TEREN™

Toby Kraft

From Tragedy to Resilience:
Using AI to Predict, Prevent, and Protect

www.teren4d.com

Tragedy in Texas Hill Country
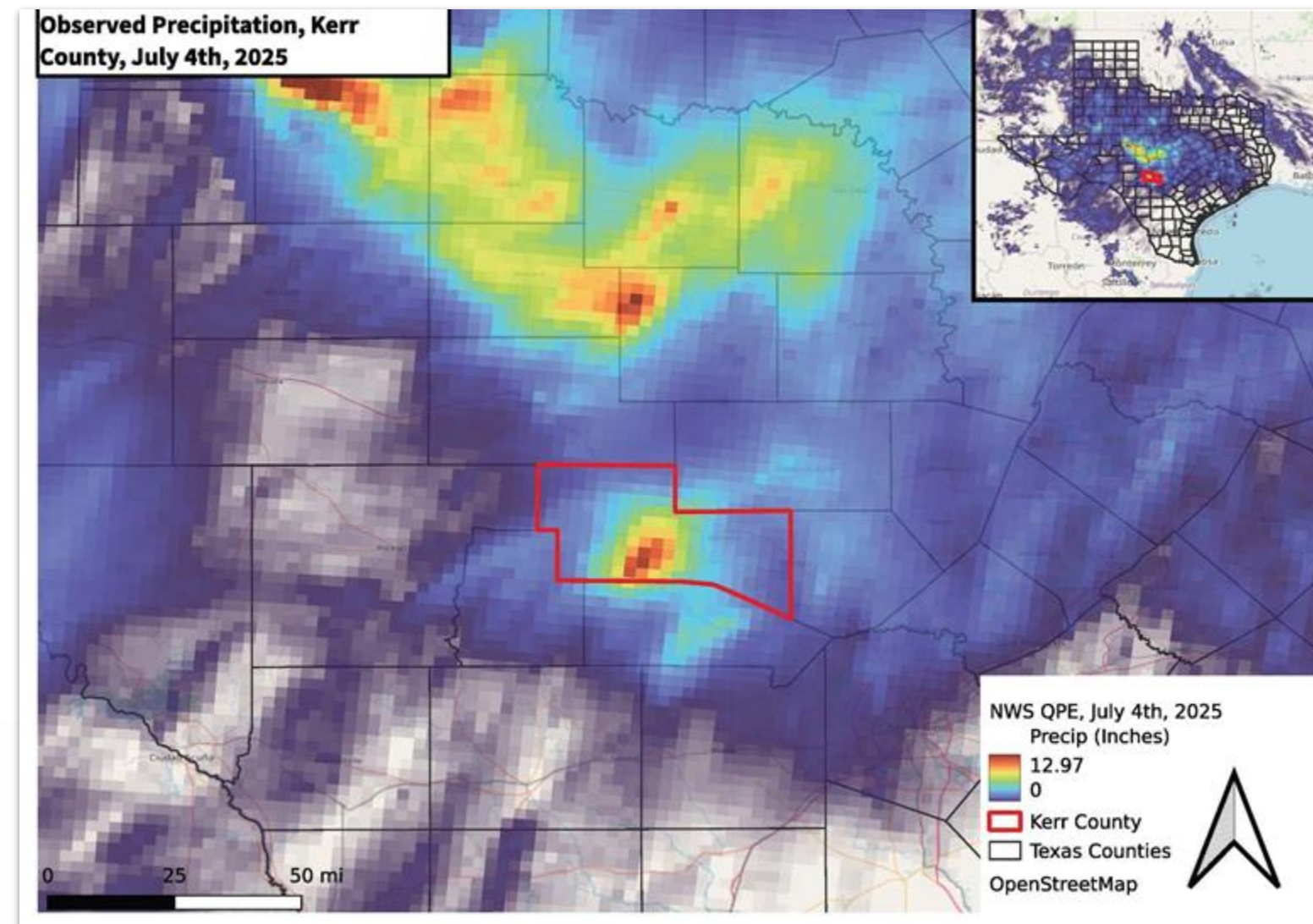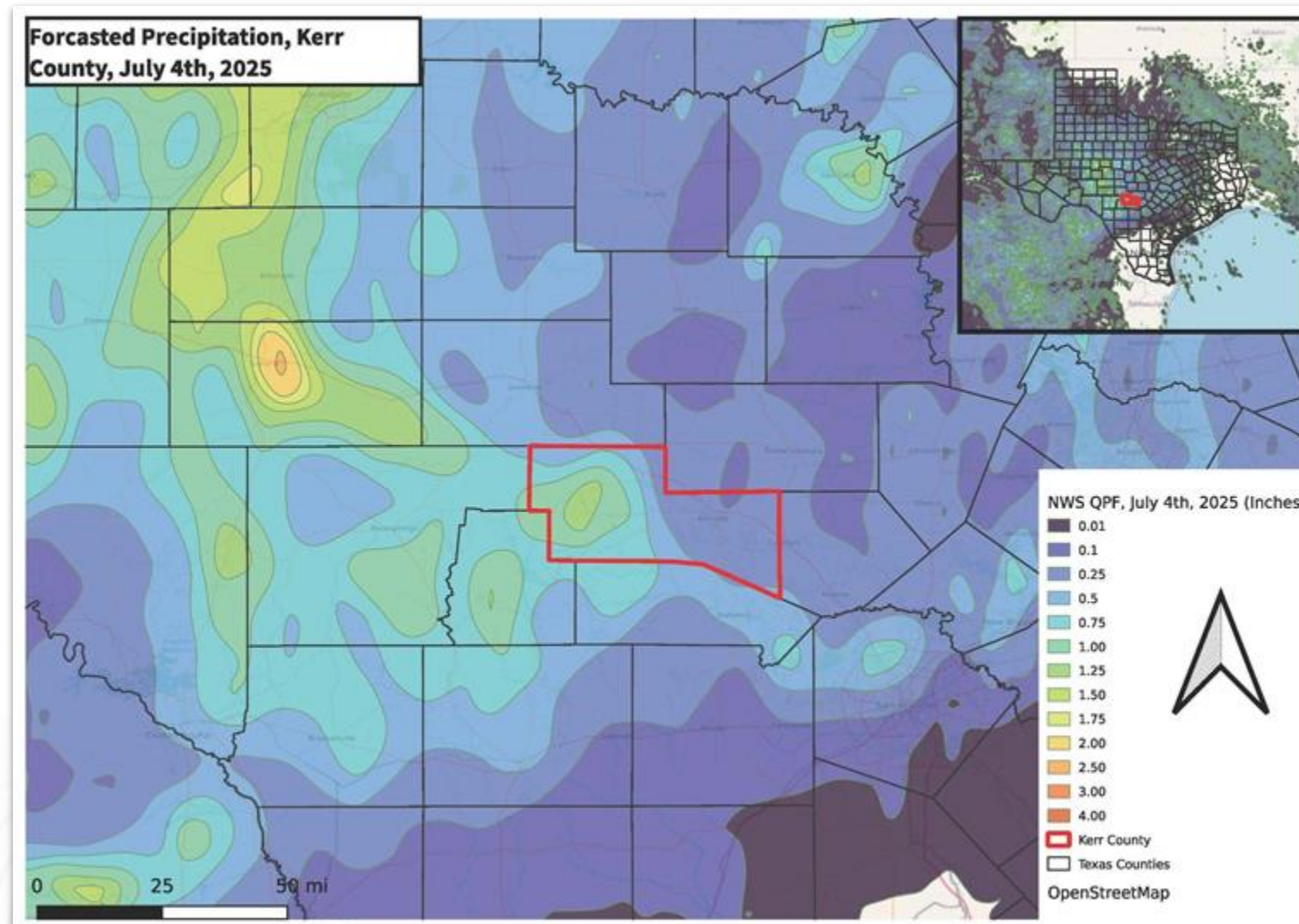
The Forecast:

National Weather Service -
- NWS Issued a Flash Flood Watch at 1:18pm CT

- QPF called for 2-4" with **up to 5-7"** in isolated areas

The Event:

- Convective burst dropped **>12"** of rainfall in **<90 minutes**

- Guadalupe watershed is steep and arid leading to excessive runoff

- 20-foot "wall of water" caused the river to explode out of its banks

The Result:

- **138** Lives Lost

- $18-22B in Economic Losses

- Devastated families and Communities

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What Went Wrong?

Limitations of Existing Systems

- Outdated models & low resolution

- Delayed alert dissemination

- No real-time situational awareness

Impact on Response

- Reactive, not proactive
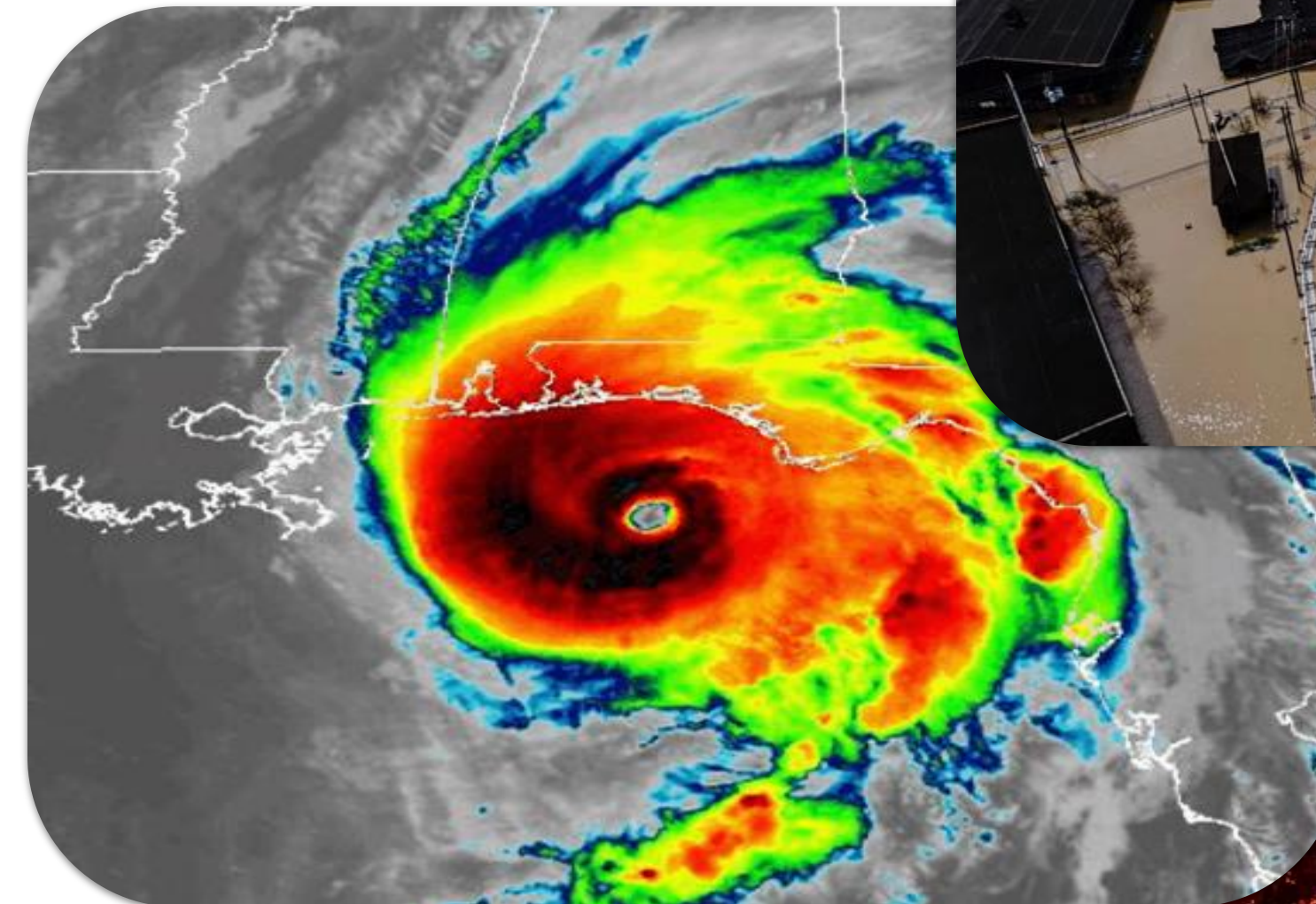
- Narrow warning window

- Fragmented information

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The Stakes Have Never Been Higher

$459.6B in damages incurred from extreme weather events.

1,460 American lives lost.

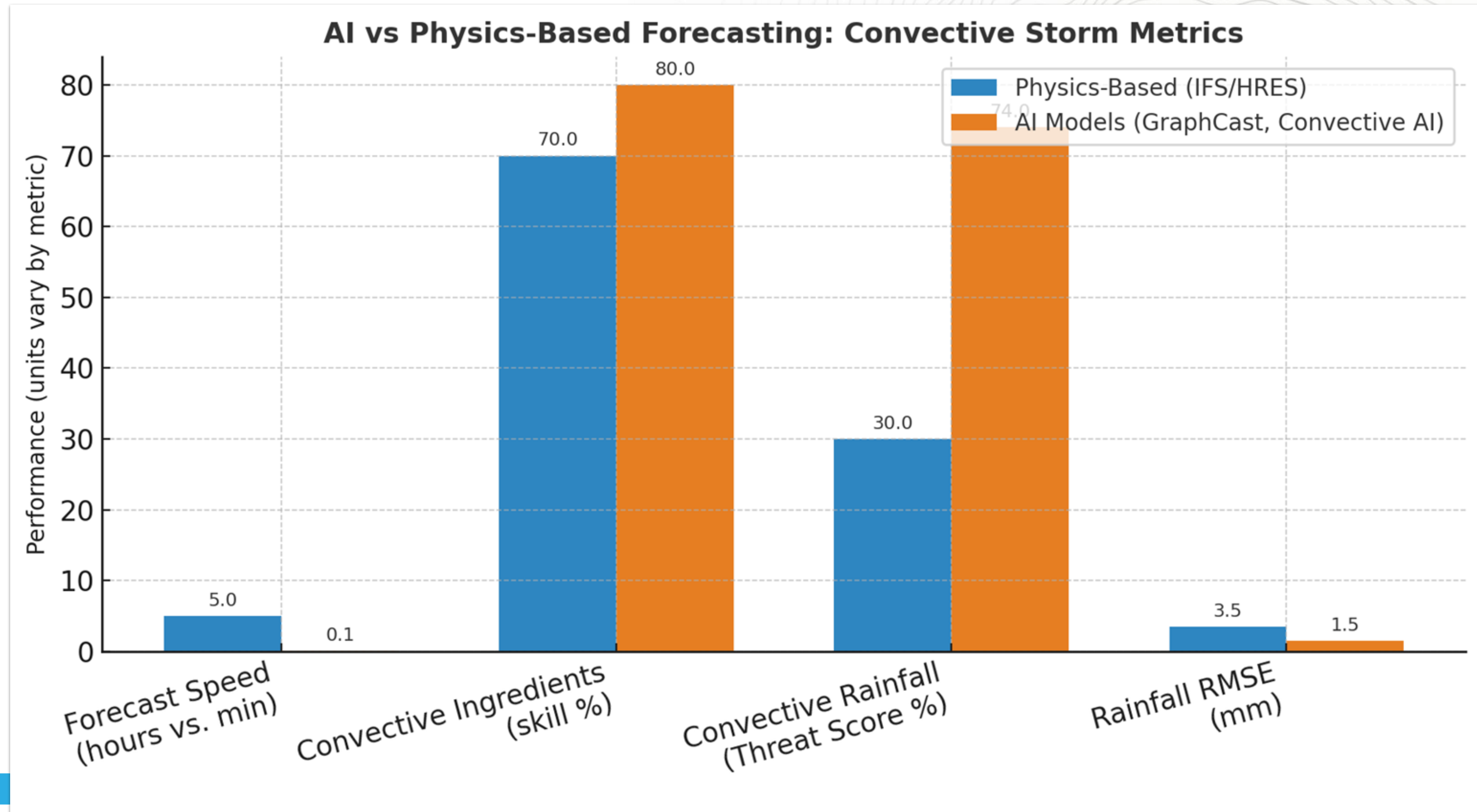| Natural Disaster	Damages	Deaths
Drought	$38.1B	410
Flooding	$4.3B	49
Severe Storm	$84.4B	209
Tropical Cyclone	$260.1B	372
Wildfire	$34.4B	71
Winter Storm	$35.2B	349

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The Technology is Here

AI Models Outperform Traditional Forecasts in Severe Weather Environments

AI vs Physics-Based Forecasting: Convective Storm Metrics

A team of **industry**, **earth** and **computer** scientists, we're poised to build a **resilient world** with the environmental intelligence platform, Terevue.
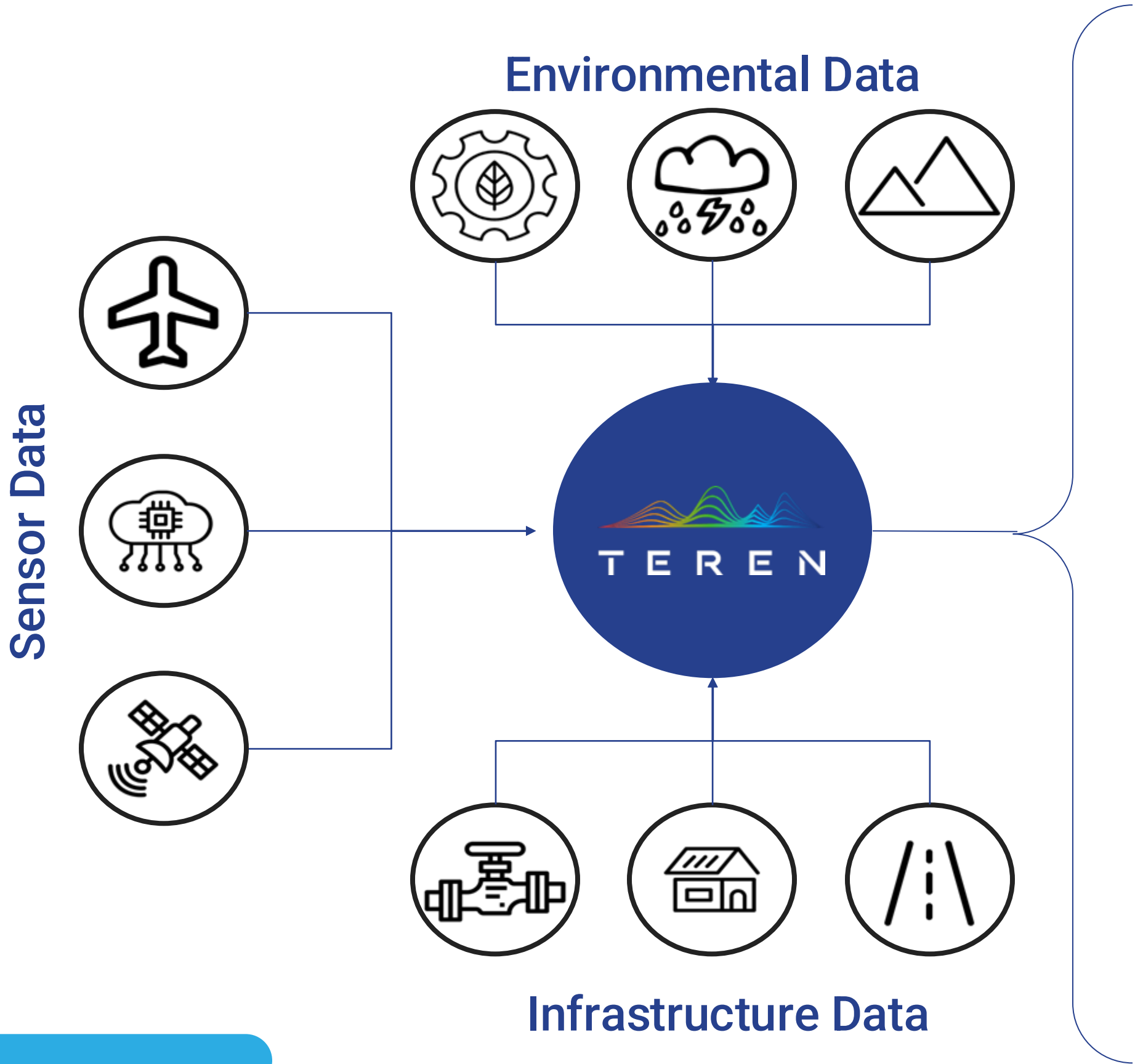
The Environmental Digital Twin

A virtual representation of real-world, changing environmental conditions and their interactions with and impacts to critical infrastructure.

How it Works - Geohazard Prediction

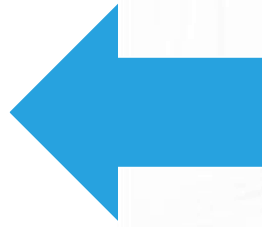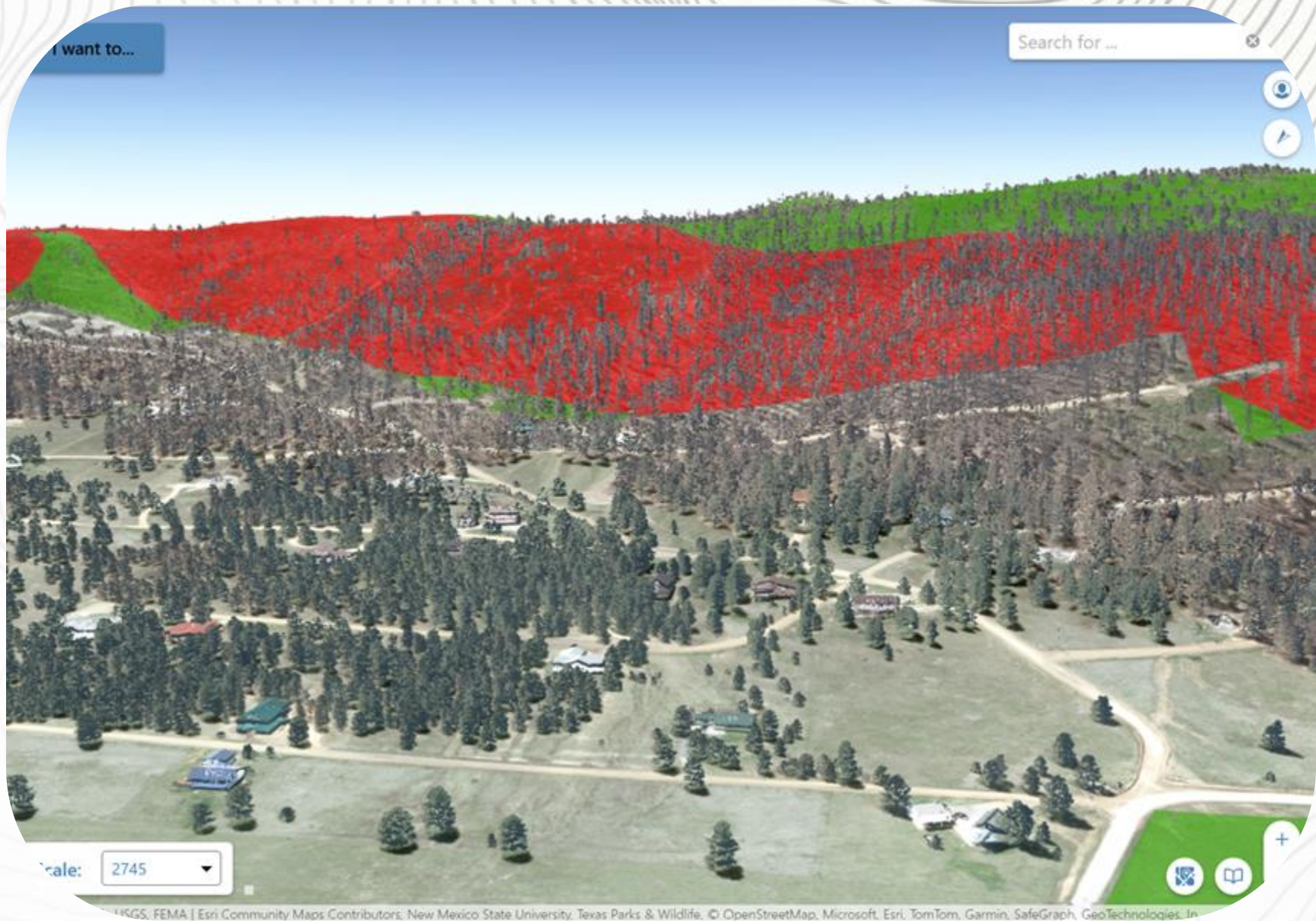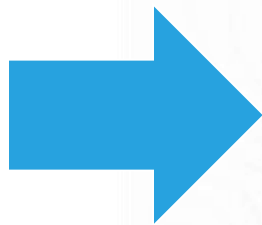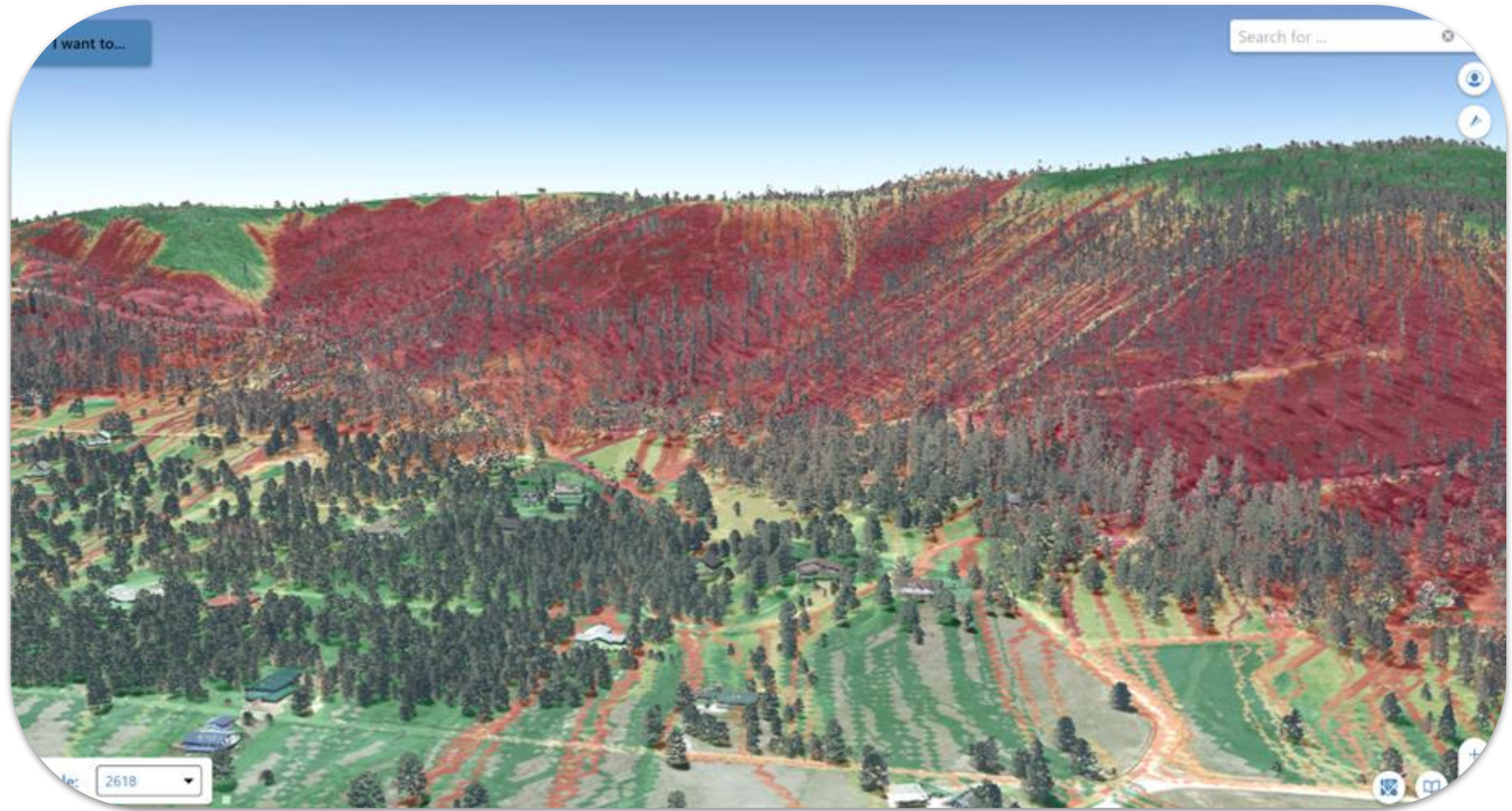**Pinpoint** Impactful Weather Patterns

Predict Where Weather Will Activate Potential Threats

Accurately **Prioritize** Resources for Resilience

How it Works - Debris Flow Prediction

The Innovation - Flood Prediction

Recap: The Challenge Today

- Floods are among the **costliest and deadliest** natural disaster in the U.S.

- Traditional models are **coarse and slow**

- Communities often receive late, generic warnings

- Critical infrastructure (roads, power, water, pipelines) is left **reactive and vulnerable.**

The Innovation; Hybrid Physics + AI Models

- Combines AI weather forecasts with **terrain, saturation, and flow dynamics**

- Provides probabilistic, hyper-localized forecasts — down to **neighborhoods, road segments, or assets**

- Runs 100–1000x faster than traditional models, enabling **near real-time updates**
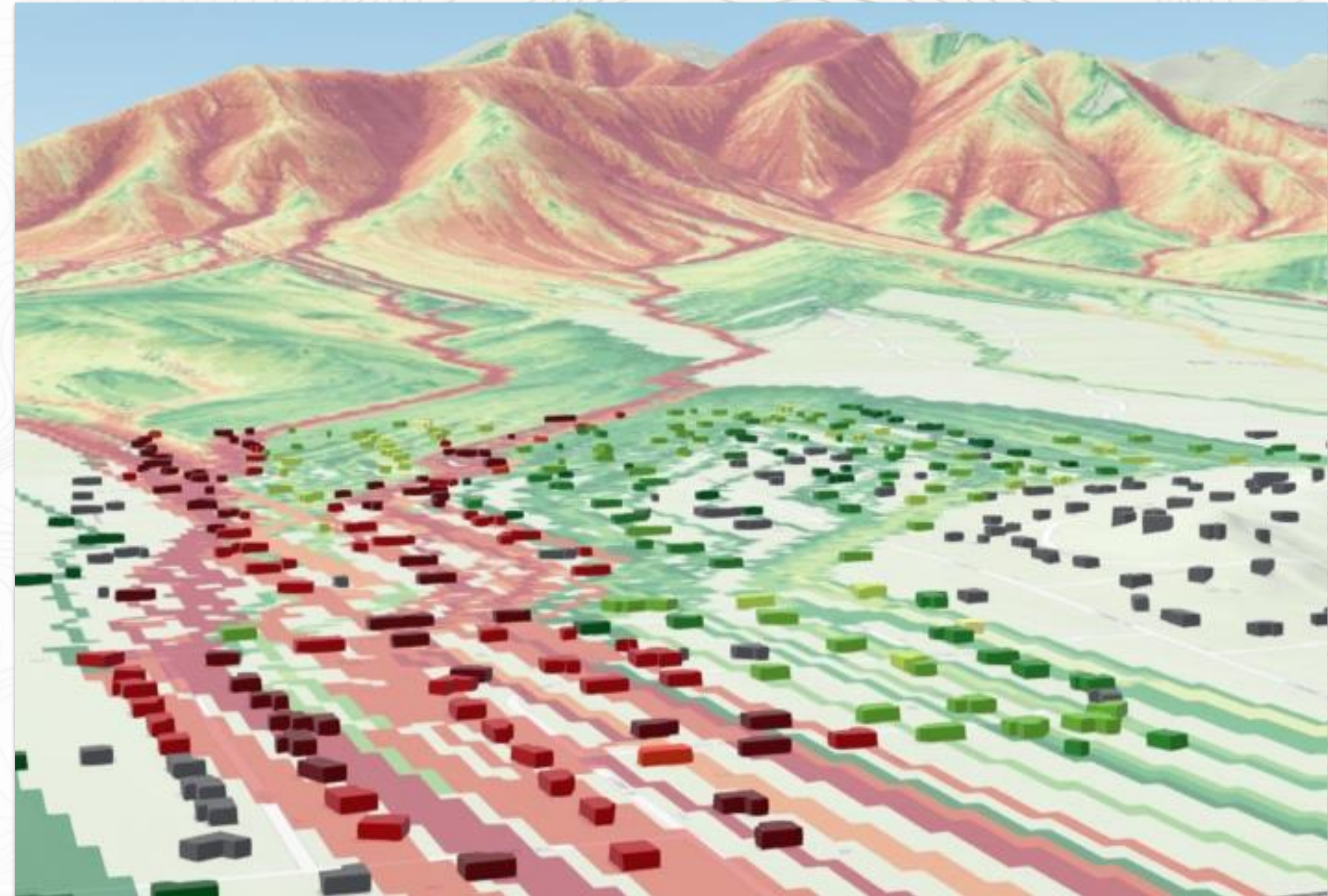
Industry sponsored research initiative (PRCI):

PG&E · Williams · KINDER MORGAN INC. · MARATHON · ENBRIDGE · ENERGY TRANSFER

A Safer Future

"The storms of the future are inevitable — but the tragedies are not."

The Safer Future

- **Actionable**, street-level forecasts

- **Community resilience:** Families, first responders, and municipalities gain hours (or days) of warning.

- **Infrastructure protection:** Utilities and operators harden and monitor assets before disaster strikes.

- **Reduced human and economic loss:** Transforming floods from uncontrollable tragedies into manageable risks.

Thank You

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