Leveraging Technology and AI for Catastrophic Risk Management in Insurance

A Whitepaper

In the past five years, the National Centers for Environmental Information (NCEI) logged over 20 catastrophic (CAT) events costing more than $750 billion in total. The growth in disasters and higher loss ratios goes beyond immediate harm; they are beginning to shake the foundation of the U.S. Property & Casualty (P&C) insurance system. The cost of catastrophic (CAT) losses in the United States in 2024 has increased tremendously. Extreme weather and natural disasters, driven by escalating climate risk in insurance, exert unprecedented financial pressure on the industry.

The rising frequency and severity of natural disasters cause more damage, fundamentally changing how insurance operates. This intensifies the demand for more advanced catastrophic risk management strategies to protect insurers, policyholders, and public infrastructure.

This whitepaper analyzes the growing threat of CAT losses, their financial impact, and the transformative role of technology—particularly the use of AI in insurance—to help carriers adapt, predict, and respond more effectively in this volatile risk landscape.

CAT Chronicles Impacting U.S. Insurance

Over the past decade, the United States has experienced numerous natural catastrophes, impacting the Property & Casualty (P&C) insurance industry, policyholders, and investors. Below is an overview of notable events from 2015 to 2025:

2015 **South Carolina Floods** – $1.5B in damages

2016 **Hurricane Matthew** – $10B in damages

2017 **Harvey (TX)** – $125B in damages
Irma (FL) – $50B in damages
CA Wildfires – $14B in damages

2018 **Camp Fire (CA)** – $16.5B in damages
Hurricane Michael (FL) – $25B in damages

2019 **Mississippi River Floods** – $6.2B in damages

2020 **CA Wildfires –** $12B in damages
Hurricane Laura (LA) – $19B in damages

2021 **TX Winter Storm Uri** – $15B in damages
Hurricane Ida (LA + NE) – $75B in damages

2022 **Hurricane Ian (FL)** – $112B+ losses

2023 **CA Wildfires** – 324K+ acres burned

2024 **LA Wildfires** – Est. $52–$57B in damage & losses

2025 **CA Wildfires** – Major losses

Insurance Industry Under Pressure: Mounting Financial Losses

Rising Combined Ratios Signal Underwriting Losses

Nearly half of the top 19 U.S. P&C insurers are expected to face higher combined ratios year over year. Six are projected to surpass 100%—indicating underwriting losses as claim payouts outpace premium revenue.

Notable insurers with elevated ratios include:

Horace Mann Educators Corp **(114.7%)**	Allstate **(108.1%)**	Travelers and Assurant (both at **100.7%**)

Catastrophe Losses Are Surging

In Q2 2024, the U.S. experienced nine major weather disasters, resulting in $23 billion in losses. This added to the first-half total of $37.9 billion across 15 separate incidents.

Allstate's catastrophe losses:

April 2024: **$494 million**	May 2024: **$1.48 billion**	Q2 2024 estimate: **$2.65 billion** (nearly 2023's $2.7 billion)

The California Crisis: A Warning Sign

Regulatory constraints (Proposition 103) limit insurers' ability to adjust rates, leading to mass exits.

FAIR Plan collapse: The state's insurer of last resort saw its exposure balloon from $153B (2020) to $458B (2024) and is now at risk of insolvency.

Domino effect: If the FAIR Plan fails, all California policyholders could face steep premium hikes.

Climate and Inflation Are Squeezing Profitability

Wildfires, hurricanes, and floods are growing more frequent and intense, leading to a sharp rise in claims.

Inflation: Rebuilding costs have skyrocketed, increasing payouts.

Result: Insurers are forced to raise premiums or withdraw from high-risk markets (e.g., State Farm's requested 22% rate hike in California).

Combined ratios for big US P&C carriers forecast to deteriorate sequentially in Q2 2024

		Combined ratio - Q2 2024 mean estimate*		
Company (ticker)	**Q1 2024 total assets ($B)**	**(%)**	**Vs. actual Q1 2024**	**Vs. actual Q2 2023**
American International Group Inc. (AIG)	544.12	92.1	▲	▲
Chubb Ltd. (CB)	234.87	88.1	▲	▲
The Travelers Cos. Inc. (TRV)	127.41	100.7	▲	▼
The Allstate Corp. (ALL)	105.24	108.1	▲	▼
The Progressive Corp. (PGR)	94.13	94.7	▲	▼
The Hartford Financial Services Group Inc. (HIG)	77.71	94.4	▲	▼
CNA Financial Corp. (CNA)	65.08	93.4	▼	▼
Arch Capital Group Ltd. (ACGL)	62.77	83.6	▲	▲
Markel Group Inc. (MKL)	57.29	97.5	▲	▲
W.R. Berkley Corp. (WRB)	37.85	90.9	▲	▲
Cincinnati Financial Corp. (CINF)	33.73	101.1	▲	▲
Assurant Inc. (AIZ)	33.23	100.7	▲	▲
AXIS Capital Holdings Ltd. (AXS)	31.76	91.8	▲	▲
American Financial Group Inc. (AFG)	30.00	92.8	▲	▲
Old Republic International Corp. (ORI)	27.06	94.9	▲	▼
The Hanover Insurance Group Inc. (THG)	14.59	101.1	▲	▼
Horace Mann Educators Corp. (HMN)	14.24	114.7	▲	▼
Kemper Corp. (KMPR)	12.63	96.8	▲	▼
Selective Insurance Group Inc. (SIGI)	12.06	96.6	▼	▲

Data compiled July 15, 2024.
P&C property and casualty.
* Mean estimate consensus estimate based on the mean calculation; the estimates are compared out to one decimal places to the operating version of the actual data from prior periods, as reported by S&P Capital IQ.
Analysis limited to the 20 largest public property and casualty and multiline insurers by total assets that are traded on major US exchanges. Excludes Assured Guaranty Ltd. which does not have corresponding data.
Total assets based on GAAP filings as of March 31, 2024.
Excludes Berkshire Hathaway Inc. and Loews Corp. given their sizable operations outside the insurance space. CNA Financial Corp. is approximately 90% owned by Loews and accounts for the majority of its total revenue.
Source: S&P Global Market Intelligence.

California's Wildfire Crisis Shakes the Insurance Market

Wildfires are burning through insurer profits, pushing them to retreat from vulnerable regions, leaving homeowners and markets in turmoil.

1. Insurers Retreat & Raise Rates

- State Farm halted new homeowner policies in California and requested rate hikes of up to 22% for homeowners, 15% for renters, and 38% for rental dwellings due to wildfire losses

2. FAIR Plan Under Pressure

- Policies in the state's insurer of last resort surged 123% in three years, reaching 451,000 by 2024.
- With only 2.6B in reinsurance and 200M surplus, the plan faces strain as recent wildfire exposure nears $5B.

3. Homeowners Face Higher Costs, Less Coverage

- Many rely on the FAIR Plan, which offers limited coverage at higher premiums, creating disparities in post-disaster recovery.

4. Market Fallout

- Wildfire losses have driven down bond prices by 10-20%, signaling broader financial stress.
- Analysts expect more rate hikes and coverage pullbacks, worsening California's insurance crisis.

The CAT Loss Crisis: Why Traditional Models Aren't Enough

Outdated catastrophe (CAT) risk models present significant dangers to the insurance industry, particularly as the risk landscape evolves rapidly due to climate change, urban development, and new perils. Here's how reliance on traditional models can lead to systemic problems:

Problem Area	Consequence
Underpricing	Premiums set too low for actual risk; market-wide competitive underpricing
Insolvency	Insufficient reserves and capital; inability to cover significant, unexpected losses
Market Instability	Volatile pricing cycles, capacity withdrawal, systemic risk, and loss of stakeholder confidence

Did you know?

"In recent years, secondary perils such as floods, wildfires, hailstorms have accounted for over 70% of insured natural catastrophe losses, yet outdated models underestimate these by 40–60%"

Building Climate-Ready P&C Insurance for Tomorrow

Rising CAT losses are driving up P&C insurance premiums and squeezing profitability. Yet with proactive risk strategies, insurers can contain costs while maintaining coverage in high-risk areas.

1. Strengthening Risk Mitigation & Resilience

- Partnering with governments to enhance climate resilience through funding wildfire-resistant construction, improved flood infrastructure, and stricter building codes.
- Promoting proactive risk reduction by incentivizing mitigation measures for property owners and expanding parametric insurance for faster, event-based payouts.

Example: *State Farm offers discounts to homeowners who harden their properties against wildfires*

2. Leveraging Advanced Catastrophe Modeling & AI

- Using AI, satellite data, and real-time weather analytics to refine risk models and improve underwriting accuracy.
- Dynamically adjusting premiums based on updated climate risk assessments rather than historical data alone.

Example: *Munich Re and Swiss Re use AI-driven climate models to anticipate future CAT losses better*

3. Expanding Risk Pooling & Public-Private Partnerships

- Governments can collaborate with insurers to establish catastrophe reinsurance pools (e.g., Florida Hurricane Catastrophe Fund).
- Multi-state or national-level risk-sharing programs can prevent excessive premium hikes in any region.

Example: *The California Earthquake Authority provides earthquake insurance without excessive premium hikes.*

4. Utilizing Alternative Risk Transfer Mechanisms

- Expanding insurance-linked securities (ILS), such as catastrophe bonds (CAT bonds), allows insurers to transfer some risks to the capital markets.
- Increasing reliance on reinsurance to absorb major losses and prevent primary insurers from bearing the full burden.

Example: *CAT bonds help insurers manage risks from wildfires, hurricanes, and floods.*

5. Reforming Regulatory & Legal Frameworks

- Curbing excessive litigation in claims settlements, especially in disaster-prone states like Florida and California.
- Advocating for state-backed last-resort insurers (like California's FAIR Plan) to ensure coverage for high-risk properties without destabilizing the broader market.

Example: *Florida's recent legislative reforms aim to reduce fraudulent claims that drive up costs for all policyholders.*

6. Promoting Usage-Based & Microinsurance Policies

- Introducing pay-per-risk models where premiums are dynamically adjusted based on climate conditions and individual property exposure.
- Offering microinsurance solutions for high-risk properties to limit financial exposure.

Example: *Farmers Insurance offers wildfire-specific microinsurance for homeowners in high-risk zones.*

How Insurers are Leveraging Tech to Tame CAT Losses

Tech solutions are turning the tide – changing volatility into predictable risk with data-driven strategies.

AI & Machine Learning

IoT & Telematics

Drones & Satellites

Parametric Insurance

AI & Machine Learning for Risk Assessment & Underwriting

1 **Sophisticated CAT Modeling**
AI-driven catastrophe models simulate disaster impacts using historical data, satellite imagery, and climate science, enabling precise loss forecasts and equitable pricing/reserving.

Data Validation & Integration 2
AI automates data quality checks (consistency, accuracy) across disparate sources, ensuring CAT models use error-free, unified datasets.

3 **Geospatial Risk Mapping**
AI-powered spatial analytics generate granular risk maps to pinpoint high-exposure assets (e.g., flood zones), refining underwriting and portfolio decisions.

Automated Damage Assessment 4
NLP and computer vision extract insights from unstructured claims data (text, images, videos), accelerating post-event risk evaluation and reducing manual effort.

Example: *Munich Re and Swiss Re use AI-based risk modeling for wildfire and hurricane assessments, leading to more precise underwriting.*

IoT & Telematics for Real-Time Risk Monitoring

1 **Real-Time Risk Prediction & Monitoring**
IoT/telematics data (environmental conditions, asset status) + ML models forecast CAT risks (hurricanes, floods) with 40% higher accuracy vs. traditional methods.

Proactive Loss Prevention 2
AI automates data quality checks (consistency, accuracy) across disparate sources, ensuring CAT models use error-free, unified datasets.

3 **Optimized Claims Management**
IoT/telematics provides timestamped damage data, slashing claims processing time by 30% and reducing fraud. Automated workflows replace manual inspections, accelerating payouts post-CAT events.

Example: *AXA and Zurich Insurance offer discounts for homes and businesses that use smart risk-monitoring devices.*

Did you know?

> Using IoT sensors in commercial properties has helped reduce fire-related losses by up to 20% through real-time alerts and predictive maintenance.

Drones & Satellites for Faster CAT Loss Assessment

1 **Rapid Damage Assessment**
Drones capture high-res imagery of inaccessible disaster zones, enabling instant damage evaluation and reducing claim settlement time.

Cost and Time Savings 2
Helps insurers and reinsurers accurately price catastrophe risks without overestimating losses.

3 **Fraud Reduction**
Time-stamped drone/satellite imagery (collected post-event) creates tamper-proof evidence, flagging suspicious claims.

Example: *Farmers Insurance and State Farm use drones for hurricane and wildfire damage assessments, reducing claim processing time from weeks to days.*

Parametric Insurance for Faster Payouts

1 **Parametric Insurance: Event-Triggered Payouts**
Pays a fixed sum when predefined triggers (e.g., hurricane magnitude, rainfall threshold) are met, bypassing loss assessments. Payouts occur within days (e.g., automatic payment for a magnitude 6.0 earthquake).

Faster Settlements, Lower Costs 2
Parametric triggers enable instant payouts post-CAT, aiding rapid recovery.

3 **Bridging the Protection Gap**
Lower operational costs enable affordable premiums, expanding coverage to underinsured markets (e.g., flood-prone regions).

Example: *Swiss Re and AXA offer businesses and governments parametric solutions for hurricanes, earthquakes, and floods.*

The Human Factor & Artificial Intelligence in CAT Claims & Recovery

The integration of artificial intelligence (AI) with human expertise is transforming how claims are triaged, assessed, and resolved, dramatically accelerating disaster victims' recovery.

AI + Human Expertise: Rapid Triage and Claims Resolution

Human Oversight

While AI can process vast amounts of data and flag high-priority cases, human adjusters remain essential for nuanced decision-making and delivering empathetic support to policyholders. AI tools free adjusters from repetitive tasks (like document review and initial damage assessment) to focus on complex cases and customer interaction.

Efficiency Gains

The combined use of AI and human judgment can reduce claims processing times from weeks to hours or days, significantly improving outcomes for insurers and policyholders.

Chatbots & Virtual Assistants: Speeding Up Recovery for Policyholders

Immediate Support

AI-powered chatbots and virtual assistants provide 24/7 support, guiding policyholders through the claims process, answering questions, and collecting essential information—even during large-scale CAT events when human resources are stretched thin.

1

Self-Service Tools

Policyholders can use their smartphones to capture and submit photos or videos of damage, which are then analyzed by AI systems for an initial assessment. This allows for virtual adjusting, where claims can be partially or fully processed without waiting for an in-person visit.

2

Touchless Claims

The industry is moving toward "touchless" claims, where AI automates much of the process—from initial intake to damage estimation—while allowing policyholders to escalate to a human adjuster when needed.

3

The Technology Revolution for Catastrophic Risk

CAT risks have plagued insurers for years, but the winners of tomorrow are those investing today in AI-driven solutions, automated claims, and parametric solutions. This isn't just risk management; it's a trillion-dollar opportunity to capture market share while future-proofing the business.

Strategic Investments for CAT Resilience

Investment Area	Competitive Advantage Gained
Advanced CAT Modeling	Accurate pricing, better risk selection
Digital Engineering & Automation	Faster claims, lower costs, scalable ops
Diversification & Risk Transfer	Reduced volatility, balance sheet strength
Loss Prevention Initiatives	Fewer claims, improved customer loyalty
Data-Driven Customer Experience	Higher satisfaction, increased retention

Authors

Zaheer Abbas C
Exec VP - BFSI & US Regional head

Arjune Santhanam
AVP - Insurance Consulting

References

This whitepaper incorporates data and insights from multiple sources, including:

- National Centers for Environmental Information (NCEI)
- Insurance Information Institute (III)
- Swiss Re Institute
- Munich Re
- AM Best
- Science Direct
- California Department of Insurance
- The Guardian (for 2025 wildfire impacts)
- Various state insurance regulators and catastrophe modeling agencies

INDIUM

About Indium

Indium is an AI-driven digital engineering company that helps enterprises build, scale, and innovate with cutting-edge technology. We specialize in custom solutions, ensuring every engagement is tailored to business needs with a relentless customer-first approach. Our expertise spans Generative AI, Product Engineering, Intelligent Automation, Data & AI, Quality Engineering, and Gaming, delivering high-impact solutions that drive real business impact.

With 5,000+ associates globally, we partner with Fortune 500, Global 2000, and leading technology firms across Financial Services, Healthcare, Manufacturing, Retail, and Technology—driving impact in North America, India, the UK, Singapore, Australia, and Japan to keep businesses ahead in an AI-first world.

USA	INDIA	UK	SINGAPORE
Cupertino | Princeton Toll-free: +1-888-207-5969	Chennai | Bengaluru | Mumbai Hyderabad | Pune Toll-free: 1800-123-1191	London Ph: +44 1420 300014	Singapore Ph: +65 6812 7888

www.indium.tech

For Sales Inquiries
sales@indium.tech

For General Inquiries
info@indium.tech