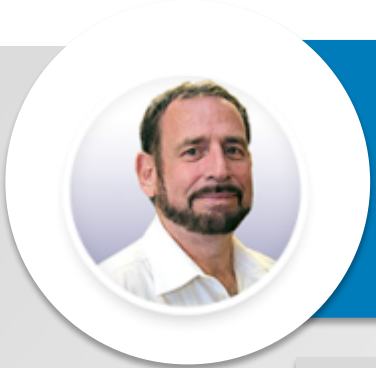
3.4 CAP and Natural Disasters



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AIM:
Discuss natural disasters and CAP Warning Systems

GOAL:
Provide the workshop participants with information to support their quest for better warning systems

Contents

- Natural Disasters Hazards Prediction
- Why natural disasters alerts are needed now more than ever
- Characteristics of a CAP Natural Disaster Warning System
- CAP features supporting Natural Disasters alerts
- Cost Effectiveness of a CAP Natural Hazards Warning System

Weather Hazards Prediction Quality

New technology = better “see” extreme weather coming:

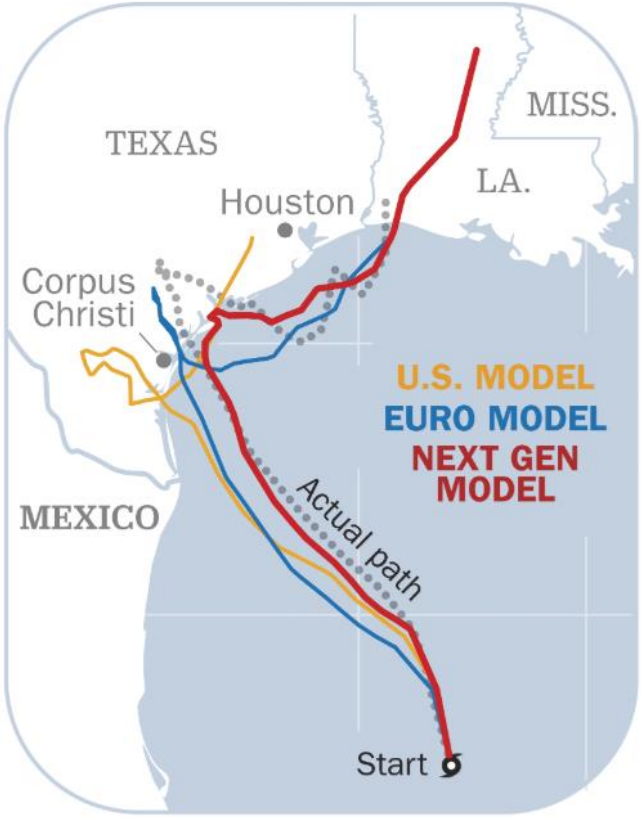
- Advanced equipment
- Networking the observation sites
- Integration with satellite system
- Better algorithms and faster computers to run modeling and view possible ways weather system can evolve.

=> Know longer time prior to effect reaching the target area

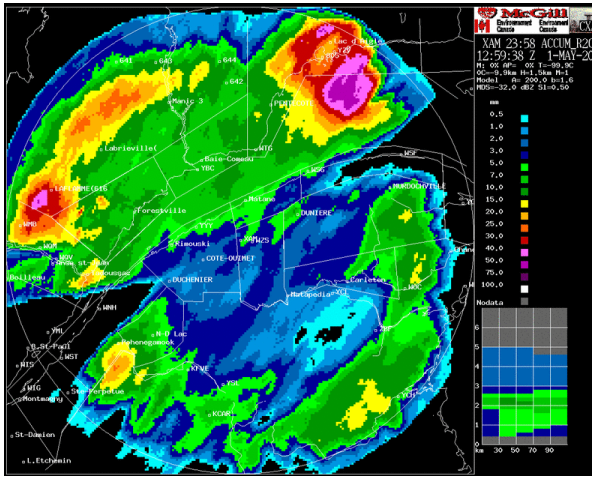
=> Predictions are reliable (no more crying wolf)

FORECAST MODELS FOR

Hurricane Harvey



Weather Hazards Alert Issuing Probability



- Better understanding how to warn the people.
- Better protocol (example: CAP levels versus *watch/warning/advisory/statement*)
- Better interaction between the DETECTORS, ISSUERS and the PUBLIC

=> Emergency managers are more inclined to issue alerts based on expected weather hazards

Weather Hazard Alerting

- In summary:

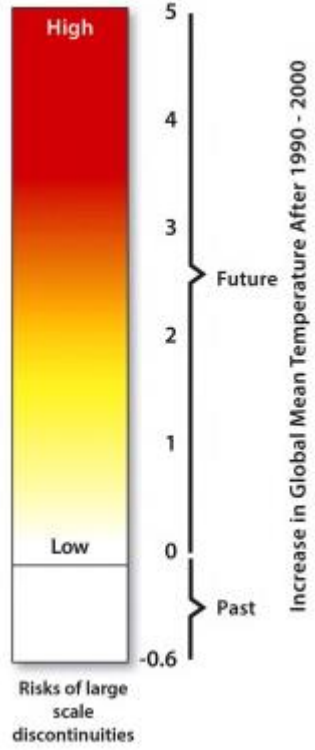
  - *We know about hazard before it affect the specific area*
  - *The knowledge is more certain and reliable (no more crying wolf)*

=> Emergency managers are more inclined to issue alerts based on expected weather hazards

Weather alerts are needed now more than ever 1/2

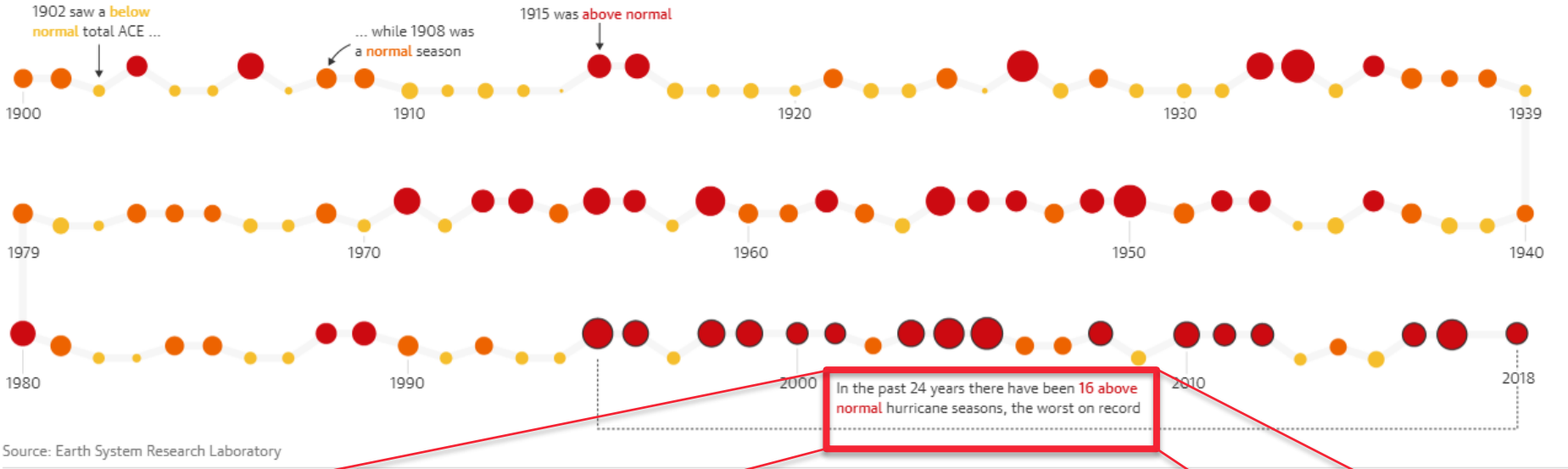
- Today and in the future, weather extremes are more likely to happen:
  i. Climate change issues with weather phenomena not seen before in various locations
  ii. More intense downpours
  iii. Stronger storms, lightning, hail
  iv. Turbulences due to heated air

=> Occurrences of weather events that require public warning becoming more frequent



Assessing dangerous climate change
(National Academy Of Science, 2009)

Example: **Hurricanes are getting stronger and lasting longer**

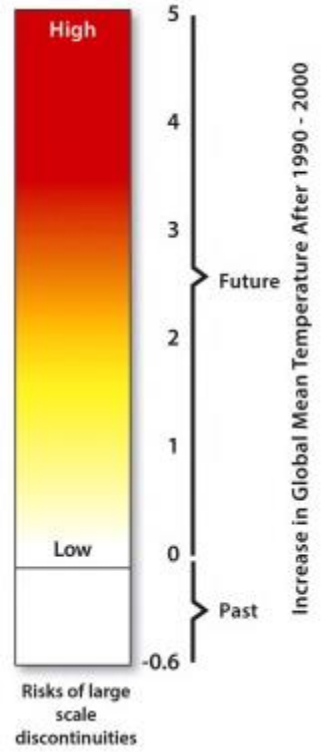


In the past 24 years there have been 16 above normal hurricane seasons, the worst on record

Weather alerts are needed now more than ever 2/2

- **Sensitivity of the public** to hazard situations is heightened. yet **they less estimate the risks** in their area (flood zone, tsunami inundation area).
- Fast speed of community communications channels (Facebook, Twitter etc.) can cause **misinformation** to spread if no official word in out.
- Public outreach due to CAP, IPAWS efforts and Amber Alerts built **expectations** that the government will alert for any coming hazardous event.

=> Public expectations are that immediate alerts will be issued timely and effectively to allow time to take protective actions.



Assessing dangerous climate change
(National Academy Of Science, 2009)

Characteristics of CAP Weather Warning System

Use of “Pull” (subscription) alerts Vs. Push (Forced Notification) alerts alerts

Pull alert notification is the alert delivered to a subscriber when a detected hazard passed a filter that the user had pre-set in the system:

- Area
- Urgency
- Severity
- Type
- etc.

Push alert notification is the “forced” delivery of alerts to people that need to take active steps of protection.

Characteristics of CAP Weather Warning System

Pull and Push Alerts

Use of “Pull” (subscription) alerts and Push (Forced Notification) alerts alerts

- Pull alerts available through personal means:
  i. Email
  ii. RSS feeds
  iii. Text messages
  iv. Cell phones apps
  v. Computers (pop-up, Internet)
  vi. Social media

>> CAP warning system provides feed for both Pull and Push alerts

- Push alerts available through:
  i. Public means:
     Cell Broadcast (WEA)
     Sirens
     Radio and TV Broadcast (EAS)
     Road signs
  ii. Personal means:
     Landline phones
     Special radios
- Relayed alerts by secondary alert systems (RBDS, Digital TV, others)

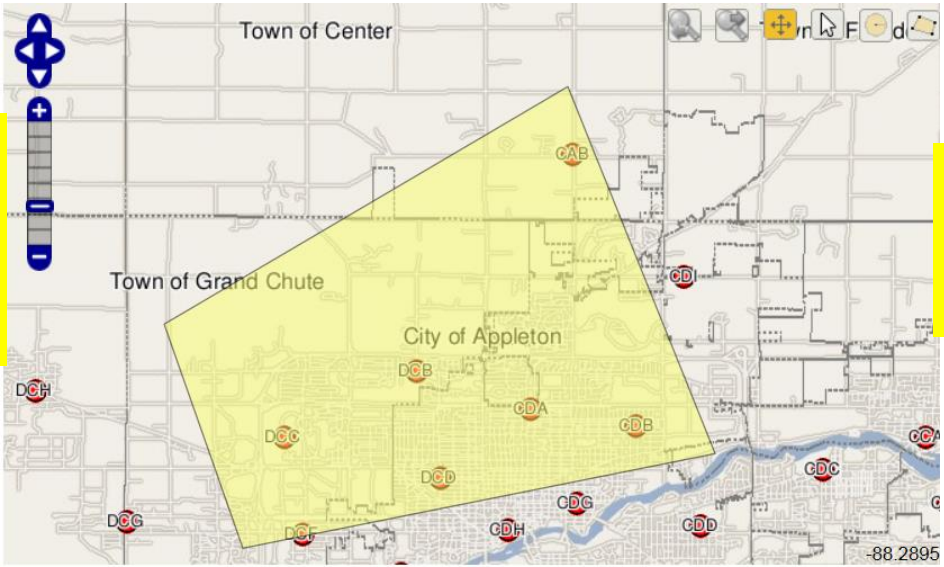
Characteristics of CAP Weather Warning System

Siren Activation Example

How system effectiveness increased with the use of CAP:

- Tornado alert **ONLY in the affected area**.
- Use the system to **automatically activate the sirens** based on CAP message received from the weather service

Hazard detector provides alerts with expected polygon of impact



Warning system activate sirens only in affected area

Characteristics of CAP Weather Warning System

Standardizing the warning language
Among Detectors, Emergency Managers and the Public

- Structured Message, encourage (among the rest) the use of:
  i. What happens
  ii. Who is affected
  iii. What to do etc.
- Single alert triggers variety of delivery mechanisms
- Include rich contents
- Better serves the hearing or visually impaired people
- Capability of multi-lingual alert

By knowing the delivery contents expectations, the event “detector” knows and fulfills the expectations down the warning channel.

Developments trends for weather alerts

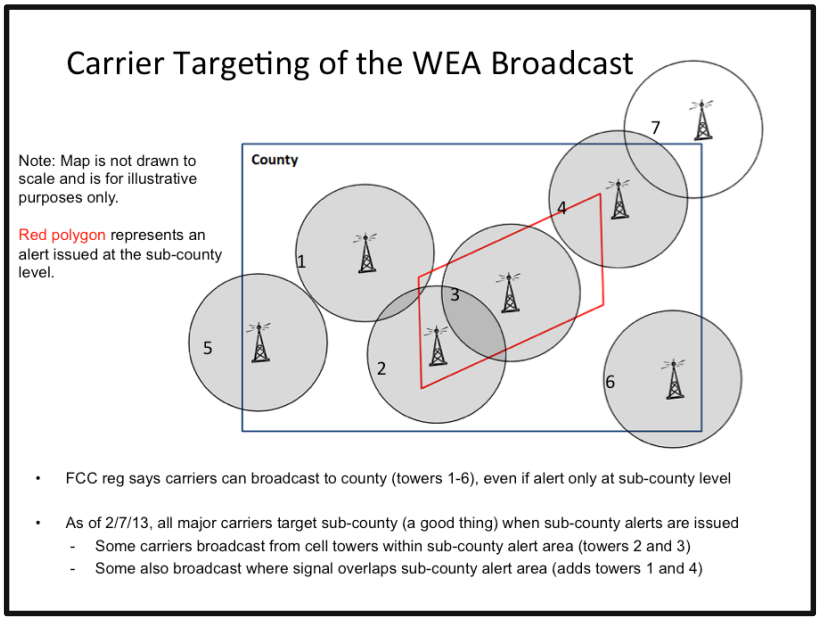
Use of “Pull” (sign-up) alerts Vs. Push (Forced Notification) alerts alerts

The CAP influences both the alert detector (weather hazard detection agency) and improves the quality of the system so as the push notifications gets more accurate the importance of public “sign up” system is slowly reduced.

Developments trends for weather alerts

Expanding use and Accuracy of Cell Broadcast

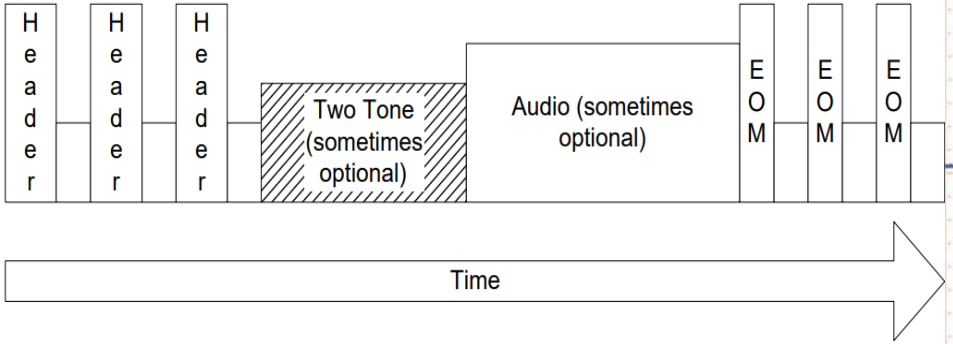
- International implementation of standard equipment and protocol
- More accurate targeting of cellphones



Developments trends for weather alerts

Expanding use and Accuracy of Cell Broadcast

- International implementation of standard equipment and protocol
- More accurate targeting of devices
- Faster alerts, to adapt for earthquake events



Cost Effectiveness of an Emergency Warning System 1/2

- **Preparation costs v. Disaster costs analysis** is requested by policy makers to justify the economic benefit of warning systems.
- In addition to the life saving aim of warning systems, the **benefit-cost-ratio** is used as the indicator to summarize the overall value for money of any project.

Cost Effectiveness of an emergency Warning System 2/2

- Common literature states the ratio of 1:7
- USA FEMA analyzed 4,000 events and concluded that 4 is the right value for USA
- In developing nations the ratio is higher due to.
  - Weaker infrastructure
  - For example, for flood mitigation in Mozambique, the post-disaster aid request was 203 times the unfulfilled pre-disaster request.

It seems like most of the headlines about weather are often related to negative impacts and implications…

330

Number of catastrophic weather events globally in 2017

31

Number of billion-dollar weather events globally in 2017

1,141+

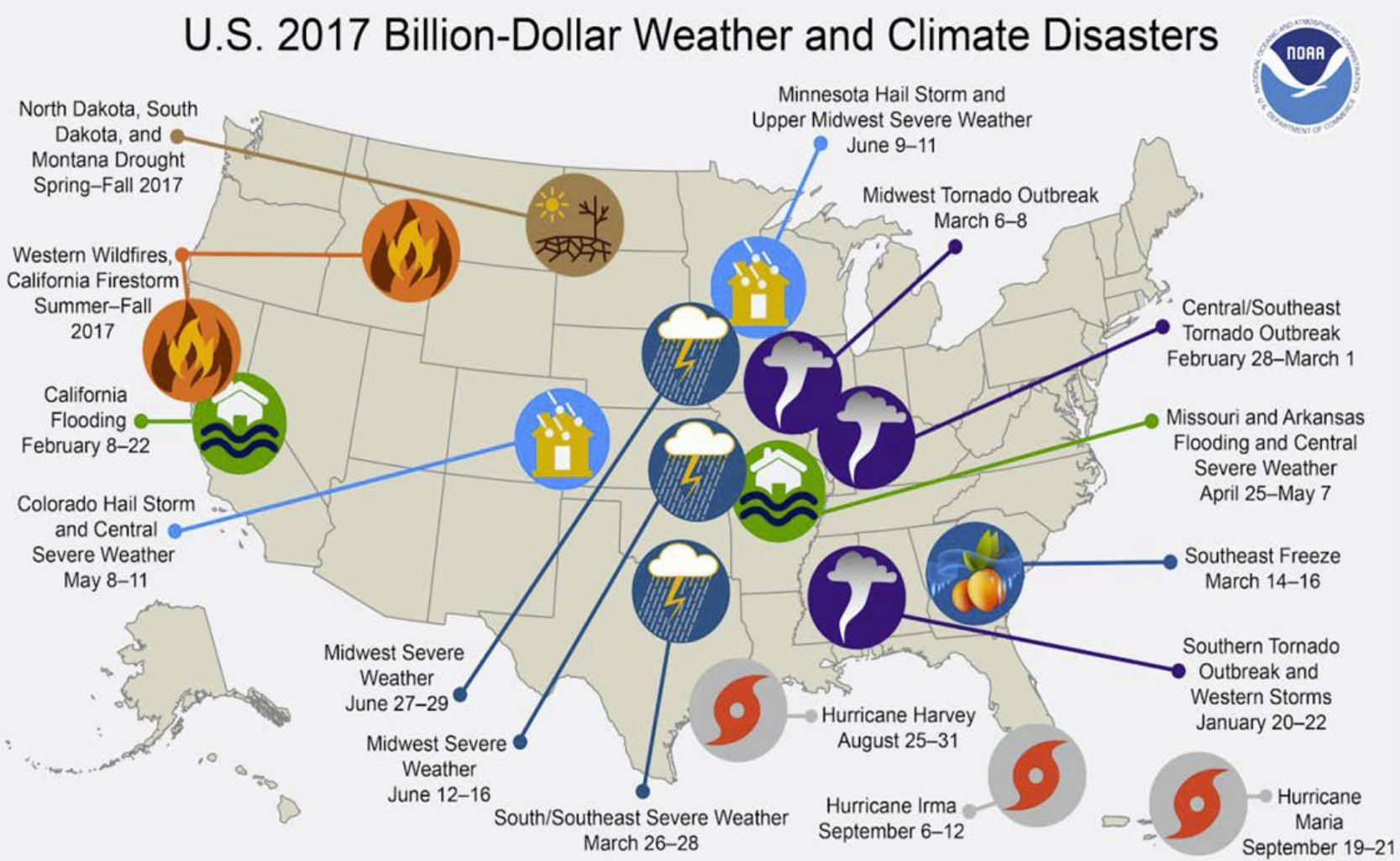
Causalities in the 2017 Sierra Leone mudslides

$24b

Second costliest year on record for insurers with severe weather peril

Source: "Weather, Climate & Catastrophe Insight, 2017 Annual Report." Aon Benfield UCL Hazard Research Center. January 2018.

U.S. 2017 Billion-Dollar Weather and Climate Disasters



*This map denotes the approximate location for each of the **16 billion-dollar weather and climate disasters** that impacted the United States **during 2017**.*

Backtracking…

- In earlier slide we saw disasters of 16 billion-dollar during 2017
- With the ratio on 1:4, preventing damages should had cost 4 billion.
- What percentage could be for warning?

Effectiveness of EWS

- An evaluation of EWS includes:
  - Percentage of the endangered population that will be warned
  - the benefits of risk reduction and
  - the negative consequences of missed events and false alarms
- If you want to go mathematics…

$$E_W = 1 - \frac{\sum_{j=1}^{n_{scen}} \sum_{i=1}^{n_{obj}} p_j \times pe_{ij}^{(W)} \times v_{ij} \times A_i}{\sum_{j=1}^{n_{scen}} \sum_{i=1}^{n_{obj}} p_j \times pe_{ij} \times v_{ij} \times A_i}$$

What is the cost of a warning system?

- Investment costs
- Operating and Maintenance costs
- Physical assets handling
- Public education
- Lifespan (capital cost / years to be used)
- What if nothing happens?
  - Qualitative social and environmental benefits are not monetized

Early Warning System

- Decreased economic loss from
  - Personal deaths and injury
  - Decreased private and commercial losses
  - Reduced aid needed from government and other sources
- Increase in lead time may provide valuable time for completion of preventative measures; however, a **false alarm** will have economic costs

US Department of Commerce Strategic Plan

- Strategic Goal 3: Strengthen U.S. Economic and National Security
  - Strategic Objective: Reduce the Impacts of Extreme Weather and Water Events

Use of Crisis Communication Systems >> CAP Warning System

3.4 CAP and Natural Disasters

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Questions?

Thank you!