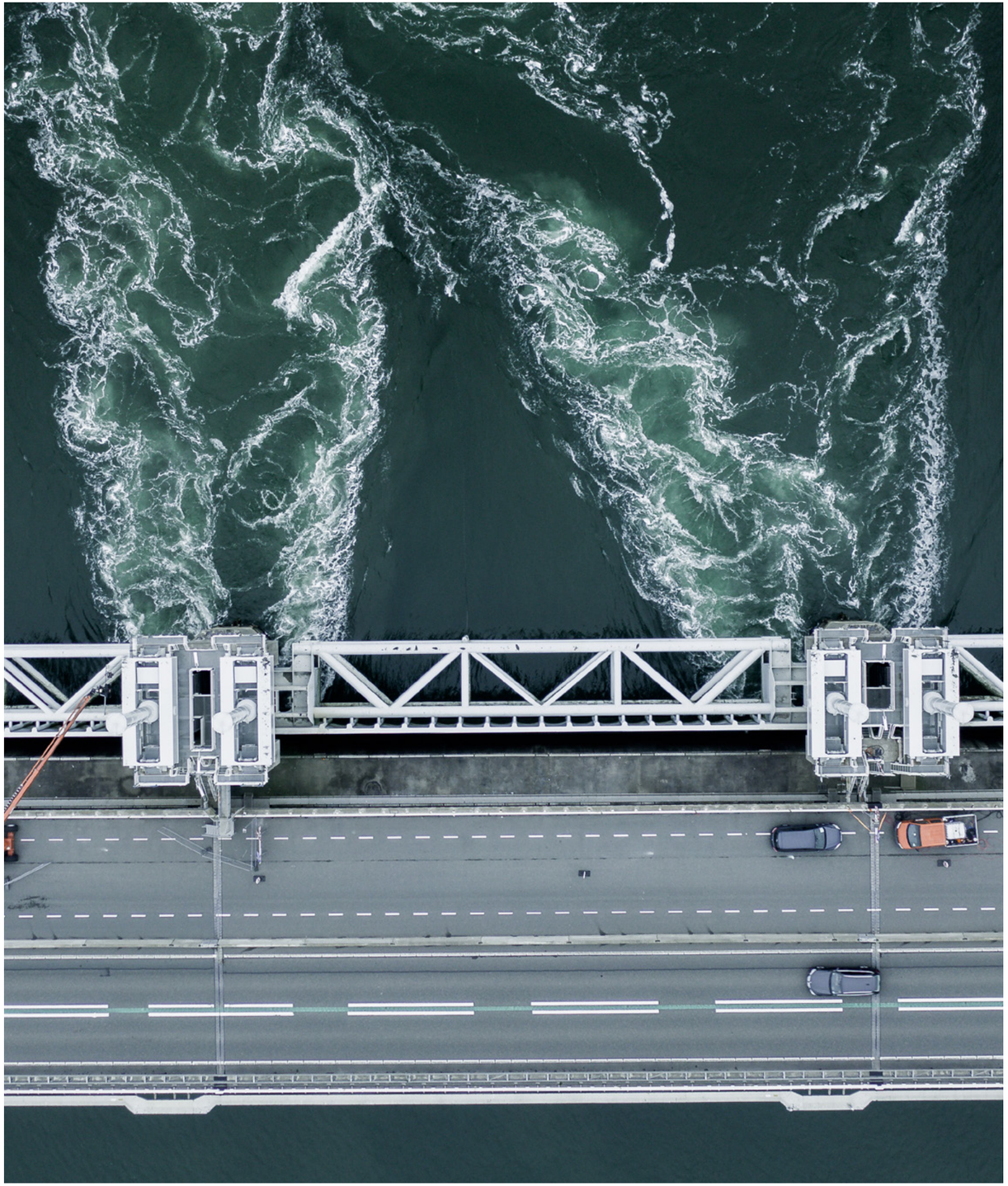
genasys

The Illusion of Safety: Rethinking Flood Preparedness in the Age of Climate Extremes

A Guide for Emergency Managers and Public Safety Leaders



Why Flooding Is Getting Worse

Flooding is not a rare or local concern. Floods are intensifying and expanding in ways communities around the world must urgently understand. Climate change is driving stronger, more destructive storms.

Recent events like Hurricane Helene in the southeastern United States, devastating floods in Texas and Valencia, Spain, tropical-fueled devastation in Queensland, Australia, and severe flooding in southern Brazil illustrate how storms are carrying more moisture and causing unprecedented damage. These storms are not limited to coastal or tropical areas; they impact rural mountain regions and dense urban centers alike, exposing communities that once believed they were safe.

At the same time, urbanization is increasing the coverage of impervious surfaces, including roads and buildings, that prevent water from filtering into the ground. This leads to drastically increased runoff and worsens flood risks even in areas far from large waterways.

This global shift is significant. And as a result, floods are affecting places across the globe not historically known for major floods. What is more, traditional flood models and maps are often outdated, inaccurate or incomplete, leaving communities vulnerable.

Understanding the background of why floods are seemingly getting worse while existing models are giving a false sense of safety is the first step toward improving preparedness, response, and ultimately saving lives.

U.S. Flood Disasters: By the Numbers

75% FEMA flood maps are older than 5 years[1]

45 Billion-dollar flood events in U.S. since 1980[2]

17 Average deaths per year from major U.S. floods[2]

↑5x A city block produces 5x more runoff than an equal-sized forest[3]

*1.https://firststreet.org/research-library/understanding-fema-flood-maps-and-limitations
*2. https://www.ncei.noaa.gov/access/billions/state-summary/US
*3. https://www.fs.usda.gov/nrs/pubs/jrnl/2020/nrs_2020_nowak_001.pdf

The Limits of Traditional Flood Models

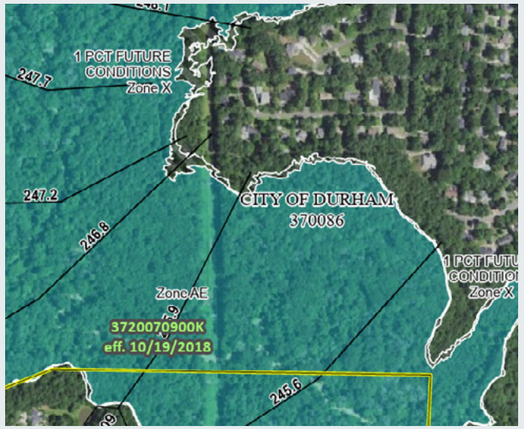
Flood models were originally built to support the National Flood Insurance Program (**NFIP**), not to reflect today's flood risks. While useful for financial regulation, they often fall short when it comes to public safety and real-world flood behavior.

FIRMs: Designed for Insurance, Not Safety

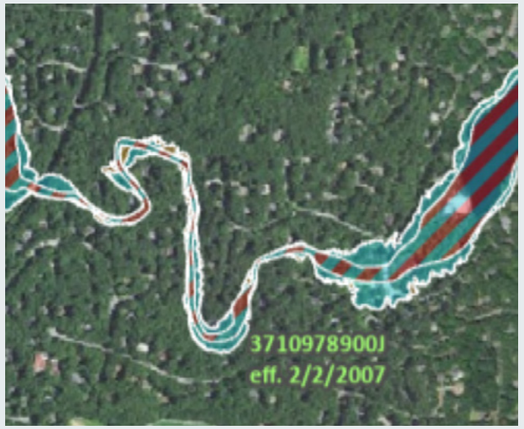
FEMA's Flood Insurance Rate Maps (**FIRMs**) are regulatory tools, not emergency planning tools. They divide properties into binary zones: inside or outside the "100 year floodplain." This determines who is required to carry flood insurance but says little about actual risk. While there are sometimes boundaries for 0.2% chance storms (500-year events) and estimated differences of Zone X (reduced risk), the 100-year, Zone AE floodplains are those most often mandated in flood studies.

That distinction matters. A home just outside the official boundary may still be highly vulnerable. FIRMs rely on coarse approximations, often using cross sections spaced hundreds of feet apart. But water doesn't respect zone boundaries. During real flood events, water moves to the area of least resistance, and while no zone boundary is ever going to be absolutely exact, the current boundaries are often ill-equipped to be used as predictive tools for the dangers that await. As floods expand beyond those boundaries, people are often caught by surprise.

Flood Model Maps



FEMA Map Service Center 100-year Zone AE Boundary



FEMA dFIRM Zone AE and Floodway Boundaries
(Flood study boundaries last updated in 2007)

Legacy Models, Outdated Assumptions

Most FIRMs are based on proven civil and environmental engineering modeling software, HEC-HMS and HEC-RAS, developed decades ago by the U.S. Army Corps of Engineers. These tools simulate runoff and flood expanse under idealized, static conditions: often unsaturated soil, no recent storms, and unchanging land use.

That's not today's reality. Torrential storms hit when soils are saturated, drainage systems are stressed, or intense cells train one after the other. Growing cities amplify this risk, as new development increases impervious surfaces and runoff volumes into storm drains and streams escalate. But maps based on outdated data don't account for these changes to the hydrologic baseline or land use degradation.

What is more, due to the extensive cost to get detailed flood studies for FEMA, flood maps are not updated with regular frequency.

Many communities are still using flood maps from the 1990s and early 2000s, even as they've added tens of thousands of residents and paved over miles of open land.

Updating these models, when public budgets are already stretched thin, require costly, intensive data collection and engineering analysis. As a result, critical updates are delayed or skipped, leading to reliance on floodplain boundaries that are not reflective of new realities.

The “100 Year Flood” Myth

The term “100 year flood” is deeply misunderstood. It doesn’t mean one flood per century; It means a 1% chance of that flood level in any given year. That might not sound like much, but when buying a home with a 30 year mortgage, it means roughly a 1 in 4 chance during the life of the loan. That’s substantially higher than most people think.

A 100-year flood sounds rare, until you realize it’s more likely to hit during your mortgage than a pro basketball player sinking four free throws in a row. A “100 year flood” doesn’t have a memory. It doesn’t care what happened last year. The 1% risk is always there, every single year. And that is working with the assumption that the 100-year storm of the last decade is the same now, in an increasingly saturated atmosphere with more torrential storms.

Yet many people, and even some officials, assume they’re safe after experiencing one major event. This false sense of security leads to complacency. People don’t evacuate. They ignore warnings. They rely on outdated maps. But in today’s climate, that kind of thinking can be fatal.

And while we cannot move homes, with better planning and modern communication solutions, we can save lives.

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Photograph by Jocelyn Augustino

Communication Failures During Flood Events

Clear, timely communication saves lives during floods, but too often, communication systems and processes fall short. From confusing alerts to infrastructure failures, communities face several obstacles that undermine trust, erode understanding, and delay response.

Experts found four major communication breakdowns that routinely occur during flood events:

The “100 Year Flood” Myth

Repeated broad warnings over wide geographical areas lead people to tune out. Many turn off their flash flood alerts after receiving too many that didn’t apply to their immediate area, home or typical driving routes. These overgeneralized alerts, often triggered at inconvenient hours for distant threats, can cause people to disable notifications entirely. As a result, those individuals may miss the one warning that actually matters, when their own home is at risk.

Sirens Causing Confusion

Traditional siren warnings are another weak link in the communication chain. They may go off during any emergency - fire, flood, tornado - yet usually provide no specific context. Without knowing what the siren means, who it’s for, or how urgent the situation is, people are left confused. That confusion gets no answers from the siren itself: Is it a tornado? A flood? Evacuate now? Shelter in place? And as a result, the confusion turns into apathy. This lack of clarity undermines the purpose of the alert and delays action.

Infrastructure Vulnerability

Often, communication systems depend on consistent power and wired connections to work effectively. During Hurricane Helene, key infrastructure in North Carolina failed fast. Cell towers and power lines went down. With power outages and no cell service, communication systems collapsed when they were needed most. These vulnerabilities aren’t rare; they’re frequent around the globe. Once infrastructure is compromised, most alert systems go silent, leaving people without guidance or time to act.

Communication failures of this nature aren’t just technical, they threaten lives. As flooding grows more severe, ensuring messages are clear, timely, and trusted is just as important as the flood models behind them.

Public Perception and Behavioral Risk

Even with better models and alerts, people often misjudge flood risk. They rely on past experience over data. If it didn’t flood last time, people in the area often assume it won’t now. This normalcy bias makes them slow to act, even when warned.

Many also tend to distrust alerts after too many broad or false alarms. Once they opt out, it’s hard to reengage. And when warnings do come through, people often wait for visible danger before responding. For flash floods, that waiting might be too late.

The Role of Community Leaders and Emergency Managers

As we've seen, flood risks are accelerating faster than many models and processes in place, and public understanding often lags even further behind. To close that gap, community leaders and emergency managers play a vital role. Here's what they can do:

- Communicate early: Move from reactive alerts to proactive messaging based on real-time conditions, not outdated maps.
- Adopt dynamic tools: Use live models that account for soil saturation, compound storms, and urban runoff to better anticipate evolving threats.
- Educate beyond insurance zones: Make clear that FEMA maps reflect insurance needs, not actual flood boundaries or personal safety.
- Cut through alert fatigue: Deliver targeted, location-specific alerts tied to current risk.
- Mitigate Breakdowns: Use redundant systems to continue broadcasting instructions to the public when power or cell networks inevitably fail.

Turning Insight into Action: Genasys Protect Helps You Stay Ahead of the Flood

The critical challenges that complicate the work of emergency managers and first responders and put public safety at risk during floods are now clearly understood. Fortunately, new technologies give us the tools to address these issues, strengthen emergency response, and ultimately save lives.

PROBLEM

Alert fatigue and slow, inconsistent workflows.

SOLUTION

Genasys delivers geo-targeted, multilingual alerts and flexible automation to match local needs in real time.

Typically, high fatalities in flooding events result from the absence or delay of early warning notifications. Precise alerting improves credibility and saves lives. The Genasys Protect platform lets agencies target only those in harm's way, using the latest floodplain intelligence to inform their decisions.

Whether directed to families inside a projected inundation zone or a commercial block near a rising river, alerts go where they're needed. Messages can be delivered in multiple languages across voice, text, email, and social platforms. Ensuring people understand alerts and reducing their exposure to broad irrelevant alerts reduces alert fatigue, improving trust and credibility.

At the same time, speed and clarity are critical. Legacy systems often rely on manual processes that delay alerts or miss key context. Genasys solves this with customizable workflows.

Agencies can set automated triggers based on real-time conditions, use pre-approved templates that align with local language and tone, and override alerts instantly as the situation evolves. The result: faster, smarter, more trusted flood communications.

Predictive Intelligence

PROBLEM

Static maps miss real-time hazards.

SOLUTION

Integration with dynamic, modern, flood models informs both the public and internal responders.

Delayed warnings that lead to higher fatalities are often not the result of limited communication channels, but rather a lack of timely situational awareness; sometimes emergency managers and first responders simply don't know how flood conditions will evolve until it's too late.

Outdated flood boundaries can't keep up with today's flood risks. That's why Genasys integrates with dynamic modeling tools like FloodMapp, which is designed specifically for emergency response and real-time understanding of danger, not just insurance.

These real-time models use live rainfall and stream gage data, fueled with AI to provide three critical insights: a nowcast of current flooding, a forecast of what's coming, and a real-time visualization of impacts down to the street and property level. The models compute compounding events too: flash floods (pluvial), river overflow (fluvial), and coastal surge, giving a more complete picture of risk as storms evolve.

These flood models aren't just more accurate; they're incredibly useful to make fast, critical decisions. Updated hourly and scalable from national to hyperlocal resolutions, the models display depth, extent, and potential impact of rising waters.

Whether you're watching a flash flood form in a dry streambed or monitoring an urban drainage system during compound storms, you get clear, up to date situational awareness via direct API integration into your GIS.

Emergency managers will know exactly which areas are flooding, which will flood next, and who's at risk. From there, Genasys enables targeted communication to those flood zones and quicker, clearer decision-making. Together, the two save lives.

Coordinated Evacuations

PROBLEM

Floods evolve fast, with multiple points of origin and thousands potentially in harm's way.

SOLUTION

Genasys provides a common operating picture, detailed and custom zones based on emergency or use types, and live situational awareness to drive faster, coordinated evacuations.

In complex flood scenarios, every minute counts. Rising water from multiple sources (urban runoff, creek overflows, saturated ground) can rapidly threaten thousands across neighborhoods, towns, and counties. Coordinating evacuations under this pressure is chaotic without clear zones, clear data, and a shared understanding of the threat.

Genasys solves this with three core capabilities:

- A common operating picture that keeps agencies and responders aligned on a single, map-based view of real-time risk, road conditions, and zone status.
- Intelligent zone creation that eliminates guesswork and delays. Zones are predefined, dynamic, and connected to critical population data, so decision makers instantly know how many people, homes, and vehicles are in harm's way. And different zones can be applied to different emergencies or even everyday use. So, your flood zones can be loaded and activated quickly.
- Integrated situational awareness that visualizes shelters, hospitals, traffic congestion, and disaster progression, giving teams the information they need to adjust in real time and keep evacuation routes clear.

With Genasys Protect, there's no more scrambling to define areas or translate vague descriptions like "north of the highway." Zones are precise. Alerts are targeted. And the entire team, from field responders to EOC staff, works from the same live data to move people out of danger faster.

> **Genasys Protect was an easy way for us to track threats by zone. At any one time, we had an average of 57 highlighted zones at the evacuation advisory level. Using Genasys, we knew exactly how many residents we were looking at. We could calculate exact numbers, e.g., 20,200 folks in 11,807 structures on 160,000 acres needing evacuation. Genasys Protect gave everyone an instant snapshot of what we were up against."**
>
> – San Mateo, California's Battalion Chief, Tony Blackman

Redundant Communications

PROBLEM

Failing infrastructure disrupts critical alerts.

SOLUTION

Genasys ACOUSTICS and LRAD systems deliver voice messages even when power and networks go down.

Floods don't just threaten lives, they can take out the very systems meant to protect people. Power outages, downed cell towers, and disrupted network links can cripple communications at the worst possible moment. That's why Genasys designs redundant, resilient, and integrated systems that keep working when everything else fails.

Genasys ACOUSTICS and LRAD RT units are built for this. Remotely operated and engineered for extreme weather, they continue broadcasting loud, clear voice messages even through howling winds, torrential rain, and deep infrastructure failure. With built in battery backups and solar charging stations, ACOUSTICS stay connected throughout the storm and long after it passes, even if the grid stays down.

This performance isn't theoretical. These systems project intelligible voice messages across many miles, reaching people inside homes, vehicles, and buildings despite ambient noise. Mounted LRADs add mobility, deployed on boats, trucks, or helicopters, they extend communication to remote or isolated areas. After landfall, they become critical for search and rescue teams to locate survivors and give lifesaving instructions in real time. When digital systems fail, voice endures. Genasys ensures the messages that matter are always heard.

Preparing for the Floods to Come

We know flood risks are growing. When minutes matter, static maps, generic alerts, and manual workflows often put lives at risk.

Smarter flood preparedness means acting sooner, communicating better, and targeting the right people at the right time. With real-time modeling, intelligent zoning, and multi-channel communication, emergency managers can stay ahead of fast-moving threats and coordinate rapid, effective evacuations.

Now is the time to modernize. Invest in tools built for today's challenges, because every alert, every decision, every second counts.

Contact Genasys today to ensure your agency is ready for the next flood and for every hazard to come.

Floods Aren’t Waiting, and Neither Should We.