Hawaii End-to-End Tsunami Warning: Emergency Alert System (EAS)

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Major Natural Disaster Fatalities in Hawaii during the 20th Century

- 14 Pacific-wide tsunamis hit the Hawaiian Islands.
- The four most destructive tsunamis caused a combined total of 222 deaths and hundreds of injuries:
  - April 1, 1946 (Aleutian Islands)
  - May 23, 1960 (Chile)
  - November 29, 1975 (Kalapana)
  - March 11, 2011 (Japan) - $30 M
<table>
<thead>
<tr>
<th>Hazards</th>
<th>Low Threat</th>
<th>High Threat</th>
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</thead>
<tbody>
<tr>
<td>Hurricane</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Flash Flood</td>
<td>2</td>
<td>6</td>
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<tr>
<td>Tsunami</td>
<td>4</td>
<td>8</td>
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<tr>
<td>Earthquake</td>
<td>6</td>
<td>10</td>
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<tr>
<td>Volcano</td>
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<tr>
<td>Landslide/Rock fall</td>
<td>10</td>
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<tr>
<td>Drought</td>
<td>8</td>
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<tr>
<td>Wild Fire</td>
<td>6</td>
<td></td>
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<tr>
<td>Power Failure</td>
<td>4</td>
<td></td>
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<tr>
<td>HAZMAT (trans/oil spill)</td>
<td>2</td>
<td></td>
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<tr>
<td>Cyber Attack</td>
<td>0</td>
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<tr>
<td>Urban Fire</td>
<td>0</td>
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<tr>
<td>Aircraft Incident</td>
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<tr>
<td>HAZMAT (fixed)</td>
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<tr>
<td>Tornado/Water Spout</td>
<td>0</td>
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<tr>
<td>Dam Failure</td>
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<tr>
<td>Radiological</td>
<td>0</td>
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<tr>
<td>Terrorism</td>
<td>8</td>
<td></td>
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<tr>
<td>Pandemic Influenza</td>
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</tbody>
</table>

**Water Related Threats:**

- Hurricane
- Flash Flood
- Tsunami
- Earthquake
- Volcano
- Landslide/Rock fall
- Drought
- Wild Fire
- Power Failure
- HAZMAT (trans/oil spill)
- Cyber Attack
- Urban Fire
- Aircraft Incident
- HAZMAT (fixed)
- Tornado/Water Spout
- Dam Failure
- Radiological
- Terrorism
- Pandemic Influenza
Hilo, April 1946
Hilo, May 1960
GOAL: COORDINATION RESPONSE EFFORTS

Federal

C&C

State

Private

Industry/Corporate

Hawaii Hotel and Visitor Industry Security Association (HHVISA)

O’ahu Visitors Bureau
Tsunami Warning System
3 Main Components

- The Tsunami Warning Centers

- Emergency Management System
  => Develop evacuation plan, communication system. Receive warning center message products. Take action for public safety

- Educate Citizenry in Hazard Risk Areas
  => Public should know what to do in tsunami emergency. Public should move quickly inland if strong ground shaking or ocean draw-down.
PTWC, ITIC, HAWAII
EXAMPLE OF END-TO-END SYSTEM

- HAZARD ASSESSMENTS DONE 1970’s and UPDATED
- EVACUATION ZONES in TELEPHONE BOOKS (1990); on Civil Defense WEBSITES.
- PUBLIC EDUCATION PROGRAMS - ANNUAL “TSUNAMI AWARENESS MONTH”
- STATE AND COUNTIES RECEIVE PTWC BULLETINS BY MULTIPLE MEANS
- PUBLIC BY MULTIPLE MEANS: SIRENS, RADIO, TELEVISION, AIRPLANES
PTWC, ITIC, HAWAII EXAMPLE OF END-TO-END SYSTEM

- GOVT CONDUCT SEMI-ANNUAL TSUNAMI EXERCISES
- PRE-ESTABLISHED PROCEDURES (SOPS) FOR TSUNAMI EVACUATION AND RESPONSE WITH POLICE, FIRE, AND OTHER DEPARTMENTS
- STAKEHOLDERS MEETINGS - TSUNAMI TECHNICAL REVIEW COMMITTEE INCLUDES PTWC, ITIC, EMERGENCY MANAGERS / RESPONDERS, SCIENTISTS
- STATE OF HAWAII / COUNTIES - TSUNAMI ADVISOR EXPERTS (STATE – LAURA KONG)
Tsunami Evacuation Maps
located in the front of Telephone White Pages

Map 1: Waikiki

Note 1
When evacuation boundaries are drawn along streets and roadways, they are considered to be safe from wave action.

Note 2
Steel and/or concrete buildings of six or more stories in height should provide adequate protection if people move to the third floor or above.

Note
The maximum rise of water in harbors should not exceed 4 feet. However, all vessels should be secured, removed, or put to sea due to the probability of strong currents and wave action.
Pink shaded area = Tsunami Evacuation Zone. If you live or work in pink area, you should have an evacuation plan in case of a tsunami event.
State Level of Emergency Alert System (EAS)
IPAWS Architecture
Standards based alert message protocols, authenticated alert message senders, shared, trusted access & distribution networks, alerts delivered to more public interface devices

Alerting Authorities
- Local
- State
- Territorial
- Tribal
- Federal

Alerting Disseminators (public alerting systems)
- Emergency Alert System
- Commercial Mobile Alert System (CMAS) / Wireless Emergency Alerts (WEA)
- Internet Services
- NOAA
  - HazCollect
- State / Local Unique Alerting Systems
- Future Technologies

American People
- AM FM Satellite Radio; Digital, Analog, Cable, and Satellite TV
- Wireless Emergency Alerts Capable
- Web browsers, Widgets, Web sites, Social media

IPAWS OPEN
Alert Aggregator / Gateway
IPAWS compliant CAP Alert Origination Tools
The Message Router (Open Platform for Emergency Networks)
Data Elements

- Urgency
- Severity
- Certainty
- Event Code
- Event Category
- Expires
- Headline
- Description
- Instruction
- Response Type
- Area Description
- Geocode
- Polygon/Circle
- Resource
How it Works (Emergency Alert System, EAS):

Activated by: National Weather Service, State Civil Defense, County Civil Defense

- Audio & Crawlers
- Audio
- EAS Audio & Alarm

BROADCASTERS
Statewide Siren Warning System

- 356 total sirens Statewide:
  - Kauai 47
  - Oahu 210
    County, Military, Simulators
  - Maui 66
  - Big Island 67

- Radio controlled
- New sirens solar powered
- Range: up to 2000 km
- Use: Emergency, 3 min
  Test Monthly, 1st work day, 1145am, 45-sec
Emergency Alert System (EAS)

KSSK  590 AM / 92.3 FM
KRTR  96.3 FM
KQNG  93.5 FM
C & C Honolulu, DEM
KMVI  550 AM
Maui Civil Def
KKBG  97.9 FM
Hawai‘i Civil Def

Additional network partners
✓ Time Warner Cable
✓ KZOO  1210 AM - Japanese
✓ KREA  1520 AM - Korean
✓ KNDI  1270 AM - Chinese, Chuukese, Filipino, Laotian, Marshallese, Pohnpeian, Samoan, Spanish, Tongan and Vietnamese
Emergency Alert System (EAS)
- SCD EOC coordinates 1st Siren sounding, initiates public message,
- Transmits immediately by dedicated microwave link
- Designated radio stations - neighbor islands
- TV broadcasts (crawlers) originate from Honolulu

Statewide EAS Activations Originate from Diamond Head
EMERGENCY ALERT SYSTEM

TSUNAMI WARNING
EAS BROADCAST – RADIO / TV

Last map update: Sat, Oct 27, 2012 at 8:09:03 pm HST
Local Tsunami Threat:
30 minutes to Waikiki, Oahu
Components of effective warning messages

- Specific Hazard (e.g. tsunami)
- Location
- Timeframes
- Source of Warning
- Magnitude
- Likelihood
- Protective Behavior
  - People may just decide to take no action because there is not a consistent call to action message from various warning sources.
PTWC issues an urgent tsunami warning for local earthquakes magnitude 6.9 or greater.

County Warning Points sound sirens in designated Counties (e.g. Hawaii and Maui Counties).

National Weather Service broadcasts warning and evacuation through the EAS.

EOC activate and prepare for disaster response operations.
"The Pacific Tsunami Warning Center has issued a Tsunami Warning for the Islands of (select islands or geographical location).

A local tsunami has been generated. Immediately evacuate all beaches and all low lying coastal areas. Move inland to higher ground or move to the 3rd floor and above in reinforced concrete buildings.

I Repeat, .....
PTWC issues Tsunami Watch and Warning Bulletins to the State of Hawaii for distant earthquakes magnitude 7.9 or greater.

Emergency Operation Centers (EOC) activate and alert emergency response agencies.

EOC coordinate siren sounding statewide at least 3 hours before 1st wave arrival in conjunction with radio and television Emergency Alert System (EAS) broadcasts.

EOC coordinate school closures and release of government workforce within tsunami evacuation zones.

EOC prepare for disaster response operations.
Oahu Evacuation - Bus Routes, Roadblocks, Waikiki

- City buses along shoreline will alter routes and shuttle people to nearest inland shelter.
- Police establish roadblocks until 45 minutes prior to first wave arrival.
- All emergency response personnel cease operations and move inland to safety 30 minutes prior to first wave arrival.
- Special concern in Hawaii is education of surfers – tsunamis are not surfing waves!
- Waikiki - Vertical Evacuation (for 6-story steel, reinforced concrete bldg, go to > 3rd floor)
Public Safety Notification

“ALL CLEAR”

PTWC will cancel the tsunami warning when destructive waves have ceased.

Search & Rescue operations commence.

County Civil Defense agencies announce “All Clear” over radio and television. No sirens will sound.

Public may return to coastlines after “All Clear” is announced.
ISSUES: Disaster Reality - Evacuation

- Hawaii has unique evacuation issues
- Hurricane/tsunami evacuation is extremely difficult
- Approximately 50,000 people reside in our evacuation zones
- On the mainland United States you can drive inland 100-miles and wait out the storm
- Here in Hawaii we do not have that option
Oahu is short on shelter space
Roughly 160 State DOE Schools double as emergency shelters
Provide for about 1/3 of Oahu population
July 2008 – 905,000 Oahu residents
April 2009 – 330,000 Oahu visitors
More than 1.2 Million people with no place to evacuate to
ISSUES: MEDIA REPORTS
1986, 1994 Tsunami Warnings

Pacific-wide Tsunami Warnings Issued
Sirens sounded, Statewide evacuations
Small, non-destructive tsunamis

- 1986 - mid-afternoon to pm rush hour
- 1994 - early morning to am rush hour

Losses
1994 (DBEDT Study) => $50M
1986 (extrapolated) => $30M
2003 (extrapolated) => $68M

- Media reports shape public opinion
Thank You

Laura Kong
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UNESCO/IOC – NOAA ITIC
PTWC MISSION

Hawaii Regional Center - Provide warnings to Hawaii for local & regional tsunamis generated in Hawaiian waters

US National Center - Provide warnings to all US interests in the Pacific and Caribbean outside the WC/ATWC AOR for regional & distant tsunamis

International Center - Provide warnings to all countries around the rim and in the interior of the Pacific and Caribbean for regional & distant tsunamis
EMERGENCY PREPAREDNESS:
Conducting Exercises

HAWAII DISTANT TSUNAMI EXERCISE

April 1, 2005
The statewide distant tsunami exercise will focus on Hawaii’s ability to respond to a distant tsunami from the Aleutian Islands in Alaska.

The exercise provides an opportunity for participants to review their distant tsunami response procedures and to promote emergency preparedness.

The exercise is planned by SCD with PTWC, who plays by issuing prescribed voice messages on the HAWAS and sending other electronic and hard copy messages.
EXERCISE OBJECTIVES

Validate:
- Warning and Communications Procedures for a distant generated tsunami.
- Organizational Procedures in emergency.

Review:
- Organization Procedures for Evacuation:
  - Inland Evacuations
  - Vertical Evacuations
  - Public Transportation

Kick off “April Tsunami Awareness Month” Public Awareness Campaign.
EXERCISE SCENARIO

10:15 a.m.  An earthquake greater than 8.0 magnitude occurs in the vicinity of the Alaska Aleutian Islands.

10:25 a.m.  Pacific Tsunami Warning Center (PTWC) issues a Tsunami Watch Bulletin for the State of Hawaii. First wave arrival to Hawaii is 4 hrs 30 mins after earthquake origin time.

11:45 a.m.  Hawaii placed in a Tsunami Warning (3 hours before first wave arrival at 2:45 p.m.) Statewide siren sounding (monthly Siren System test).

2:45 p.m.  First wave arrival.

3:30 p.m.  End of Exercise.
EXAMPLE, HAWAII:

STAKEHOLDER COORDINATION MECHANISM

IMPLEMENTATION, POLICY, EMERGENCY RESPONSE, PUBLIC AFFAIRS AND MEDIA, OUTREACH, EDUCATION
HAWAII TSUNAMI TECHNICAL REVIEW COMMITTEE (TTRC)

- **Reduce risk of tsunamis** to State of Hawaii Founded 1998, meets 2x/year Funded by State & NOAA (NTHMP)

- **Scientists, engineers, planners, Emergency managers, public affairs personnel**

  NOAA, FEMA, USACE, USCG, FEB, Univ. Hawai`i, Center, Tsunami Agencies (DOE, DBEDT, DOT, CZM, Warning Points, Defense, advisors)
• Activities
  Hazard ID, Risk Assessment, Warning Guidance
  Awareness and Mitigation

• Recent TTRC Agenda Topics
  PTWC Operations Report
  Runup and Inundation Modelling – Evacuation Maps
  Tsunami Observer Program, Post-Tsunami Survey Plan
  Multi-Level Regional Warning and Coastal Evacuation
  Statewide Exercise - Local Tsunami
  Public Affairs Working Group Activities (Awareness Month)
  Social Science Perspectives on Tsunami Warnings
  Maritime operations during tsunami events –
  Ocean Currents in Harbors, Shipping ports, boating safety
  Civil Air Patrol Capabilities
  Working Groups: Emergency Mgmt, Scientific, Public Affairs