

Bernardi Environmental Risk Index

Measuring & Mitigating Natural Disaster Risk Within Municipal Bond Portfolios

White Paper | May 2026 | Matthew Bernardi · Thomas Bernardi, CFA, CIPM · Zachary Cronin · Jeremy Williams

OVERVIEW AT A GLANCE



¹ NOAA, coast.noaa.gov/states/stories/ · ² Climate Central, climatecentral.org/climate-matters/2025-in-review
³ Sourced from NOAA, which covers only events with at least \$1 billion in damages; growth rate based on their 2005-2015 average vs. the 2024 and 2025 figures (ncei.noaa.gov/access/billions/summary-stats/US/2000-2010). These calculations deserve a caveat: though the cost of natural disasters has outpaced inflation, this NOAA-based data could be biased toward a higher relative growth rate. Because the price level has risen sharply due to inflation, a billion-dollar event is more likely to occur today than ten or twenty years ago. As the value of property increases, so does the probability of the billion-dollar events used in NOAA's data.

UNDERSTANDING THE ERI SCALE (0 = LOWEST RISK → 10 = HIGHEST RISK)



■ Low ■ Below Avg ■ Moderate ■ Elevated ■ High / Extreme

△ The ERI is ordinal, not ratio-based: a score of 6.0 does not mean twice the risk of 3.0. Scores reflect hazard frequency + insurance non-renewal rates — based on historical data, not predictions of future events. Not probabilities of loss or default.

HOW THE ERI IS CONSTRUCTED

Two Data Inputs

The ERI blends FEMA's National Risk Index — annualized frequency of 18 natural hazards at the county level — with property insurance non-renewal rates from the U.S. Senate Budget Committee. Counties where non-renewal exceeds the 1.17% national average receive a 10% score penalty.

FEMA HAZARD FREQUENCY **INSURANCE NON-RENEWALS**

Why Bernardi Removed FEMA's Wealth Factor

FEMA's methodology includes economic exposure, which can elevate risk scores for larger and wealthier counties. Bernardi removes this component and focuses on natural hazard exposure and insurance-market stress, reflecting the view that stronger local economies often recover more effectively from disaster-related losses than raw property values alone would suggest.

HAZARD PROBABILITY ONLY **CREDIT-RELEVANT FRAMEWORK**

STATE RANKINGS BY AVERAGE ERI SCORE — NATIONAL AVERAGE: 2.48

▲ Highest Risk States

#1	FL	4.17	Highest non-renewal rate; hurricane-prone coast
#2	OK	4.11	Tornadoes, hail, drought & flooding; 5th in non-renewals
#3	AZ	3.93	Wildfire, drought, heat wave, riverine flooding
#4	CA	3.82	3rd in non-renewals; wildfire, drought, earthquake
#5	HI	3.77	Volcanic, tsunami, earthquake & flooding
#6	DE	3.68	Coastal flooding & insurance pressure

▼ Lowest Risk States

#50	MI	0.67	41st in non-renewals; rare severe hazards
#49	WI	1.05	40th in non-renewals; lower hazard exposure
#48	VT	1.15	36th in non-renewals; lower hazard exposure
#47	WV	1.28	47th in non-renewals; lower hazard exposure
#46	OH	1.38	23rd in non-renewals; less frequent severe hazards

Avg. Midwest ERI: 1.82 — led by MI, WI, OH, IN



How Environmental Risk Varies by Region

Within the ERI framework, Midwestern states generally exhibit lower environmental risk scores than many other regions of the country, reflecting comparatively limited exposure to hurricanes, wildfires, and earthquakes as well as relatively stable homeowners insurance markets. With an average regional score of 1.82 compared with the national average of 2.48, the results illustrate how geographic and insurance-market conditions can contribute to meaningful differences in environmental risk across municipal issuers.

WHY INSURANCE NON-RENEWAL RATES MATTER FOR MUNICIPAL CREDIT

THE INSURANCE-CREDIT LINK

Insurance Market Trends and Credit Implications

Reduced insurance availability, higher premiums, and increasing deductibles may place pressure on households and businesses over time. In regions experiencing these trends, municipal issuers could face indirect effects through slower economic growth, reduced property investment, and potentially weaker tax-base expansion.

National avg. non-renewal: 1.17% — Glades County, FL hit 16.2% in 2023

FEDERAL SUPPORT RISK

Federal Support Considerations

Municipal recovery following major disasters has historically benefited from federal assistance programs. Changes in the scale, timing, or availability of future disaster aid could increase the fiscal burden on state and local governments, making local resilience and financial flexibility increasingly important considerations.

HIGHEST RISK COUNTIES

Counties with the highest ERI scores are concentrated in California, Oklahoma, and Florida, reflecting combinations of elevated hazard exposure and insurance-market stress. San Bernardino, San Diego, and Riverside Counties, California, represent the highest-scoring jurisdictions in the current ranking.

LOWEST RISK COUNTIES

The lowest-scoring counties are concentrated in Michigan, Wisconsin, and Alaska, where severe natural hazards occur less frequently and insurance markets have remained comparatively stable. Schoolcraft County, Michigan, currently records the lowest ERI score.