

# COMPOUND THREATS AND KNOWLEDGE

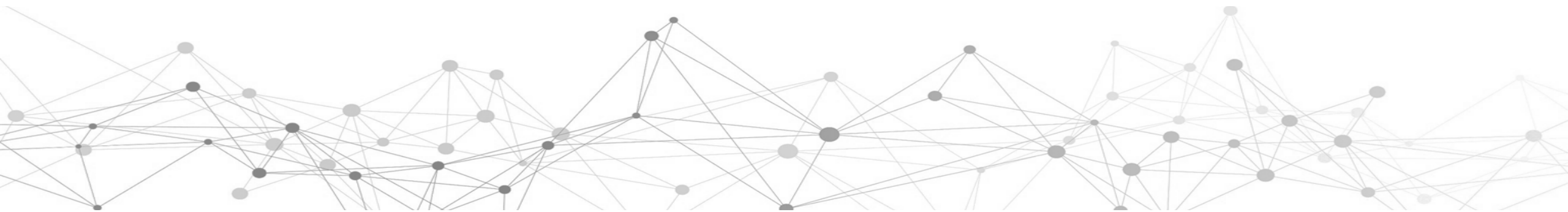
Thoughts of a Tornado and Flash Flood Research

**Rodolfo Hernandez-Perez**

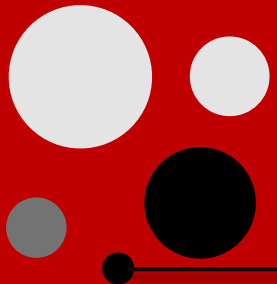
Research Knowledge Transitions & Compound Hazards:  
Generating Ideas for Adapting Social Science to Your Workspace

June 6, 2023

A collaboration between

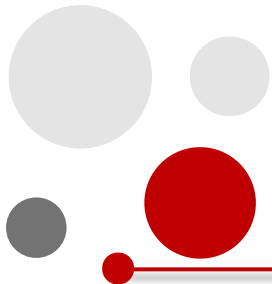


# Research Context



# Improving Knowledge about NWS Forecaster Core Partner Needs for Reducing Vulnerability to Compound Threats in Landfalling Tropical Cyclones Amid Covid-19

2021 SBES-Weather Program Office Research Programs,  
NOAA



# Research Team



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# Context of the research

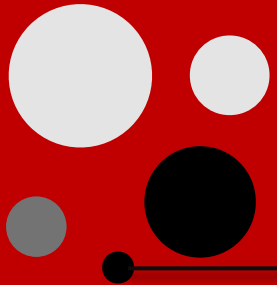
**Goal:** to develop knowledge about compound wind and water hazards during landfalling tropical cyclones (e.g. Hurricane Ida) amid Covid-19:

- i. how NWS partners in emergency management and broadcast meteorology attend to, assess, and communicate compound hazards in Hurricane Ida given Covid-19 surges
- ii. how this understanding shapes and is shaped by partners' conceptualizations and indicators of the public's changing vulnerability
- iii. what pathways for research-to-operations (R2O) can be developed for products, processes, and practices that can help build forecaster and core partner knowledge and situational awareness of compound hazards

# Methods

- **Semi-structured interviews:** Emergency Managers (6 interviews) and Broadcast Meteorologists (15 interviews). First coding round.
- **National survey:** Emergency Managers (Oklahoma University collaboration)
- **Case Study:** Hurricane Ida (Aug 29-Sep 3, 2022)
- **Outreach education:** Local Schools in Lubbock, Texas

# Concepts



# TORFFS: Overlapping tornado and flash flooding warnings

## Town B Scenario

### **Tornado Warning**

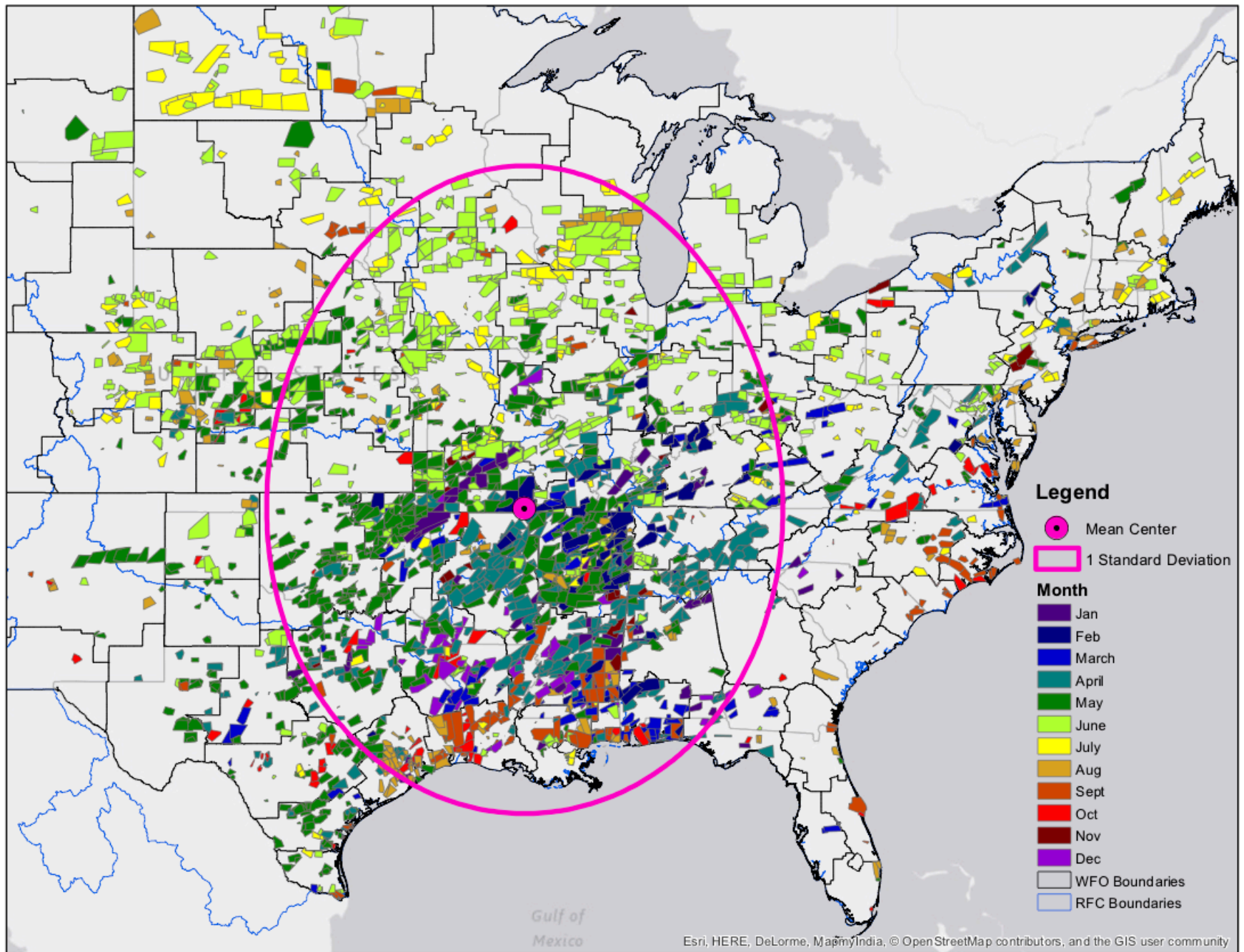
Seek shelter in low places

### **Flash Flood Warning**

Seek shelter in high places

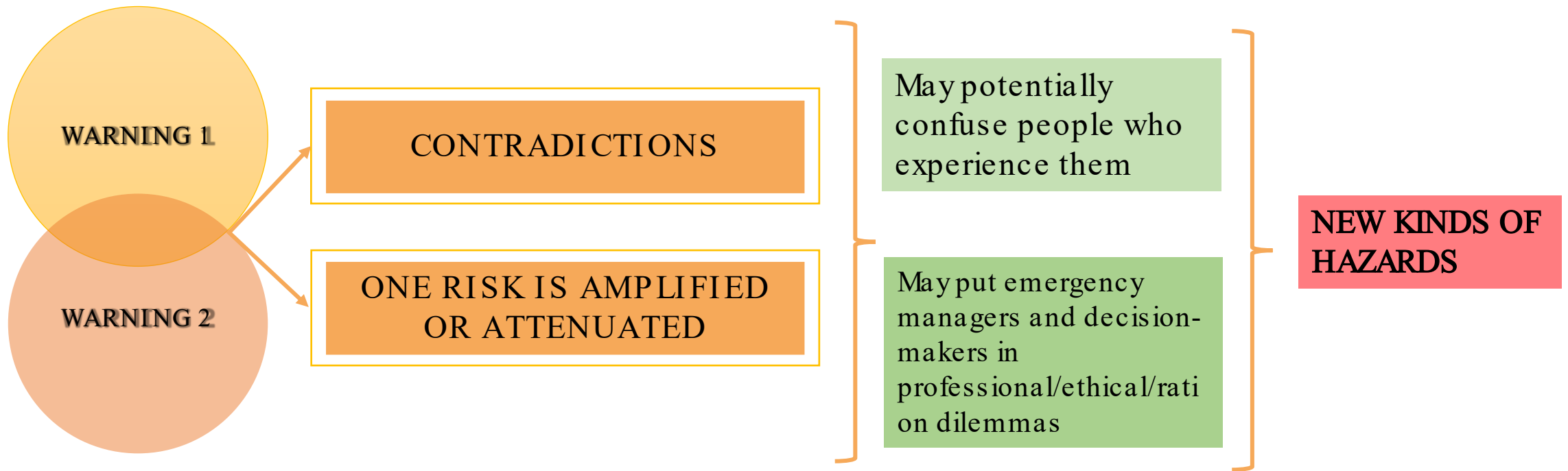






# Map of "Verified" TORFF Events from 2003 - 2018

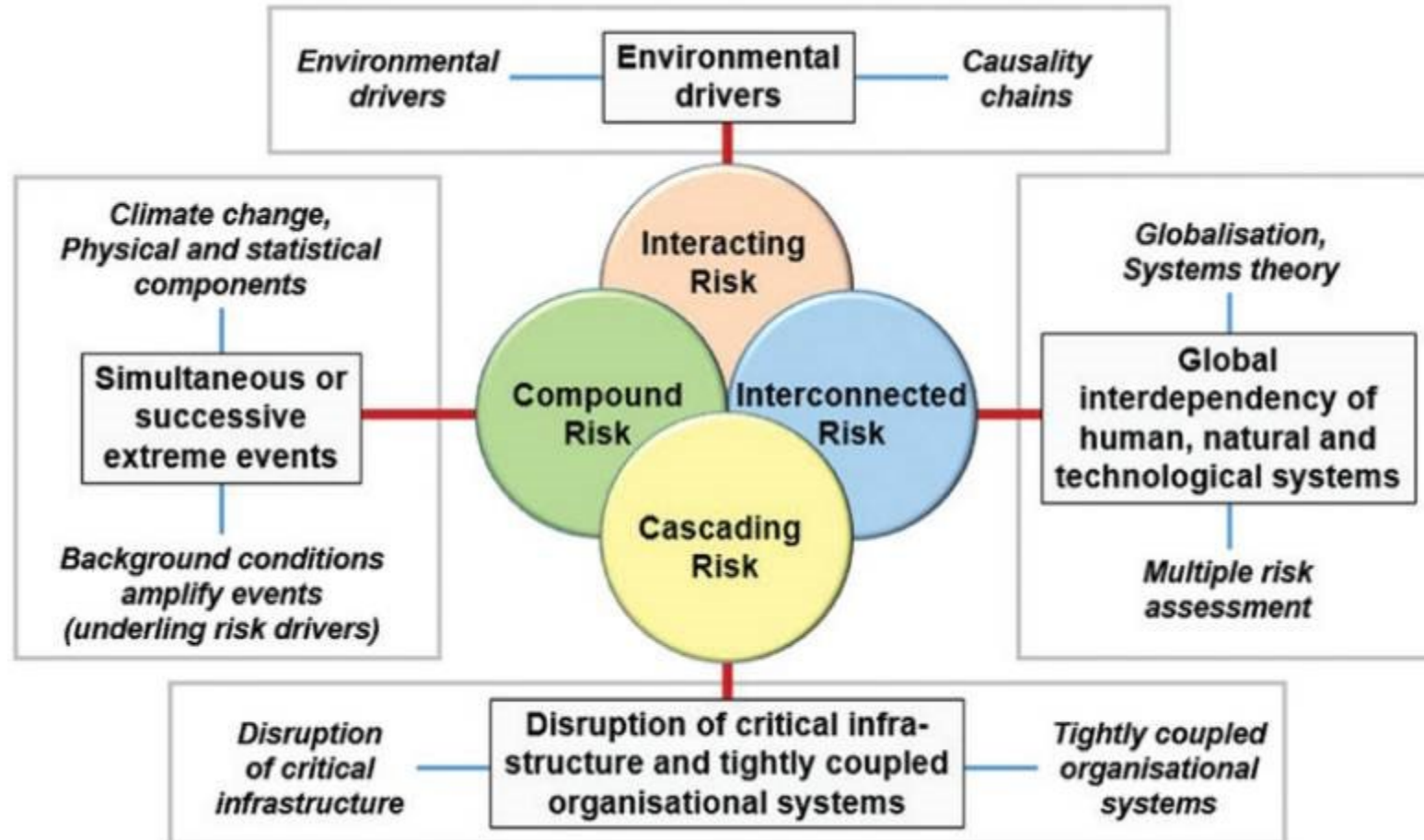
**Sources:** (Nielsen, et al. 2015)  
Monitoring of concurrent, co-located tornado and flash flood (TORFF) warnings  
[https://schumacher.atmos.colostate.edu/weather/TORFF\\_rt/](https://schumacher.atmos.colostate.edu/weather/TORFF_rt/)



## SOCIAL AMPLIFICATION OF RISK FRAMEWORK

**Based on:** Henderson et al. 2020. A Hazard Multiple: Overlapping Tornado and Flash Flood Warnings in a National Weather Service Forecast Office in the Southeastern United States. *Weather and Forecasting* 35 (4), 1459–1481.

# Cascading Disasters



SOURCE: Alexander D, Pescaroli G. What are cascading disasters? UCL Open Environ. 2019 Aug 8;1:e003. doi: 10.14324/111.444/ucloe.000003.

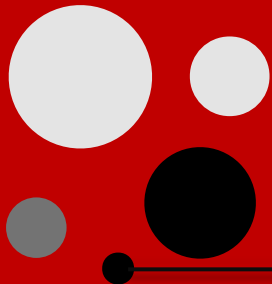
# What are cascading disasters?

David Alexander<sup>1</sup> and Gianluca Pescaroli\* 

Cascades have emerged as a new paradigm in disaster studies. The high level of dependency of modern populations on critical infrastructure and networks allows the impact of disasters to propagate through socio-economic systems. Where vulnerabilities overlap and interact, escalation points are created that can create secondary effects with greater impact than the primary event. This article explains how complexity can be categorised and analysed in order to find those weak points in society that enable cascading impacts to develop.

**SOURCE:** Alexander D, Pescaroli G. What are cascading disasters? UCL Open Environ. 2019 Aug 8;1:e003. doi: 10.14324/111.444/ucloe.000003.

# Preliminary Results







A Flash Flood Emergency has been issued for Metro New York City. This is a PARTICULARLY DANGEROUS SITUATION. SEEK HIGHER GROUND NOW!

## Flash Flood Emergency

Valid Until  
11:30 PM EDT Wednesday  
September 1, 2021

**Safety Information**

- Move immediately to higher ground!
- Avoid walking or driving through flood waters!

**Potential Exposure**

- Population: 9,136,562
- Schools: 1723
- Hospitals: 71

@NWSNewYorkNY

8:45 PM · Sep 1, 2021

1,048 Retweets 290 Quotes 1,646 Likes 57 Bookmarks

At least 43 people were killed in New York, New Jersey, Pennsylvania and Connecticut as the remnants of [Hurricane Ida](#) struck the region on Wednesday.

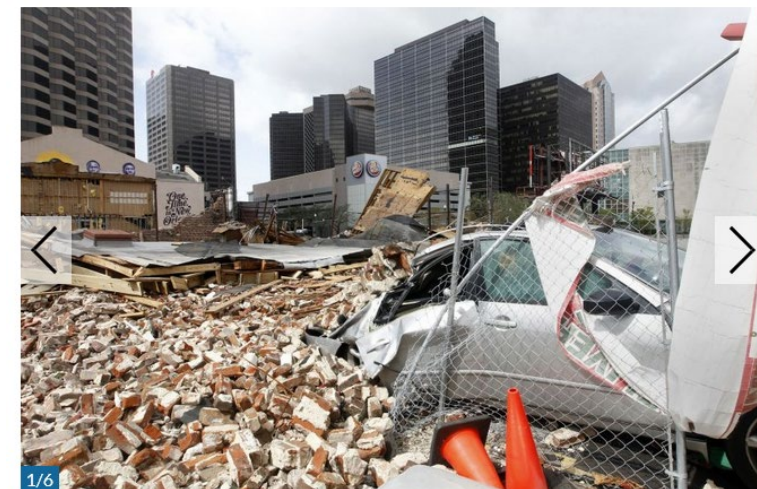
Fifteen people are known to have died in New York, including 13 in New York City, most of whom were found at homes in [Queens](#) and Brooklyn and ranged in age from 2 to 86, the police said. Official causes of death will be determined later by the city's medical examiner, the department said.

<https://www.nytimes.com/2021/09/02/nyregion/ida-new-york-city-deaths.html>

U.S. NEWS AUG. 26, 2022 / 5:16 PM

### New Orleans continues recovery one year after Hurricane Ida

By Adriana Navarro, AccuWeather, [Accuweather.com](https://www.accuweather.com)



[https://www.upi.com/Top\\_News/US/2022/08/26/hurricane-Ida-anniversary/2081661537444/](https://www.upi.com/Top_News/US/2022/08/26/hurricane-Ida-anniversary/2081661537444/)

# Emergency Management

- **Cascading effects:** New hazards and emergencies created new scenarios of vulnerability and messaging uncertainty but also learning opportunities for new emergency management approaches.
- **Covid-19 Pendulum Effect:** Between any known impact on operations to significantly affecting coordination efforts, team management –staff shortage and fatigue-, and personal burdens.



“COVID changed everything. And that is, I have two people in my office right now today. I've got everybody working from home as much as they can, when we're doing this stuff. Our EOC this year, during Ida, we've had to, you know, great challenges with trying to keep people healthy. My office has worked throughout all of COVID for two years, while most of my building here at City Hall has worked remotely.”

**Emergency Manager**

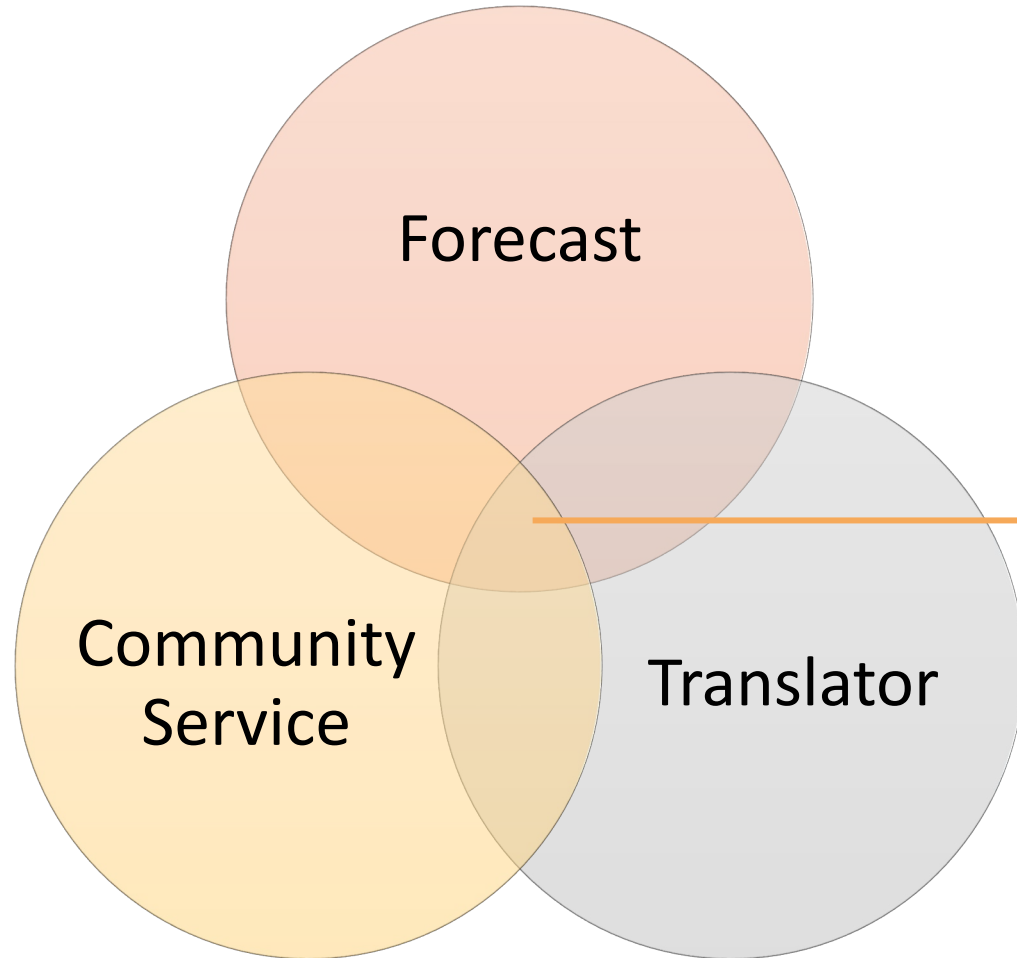
“Our greatest is complacency. And so there is concern always when you wear people down with these things. When a residency or a group in your city get beat down constantly, over the course of three and a half years by 17 declarations and, and hopefully, some of those things have been a little seamless, and maybe not affected everyone the same way. But we have had some big events, you know, both infrastructure-related and natural disaster-related that have, you know, definitely been trying for our residents. So we do have to continue to try and engage with our public and make sure that, I hate to say it, but sometimes it's like, no, we're really serious, this is dangerous, just like last time, you know.”

## **Emergency Manager**

“We know that extreme weather events continue to impact the country, we know that climate change is a real issue that we're continuing to experience. And I think it's now become part of the repertoire. And like, part of like, you know, the collective consciousness of residents across every jurisdiction is not like ours. You know, sometimes what happens is when an emergency like this happens, people will say, ‘Oh, we experienced this, but we were fine. We bounced back, we're resilient, we figured it out’. But I think that so many people were affected by this and weren't expected to be affected by this, because they're like, I don't understand. I don't live near water. I think that is something that has really resonated with people today is that, you know, obviously some people say coastal storms or hurricanes, I don't live in a zone, I'm fine. But flash flooding affects everybody.”

## **Emergency Manager**

# Multiplicity of Roles: Bilingual Broadcast Meteorologist



- **Scientific expertise:** Meteorological knowledge, scientific data, and conceptual frameworks
- **Social expertise:** Actively involved in societal issues (representation, diversity, immigration, education).
- **Mixed roles:** Expanding the knowledge in Spanish. Supporting intercultural communication across different Spanish-speaking communities, different English proficiency levels, and social groups (workers, undocumented, highly educated people, etc.).

“When a mom is saying, 'I'm here with my three kids, and nobody's helping us, and we're drowning', you have to keep them through your head, and you have to try to give them the best information that you can. But if you know some of those situations, it shouldn't be us, right? But unfortunately, it's, it's what it's become. We become the therapists, scientists, and geologists. And like, they that's all like an eclipse, covering me. Then I'm like, 'How did I become all these things?’”

**Bilingual Broadcast Meteorologist**

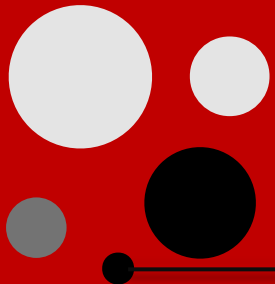
# Linguistic inclusivity and communication

Communication

Intercultural  
interaction

Crucial at times of  
disasters,  
emergencies and  
in the different  
phases of  
developing crises

# Discussion & Questions



# Let's discuss

1. Are you coping with compound hazards and cascading disasters in your workspace?
2. What challenges have they brought to your operation?
3. Have you been challenged by messaging or explaining compound hazards to diverse professional and local communities?

