Feedback and Recommendations

ASTARTE Final Meeting

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Mallorca

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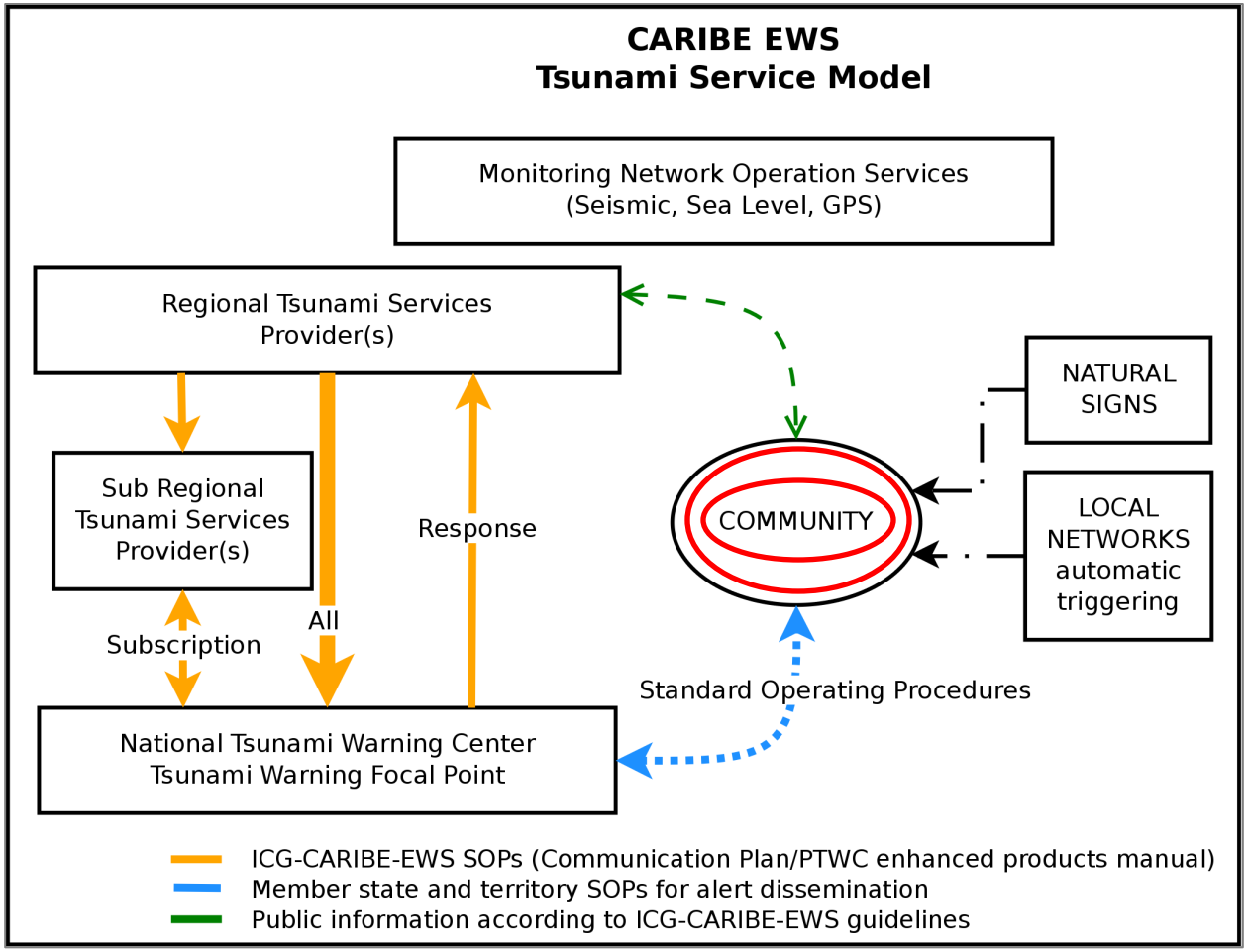
Achievements of ASTARTE

- ASTARTE has improved the knowledge of tsunamis and recurrence in the region and supports the enhancement of this knowledge thru the establishment of databases. It is important to note that this understanding extends beyond the traditional earthquake generated tsunamis, but those of volcanic and landslide origin.
- Thru ASTARTE there has been an advancement of numerical techniques and experimental data for tsunami simulation
- Thru ASTARTE important data have been acquired to facilitate the assessment of hazard, vulnerability, and risk.
- The evaluation of codes and review of observational data can facilitate enhancements of forecasts and warning s by the Tsunami Service Providers and National Tsunami Warning Centers.
- Consideration has been given to the establishment of guidelines for decision makers to increase sustainability and resilience of coastal communities.
- The findings and advancement have the potential to foster tsunami ready and resilient communities.

Additional Comments

- The level of detail of the research and studies conducted in all WP is impressive, important for creating a level of confidence in the end users
- The integration of students and Early Career Scientists facilitates continuity ASTARTE and more innovations
- The expertise and interest developed can lead to enhancements of warning system beyond the ASTARTE program
- Transfer of knowledge and collaboration between work packages was important to optimize the resources available
- Resilience is more than just getting ready, ASTARTE assessments and tools provide a foundation to reduce vulnerability and increase resilience.

Foster tsunami resilient communities
Survival is Key



What does the Community want to know?

- Can a tsunami really happen?
- If it happens, what areas will be flooded, what will be impacted?
- Where do I need to go?
- Who and how will I be warned?

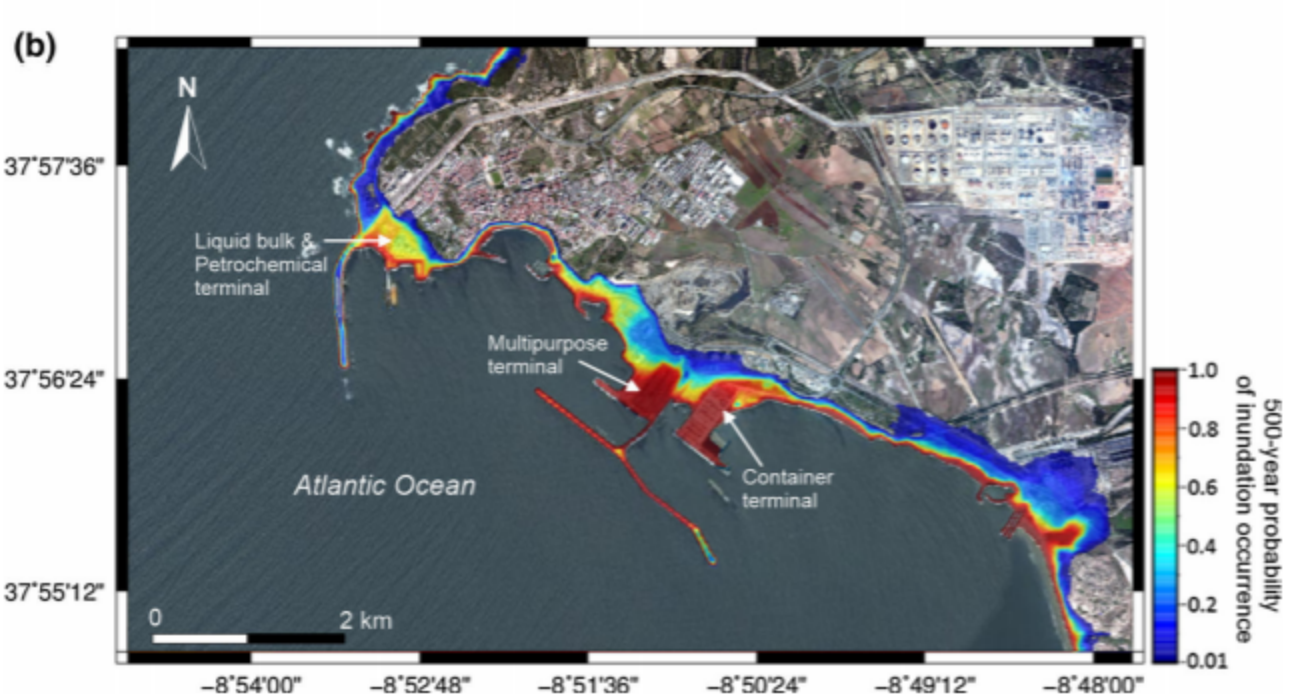
What does it take for a Community to be Ready for a Tsunami?

More and more coastal communities are realizing that they need to take specific actions to protect their lives and livelihoods from tsunamis. In the Caribbean, and more recently in the Pacific and Indian Ocean, voluntary UNESCO CARIBE EWS Tsunami Ready guidelines are being piloted. These guidelines, while focusing on the actions to save lives during a tsunami, can also lead to communities more resilient to tsunamis. Thru ASTARTE knowledge and tools have been developed that can underpin tsunami readiness in the NEAM region.

Categories
MITIGATION
Mit-1. Have designated and mapped tsunami hazard zones
Mit-2. Have a public display of tsunami information
PREPAREDNESS
Prep-1. Produce easily understood tsunami evacuation maps as determined to be appropriate by local authorities in collaboration with communities
Prep-2. Develop and distribute outreach and public education materials
Prep-3. Hold at least three outreach or educational activities annually
Prep-4: Conduct an annual tsunami community exercise
RESPONSE
Resp–1. Address tsunami hazards in the community's emergency operations plan (EOP)
Resp–2. Commit to supporting the emergency operations center (EOC) during a tsunami incident if an EOC is opened and activated
Resp–3. Have redundant and reliable means for a 24-hour warning point (and EOC if activated) to receive official tsunami threats
Resp–4. Have redundant and reliable means for 24-hour warning point and/or EOC to disseminate official tsunami alerts to the public

1. Define Tsunami Hazard Zone

- Sources
  - Seismic
  - Volcanic
  - Landslides
- Methods
  - SPTHA
  - SBTHA
- DEM/DTM
- Tsunami Models
  - Probabilistic
  - Deterministic



Sines, Portugal, PTHA from Omira, Baptista and Matias, 2016

ASTARTE WP 2, 3, 5, 8, 9 and 10

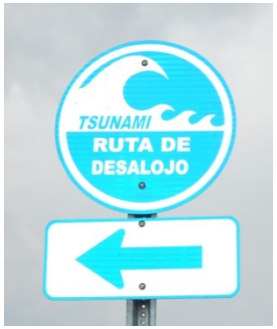
2. Signs


ENTRANDO
ZONA DE
PELIGRO
TSUNAMI


PERIGO DE TSUNAMI
TSUNAMI HAZARD ZONE
EM CASO DE SISMO DIRIJA-SE
PARA UM LUGAR ALTO
IN CASE OF EARTHQUAKE,
GO TO HIGH GROUND
200 mts.


ENTRANDO
A UNA COMUNIDAD
TSUNAMI READY
EN CASO DE TERREMOTO O ALERTA DE TSUNAMI
SALGA DE LA ZONA DE EVACUACIÓN


ZONA DE PELIGRO
TSUNAMI
EN CASO DE UN TERREMOTO MUÉVASE
A UN LUGAR ALTO O ALÉJESE DE LA COSTA


TSUNAMI
RUTA DE
DESALOJO


SALIENDO
DE UNA COMUNIDAD
TSUNAMI READY


SALIENDO
ZONA DE
PELIGRO
TSUNAMI


ZONA DE TSUNAMI
EN CASO DE TERREMOTO O
ALERTA DE TSUNAMI
SALGA RÁPIDAMENTE DE
LA ZONA DE EVACUACIÓN


PUNTO DE
REUNIÓN
TSUNAMI
ESPERE POR
INFORMACIÓN OFICIAL


ESTADIO JUAN EUGENIO BOU CINT
LUGAR DE
ASAMBLEA
TSUNAMI
BIENVENIDOS

3. Tsunami Evacuation Maps and Guidance…

- Run to a high place, away from the shore.
- Go to a fourth floor or higher in a sturdy building (that has survived the earthquake)

ASTARTE WP 8 and 9

Boating and Maritime Community

US Maritime Guidance - DRAFT

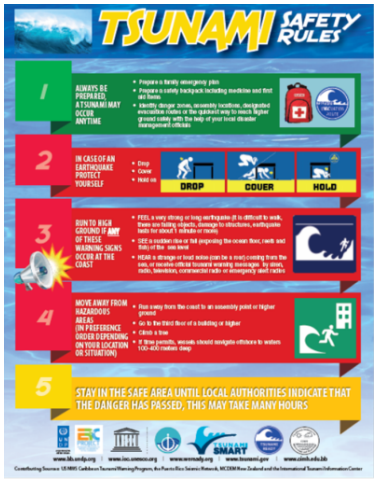
TABLE 1: Specific regional guidance for minimum offshore safe depths for maritime vessel evacuation prior to the arrival of tsunami.

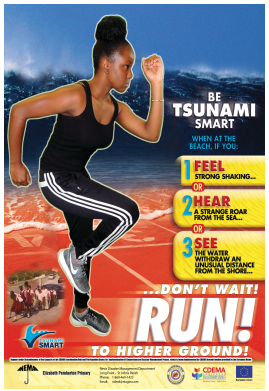
State/Territory	Distant Source (ships in harbor)*	Local Source (ships at sea)*	Notes on this Update
California	30 fathoms	100 fathoms	Evaluated; evaluating potential safe areas within large bays and ports
Oregon	30 fathoms	100 fathoms	Evaluated; also evaluating Columbia River
Alaska	30 fathoms	100 fathoms	Evaluated; ships should be at least 1/2 mile from shore for all scenarios
Washington	30 fathoms	100 fathoms	Evaluated; evaluating special conditions exist inside Puget Sound
Hawaii	50 fathoms	50 fathoms	Evaluated; implemented in Coast Guard response plans at some locations
American Samoa	50 fathoms	50 fathoms	Evaluating, guidance from others
Puerto Rico	50 fathoms	100 fathoms	Evaluated
USVI	50 fathoms	100 fathoms	Evaluating; possibly follow PR
Guam	50 fathoms	100 fathoms	Coordinated with USCG Guam Sector
CNMI	50 fathoms	100 fathoms	Coordinated with USCG Guam Sector
Gulf Coast States		100 fathoms	Evaluating; issues with long, shallow shelf complicate getting beyond safe depth
East Coast States		100 fathoms	Evaluating; issues with long, shallow shelf complicate getting beyond safe depth

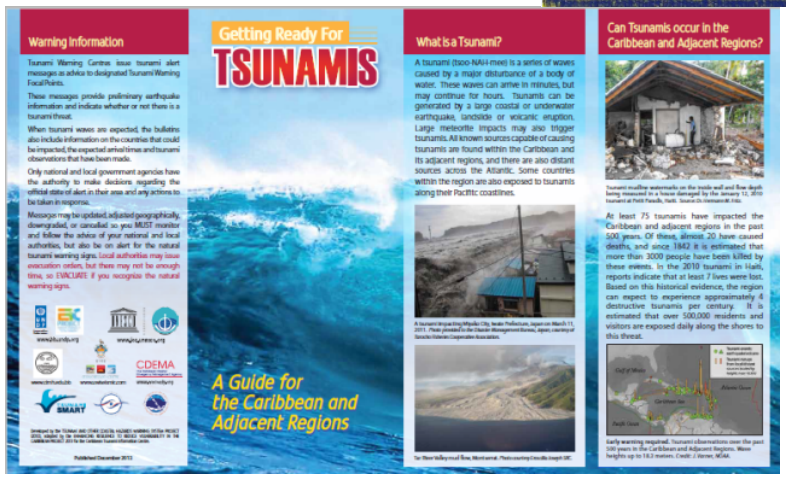
* Ships also recommended to be a minimum of ½ mile from shore or fringing reef

ASTARTE WP 2, 3, 5 and 8

4/5. Public Education and Outreach Materials







ASTARTE WP 8, 9 and 10

6. Community Exercise
eg. CARIBE WAVE 17 held on March 21, 2017

- 470,312 participants
- 3 Scenarios
- Communications and response plans tested
- Communications, table top, drills and full scale exercises
- Developing and promoting a **culture of evacuation**

WP 2, 3, 4, 5, 6, 7, 8, 9 and 10

Haiti

Saint Kitts and Nevis

Venezuela

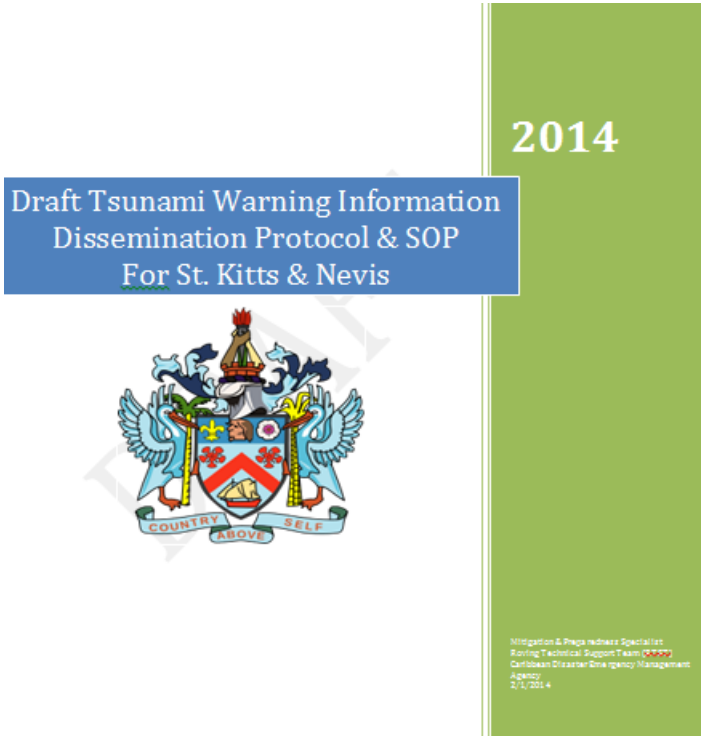
Panama

Guadalupe

British Virgin Islands

Puerto Rico

7. Tsunami Response Plan - Governance



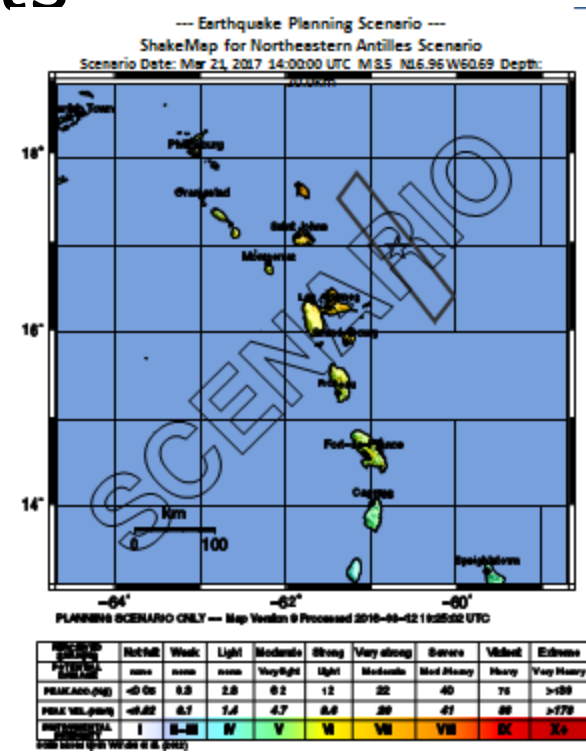
ASTARTE WP 6, 7, 8 and 9

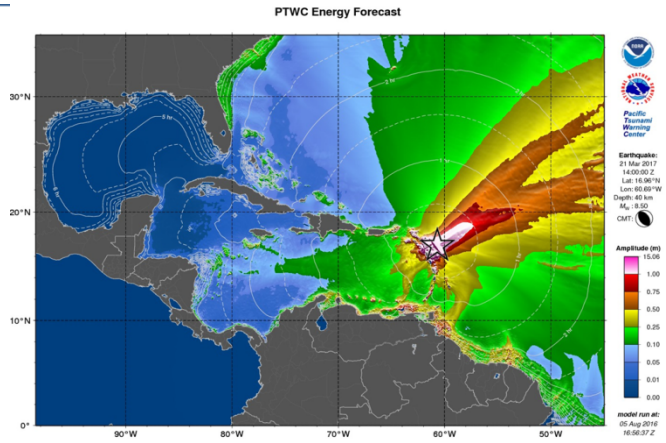
8. EOC Warning Operations – Governance EOC Authorities and Standup

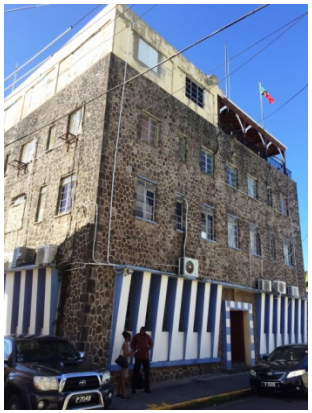
ASTARTE WP 6, 7, 8 and 9

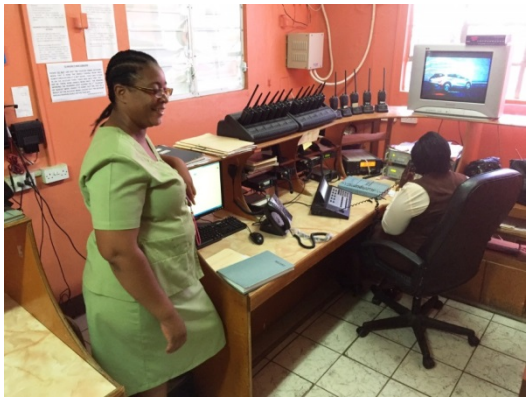
9. Multiple Methods to Receive Tsunami Alerts

- EMWIN
- FAX
- GTS
- EMAILS
- Telephone Call
- WhatsApp
- Text Message
- Police Radio
- Ground Shaking



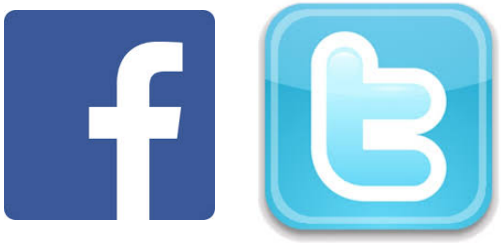






ASTARTE WP 3, 6, 8 and 9

10. Public Dissemination of Alerts



ASTARTE WP 3, 6, 8 and 9

ASTARTE outputs/future work

- Reports
- Scientific and Technical Publications
  - Seismology, Geophysical, Geology, Science Journals
  - Also… Engineering, Civil Protection, Land Use Planning, Technology
- Database maintenance and expansion, considerations of open access
- NEAMTWS
  - Monitoring enhancements
  - Decision Matrix updates
  - Tsunami Planning – Education, Resilience, Readiness
  - Communication Exercises and NEAMWAVE

Cont.

- SEVENTH FRAMEWORK Programme
- UNISDR – Sendai Framework – Targets:
  - Reduce Mortality , numbers of affected people, economic losses and damage to critical infrastructure and disruption of basic services
  - Increase number of countries with DRR strategies, international cooperation to developing countries and access to multi hazard warning systems and disaster risk reduction
- National
  - Communication systems – observations, products
  - National protocols, alert levels
- Other Projects – GTM, TSUMAPS…

The infrequency of tsunamis in the NEAM region can be disarming, a challenge. The findings and results of ASTARTE should contribute to the development of a comprehensive strategy to mitigate tsunami impact in the region which empowers communities to reduce risk, save lives and protect livelihoods from tsunamis, become resilient.