of administering territories.

Together, these benefits present a new frontier and new opportunity for the P&C insurance industry.

Visualize the Difference

A picture is worth 1000 words, and the next few images clearly illustrate the benefits of moving from territorial rating to geospatial hazard rating. This example is illustrated using state boundaries, but the same could be done for counties or zip codes within a state.

Map A - State Risk Map

A map based on territorial boundaries, like the State Risk Map below, captures risk, in this case tornado risk, delimited by state territorial boundaries. Of course, the actual distribution of loss varies across each state, so only the average risk for the state is shown. Carriers using these territories would have one tornado rate for each territory or state.

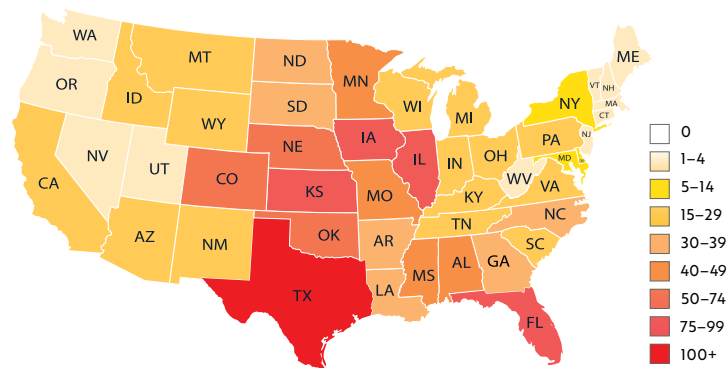


Figure 1.State risk map

Map B - Risk Map

If one is not confined to using municipal boundaries, territories could be drawn to describe geographic regions with higher risk propensity more accurately as shown in the Tornado Risk Map below.

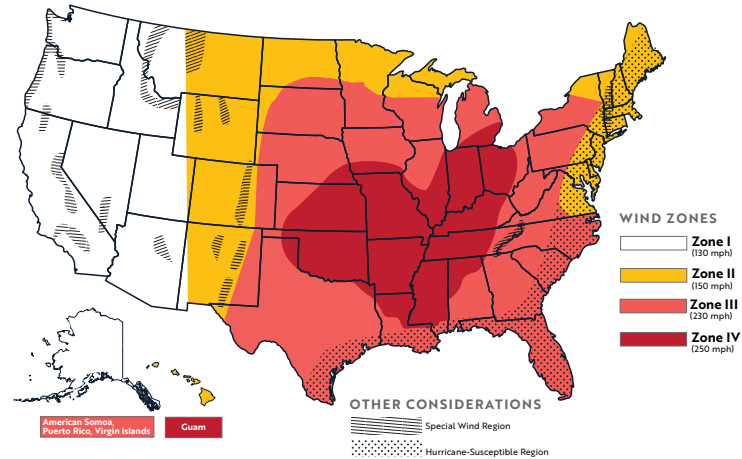


Figure 2. Tornado Risk Map

A carrier using these territory-based risk definitions could have different rate levels within a state. For example, in Michigan tornado risk is defined by three zones representing three risk levels. When looking at multiple territories, issues can arise at the border when neighboring properties fall on opposite sides of the risk boundary. The issue can be resolved by creating a new zone, such that both locations fall in the same rating territory.

Map C - Geospatial Hazard Rating Map

With Geospatial Hazard Rating, we are not constrained by municipal boundaries. We can overlay a detailed hexagonal grid map across the U.S., a state, or other territorial boundary and accumulate risk propensity for each specific property/location file by assigning historical events to their geographic hexagons. By doing this, we are able to evaluate risk at any location as the average of the surrounding hexagons (locations).

Every location can now be rated according to the risk levels of its own hexagon (location) and six neighboring hexagons so that there can never be a tremendous rate differential between neighbors. Levels will gradually change by location instead of a stepwise increase when one crosses an arbitrary territory boundary.

Using geospatial applications, we can measure any peril risk (e.g., tornado risk) at any location more precisely. Every property is placed at the center of its own territory and analyzed in conjunction with contiguous neighboring regions that surround the location.

If there is not enough location-specific historical data to meet actuarial credibility standards, the carrier has the choice to either increase the size of the hexagon or apply credibility weighting to the results by combining them with regional or state-wide averages. Both approaches will have the same effect of dampening the rate differential between hexagons and properties, resulting in less variance between price points of neighboring properties. The more data you have—as a result of more policies, leveraging more years of data or accessing third-party sources—allows for smaller hexagons and greater refinement in rate differentials by location.

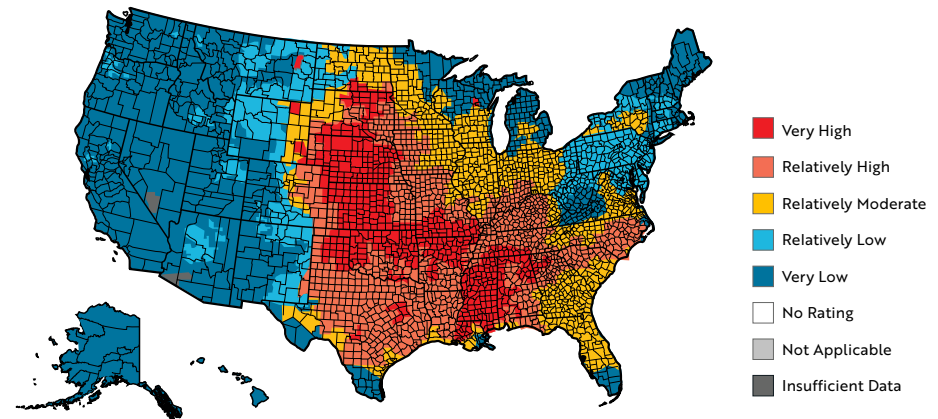


Figure 3. Geospatial Hazard Rating Map

New and more accessible sources of data have enhanced the ability of insurers to develop more accurate risk models. Now insurers can develop loss costs reflective of the true underlying exposure of each property.

With Geospatial Hazard Rating every property can be rated fairly according to its actual exposure to loss, without subsidy and without bias.



About the Author

Tammy Nichols Schwartz, CPCU, is the Senior Director of Data and Analytics at Guidewire, the leading provider of technology solutions to the P&C insurance industry. She has more than 20 years of experience as an actuary, underwriter and executive at leading insurance carriers and financial institutions including Farmers Insurance and Bank of America. Prior to Guidewire, Schwartz was the Founder and CEO of Black Swan Analytics.

The Hazard Rating Differences in One Zip Code

On the right we illustrate the difference between Territorial Ratings and Geospatial Hazard Rating using a single zip code and examining several perils at seven different properties.

Zip Code: Beverly Hills, 90210

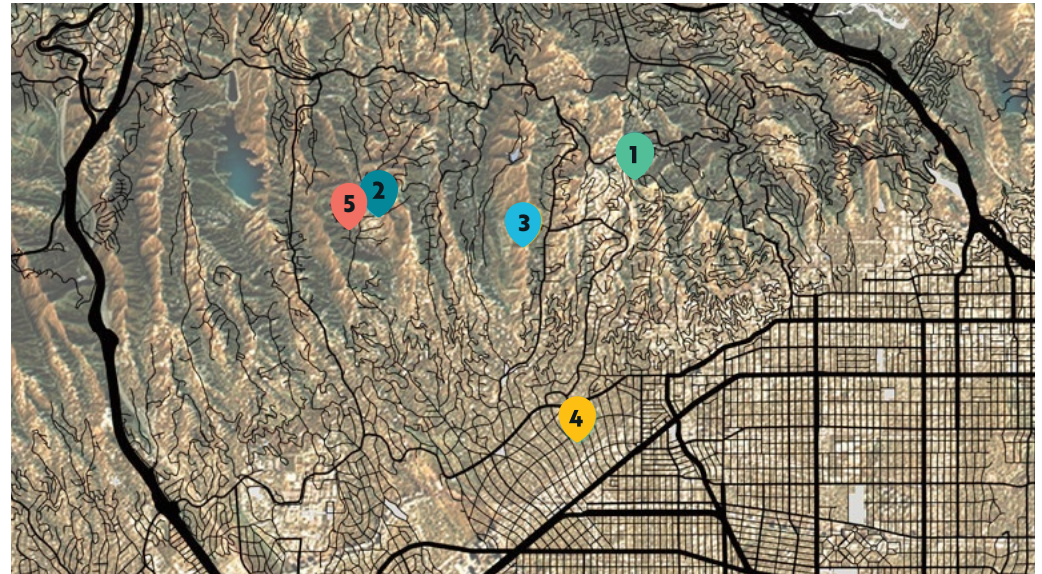
Each pin represents a home within this one zip code. As you'll see in the chart on the right, each property has different positive and negative elements with regard to its risk.

Wildfire risk is prominent for about half of the properties, specifically those in the areas of higher vegetation in the hills above the more densely populated urban areas. Whereas, conversely, property 4 has an excellent fire risk score, including lower wildfire risk, resulting in the lowest risk levels of the group.

Note that property 3 has the highest theft rates nearby, making a much more significant property theft risk than the other properties.

Current annual premiums when rating on a territorial basis are \$611 per \$100,000 in property value across the entire zip code, assuming identical coverage limits. However, if we use Geospatial Hazard Rating and apply indicated relativities to each peril according to the hazards at that location, the premiums will vary significantly, as shown.

For more information on Geospatial Hazard Rating, visit guidewire.com/hazardhub/



ID	Fire	Liability	Theft	Weather	Other	Wildfire	Total
1	133	19	95	252	77	50	626
2	133	19	95	252	77	84	660
3	133	22	112	252	63	59	621
4	93	19	81	252	38	41	524
5	133	19	95	252	46	84	629

Guidewire is the platform P&C insurers trust to engage, innovate, and grow efficiently. We combine digital, core, analytics, and machine learning to deliver our platform as a cloud service. More than 500 insurers, from new ventures to the largest and most complex in the world, run on Guidewire. For more information, contact us at info@guidewire.com.