Resilience Factors of Incident Management Teams during Hurricane Harvey

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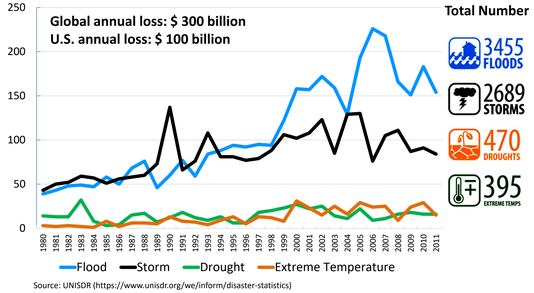
BACKGROUND

Increasing Threats of Natural Disasters



Source: UNISDR (https://www.unisdr.org/we/inform/disaster-statistics)

Hurricane Harvey in 2017

Source: abcNEWS (https://youtu.be/Zo3Wb8LiWFw)

- **The costliest tropical cyclone** in the U.S. history
- Inflicted **$ 125 billion** in damage
- Considered **a 1,000-year flood**
- **30,000 people** sought shelter
- **10,000 rescue** missions
- **Major Disaster** declared by State

Incident Management Team (IMT)

- **Multidisciplinary**: fire, search & rescue, law enforcement, medical, etc.
- **Multijurisdictional**: multiple cities, counties, and states.
- **Impromptu formation**: constituting members may(can) not be pre-determined.
- **Under pressure**: limited time, lack of resources, inaccurate and incomplete information.
- **Needs for adaptation**: coping with constantly changing conditions.

An IMT established during Macondo Well Blowout

RESEARCH AIM

To elicit **resilience factors of multidisciplinary incident management teams** during Hurricane Harvey

METHODS

Semi-structured Interview

- **Participants:**
  - **10 government emergency** personnel
  - Interview period: March to September 2018
- **Interview questions:**
  - **Roles** performed during Harvey
  - **Functions and structure** of the IMT
  - **Major challenges** of Harvey
  - **Response efforts** to such challenges

Data Processing and Analysis

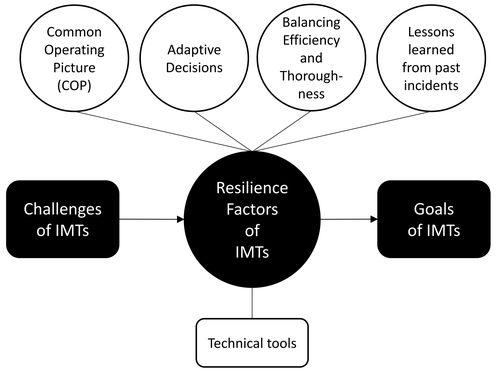
- **Transcribing the interviews**
  - **Automated (AI-based)** and **manual** transcribing
- **Qualitative data analysis**
  - **Thematic analysis** (Braun and Clark, 2006)
  - Using MaxQDA Analysis Pro 2018

RESULTS

Categories and Themes

Category	Theme
Goals of the IMTs	• Life safety • Mass evacuation • Operational planning and guidance
Challenges to the IMTs	• Uncommon damaging pattern • Massive and unanticipated needs for resources • Unrealistic expectations and unimplemented measures
Resilience factors of the IMTs	• Establishing and maintaining Common Operating Picture (COP) • Making adaptive decisions • Balancing between efficiency and thoroughness • Lessons learned from past experience
Technical tools for IMTs	• Different functions supporting COP, decision-making • Needs for better technologies to relieve cognitive load

[Thematic Map]



[Supporting Quotes from Interview]

Challenges of IMTs

[…] **the flooding was like, 300 miles, 39 counties. It was across 1,777 square miles** […] where we received over three feet of rain in less than four days. **95 percent of your infrastructure is under water.**

COP

So now that gives me **a snapshot** and under that **SWEAT** [security, water, energy, accessibility, and tele-communication] **report** it breaks out into multiple categories. […] Now I can do **a snapshot of a jurisdiction and know now who's in trouble.**

Adaptive Decisions

We're very flexible. I mean, if you're, **if you're rigid in your decisions and your thoughts, you're going to break.** You got to be, you have to be able to adapt.

Balancing Efficiency and Thoroughness

That's a hasty search. **There was nothing organized about it**. […] **A primary search** is much more organized and **it takes longer**, but **a secondary search** means we're going in and searching every single building.

Lessons Learned

So when Harvey hit, they were so **much better prepared to manage Harvey** than all of our departments because we joke that the 2015, the Memorial Day and Tax Day floods, they got to play the JV team, the junior varsity team.

Goals of IMTs

Our priority is LIPS, right? **Life safety**, incident stabilization and societal restoration and […] property protection. So **'L' is first**. **'L' is always first and that's how we drive our priorities.**

IMPLICATIONS

Unique challenges imposed by Harvey

- Unexpected pattern of movement and resultant flooding
- Massive demands for relief efforts

➡ **Needs for resilience of IMTs during disasters**

Resilience factors of IMTs in action

Theoretical factors (Hollnagel, 2011) vs. This study

- Monitoring (what to look for)
- Anticipating (what to expect)
- Responding (what to do)
- Learning (what has occurred)

- COP
- Adaptive decisions
- Balancing between efficiency and thoroughness
- Learning from past incidents

Limitations of the current findings

- Initial findings from interview data were presented.
- Findings from Harvey were not compared with other hurricane incidents.
- Only IMT personnel were interviewed. Responders at other levels may provide different insights.

FUTURE WORK

- **Further iteration of analyses**
  - Finalizing themes and categories.
  - Refining the thematic map.
- **Comparison with the existing literature of other incidents**
  - e.g., Hurricane Katrina, BP Deepwater Horizon.
- Reflecting findings on **incident management policies** and **training programs.**
  - How to enhance each resilience factors of the IMTs

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