Tsunamis: Preparations for the Caribbean Shipping Community

Caribbean Shipping Association Annual General Meeting
Bridgetown, Barbados
October 11, 2011

Christa G. von Hillebrandt-Andrade
NOAA NWS Caribbean Tsunami Warning Program
Vice President UNESCO ICG CARIBE EWS
President Seismological Society of America
With input from Carolina Hincapie, Puerto Rico Seismic Network
Thank you for the invitation!
Videos on Tohoku Tsunami and its Impacts on the Maritime Infrastructure

- [http://www.youtube.com/watch?v=NW7vENdDu1o&feature=related](http://www.youtube.com/watch?v=NW7vENdDu1o&feature=related)
- [http://www.youtube.com/watch?v=TvuJd1Jdluk](http://www.youtube.com/watch?v=TvuJd1Jdluk)
- [http://www.youtube.com/watch?v=zy8GKjiPd04&feature=related](http://www.youtube.com/watch?v=zy8GKjiPd04&feature=related)
- [http://www.youtube.com/watch?v=zy8GKjiPd04&feature=related](http://www.youtube.com/watch?v=zy8GKjiPd04&feature=related)
- [http://www.youtube.com/watch?v=e3LCVU74bsY&feature=related](http://www.youtube.com/watch?v=e3LCVU74bsY&feature=related)
Tohoku Earthquake and Tsunami
March 11, 2011, Mw 9.0, Runups: 40 m

http://www.guardian.co.uk/world/video/2011/mar/14/japan-tsunami-amateur-footage-video
Mareograms Tohoku Tsunami

Ofunato

Hanasaki

DART 21418

Acapulco
Tsunami Heights in Japan

Preliminary Information; no tide correction. Red circle: inundation depth. Blue triangle: run-up height.
In the past 500 years more than 75 tsunamis have been observed in the Caribbean causing the death of at least 3,510 people.
Different Sources of Tsunamis in the Caribbean

- Earthquakes (90%) subduction zones and other faults
- Landslides (1%) trench, continental platforms.
- Volcanoes (8%) subamarine and subareal
- Tele–tsunamis (1%) eg. “Lisboa” Nov. 1, 1755
Since 1842, at least 3,510 people have lost their lives from tsunamis in the Caribbean (Haiti, Jamaica, VI, PR, Dom. Rep. Venezuela, Panamá...)

*With 1/5 the area of the Pacific NE, there have been 6x more deaths!*
October 11, 1918 Puerto Rico Earthquake and Tsunami

R-F Intensity Scale

Mayagüez, 1918

2010 Population in TFZ in Mayagüez: 20,000
The risk from tsunamis has increased dramatically due to population growth, coastal infrastructure development and tourism.

During high season, there can be as many as 25,000 people arriving on cruise ships during a day. During low season, as much as 15,000 people/day.
Intergovernmental Coordinating Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG CARIBE EWS)

- UNESCO/IOC body
- 30 member states, commonwealths, territories
- Established in 2005
- 6 Sessions have been held in Barbados, Venezuela, Panama, Martinique, Nicaragua and Dominican Republic
- Next session: March 2012, Curacao
- Main recommendations:
  - Identification of Tsunami Contacts and Warning Points in each country
  - Establishment of a Caribbean Tsunami Information Center
  - Establishment of a Caribbean Tsunami Warning Center
Caribbean Tsunami Warning Center

“Providing regional service, strengthening local capabilities...”

- NOAA NWS established in February 1, 2010 the Caribbean Tsunami Warning Program, jointly located at the Puerto Rico Seismic Network at the University of Puerto Rico at Mayagüez as a 1rst step of the U.S. towards the establishment of a Caribbean Tsunami Warning Centre.
- Fully endorsed by the UNESCO IOC Intergovernmental Coordination Group for Tsunamis and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions
- When will the Program become a Centre?
  - Funds are appropriated
Tsunami Alerts are currently provided for Puerto Rico and the US and British Virgin Islands by NOAA NWS WCATWC (Alaska) and Puerto Rico Seismic Network (Mayagüez) and for the rest of the Caribbean by NOAA NWS PTWC (Hawaii)
TSUNAMI ALERT LEVELS/PRODUCTS
Vary within the Caribbean
How can one receive the Tsunami Products

• NOAA NWS Email subscription service  
  [http://tsunami.gov](http://tsunami.gov)  
  – Puerto Rico, US and British Virgin Islands West Coast Alaska Tsunami Warning Center  
  – Rest of the Caribbean: Pacific Tsunami Warning Center

• Local Services  
  – Emergency Alert Systems – Radio / TV  
  – NOAA Weather Radio or other local alert  
  – Sirens
CARIBE WAVE 2011
First Caribbean Wide Tsunami Exercise
March 23, 2011...

- 75% of the member states of the CARIBE EWS participated
- 50% of the countries had tsunami response plans
- 47% indicated that the plan was adequate
- Next regional exercise: 2013
ANGUILLA
1rst IOC-NOAA TsunamiReady Community

• 24 Hour Focal Point to receive and disseminate tsunami messages
• Tsunami Evacuation Map
• Tsunami Signage
• Tsunami evacuation exercise
• Tsunami response plan
• Cost: $15,000
Maritime Community Specific Materials

available at:
http://www.srh.noaa.gov/srh/ctwp/
and http://prsn.uprm.edu
PROCEDURES

Now, BEFORE a tsunami

Plan of port facilities against tsunamis

- Local security and local law jurisdiction
- Economic Characteristics
- Security Assessment (vulnerability and mitigation strategies)
- Physical Characteristics
- Information Flow Chart
- Communications
DURING a tsunami event

Strong earthquake felt
MM ≥VII

In port
Abandon vessels!
Once the shake stop, persons should immediately evacuate on foot to the safe place on land.

At sea
Vessels should stay offshore in deeper areas at least 320’/100m, according to plan.
Warning issued, local tsunami

In port
- Persons should immediately evacuate on foot to the safe place on land.
- Limit the entrance of ships to the port.
- According to plan, vessels should move to the open sea area and/or secure the vessels in port.
- Indicate a secondary port to attend the ships evacuated or redirect those that could not enter to the port.

At sea
- Ships should stay offshore in deeper areas at least 320'/100m, according to plan.
Warning issued, teletsunami [more than 3 hours]

In port
- Keep away personnel, workers, tourists, residents from the port facilities once the 1st wave arrival time is close (at least 1 hour).
- Vessels should move to deeper areas at least 320'/100m or order to secure vessels to the best of their abilities and time permitting.

At sea
- Ships should stay offshore in deeper areas at least 320'/100m.
Per recommendation of the CARIBE EWS a Caribbean Tsunami Information Center is in the process of being established in Barbados.
In preparing and planning for a tsunami, it is very important to take into consideration the impacts of an earthquake itself, because port facilities are often built on reclaimed land, they are susceptible to EQ damage.

Images from the 2011 New Zealand earthquake, M 6.3
Stations of CARIBE EWS Core Seismic Stations on IRIS and PRSN
NOAA NWS Caribbean Tsunami Warning Program
http://www.srh.noaa.gov/srh/ctwp/

- Contributing RTX IRIS/PRSN
- Contributing RTX PRSN
- Contributing RTX IRIS
- Existing
- Gap
- Planned
Despite the advances, we are still not as ready as we should be, there are still critical elements of the TWS that are absent or need to be strengthened: Caribbean Tsunami Warning Center, Individual Preparation, Improved Planning...
We can’t let the infrequency of the Tsunamis in the Caribbean disarm us, because DISASTER will strike

Indian Ocean 2004

Haiti 2010
Topics for Discussion with CSA

• Need to know your specific needs
  – Lead times required
  – Information in products
• Adaptation of the Caribbean tsunami protocol for ports and harbor operators
• Support for new TsunamiReady communities
  – Tsunami evacuation maps
  – Emergency response planning
• Hosting of sea level stations at port facilities
• Participate as an observer in CARIBE EWS
We will never be Tsunami Proof but we need to continue working to be as Ready as possible when the next earthquake and tsunami strikes our region…
More Information...

- NOAA NWS Caribbean Tsunami Warning Program
  - [http://www.srh.noaa.gov/srh/ctwp](http://www.srh.noaa.gov/srh/ctwp) Tel. 787-833-8433, 249-8307, christa.vonh@noaa.gov
- PRTWMP tsunamis inundation maps
  - [http://poseidon.uprm.edu](http://poseidon.uprm.edu)
- UNESCO IOC Caribe EWS
  - [http://www.ioc-tsunami.org/](http://www.ioc-tsunami.org/)
- PRSN Brochures, tsunami evacuation maps, sea level and seismic information
  - [http://redsismica.uprm.edu](http://redsismica.uprm.edu), Tel. 787-833-8433

The CTWP also are on Facebook, like us today...

Thank you very much...