



Essential Tsunami Preparedness: Tsunami Evacuation Plans, Maps, and Procedures
Training 1: Tsunami Inundation Modeling using ComMIT 27-31 July 2015 Tegulcigalpa, Honduras

End-to-End Tsunami Warning System and PTWC New Enhanced Products



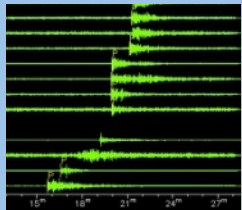
Charles McCreery
Director
NOAA Pacific Tsunami Warning Center

Outline

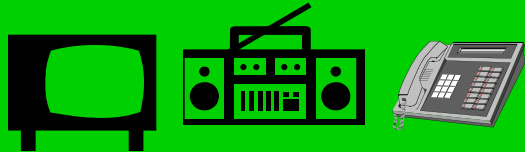
- *Who are the stakeholders in the end-to-end process?
- *How are the stakeholders are linked by their standard operating procedures?

The End-to-End Tsunami Warning Process

**Earthquake
Tsunami**



**Country
Alert System**



**Emergency Alert System
& Mass Media**

**TWCs
International
and
National**

**National /
Provincial /
Local
Government**



**Public
At Risk**



End-to-End Tsunami Warning Stakeholders

- * **Regional Tsunami Service Providers (RTSPs)**
- * **National Tsunami Warning Centres (NTWCs) and Tsunami Warning Focal Points (TWFP)**
- * **Disaster Management Offices (DMO) and Other Local Authorities**
- * **Emergency Services (Police, Fire Dept., Military)**
- * **Media**
- * **Public at Risk**

Regional Tsunami Service Providers

**Pacific: Pacific Tsunami Warning Center
Japan Meteorological Agency**

Caribbean: Pacific Tsunami Warning Center

- ☐ **Regional Monitoring & Detection (24/7)**
- ☐ **International sharing of data**
- ☐ **Issue Regional Threat Advice to National Tsunami Warning Centres and Tsunami Warning Focal Points**
- ☐ **Cancel Regional Threat**

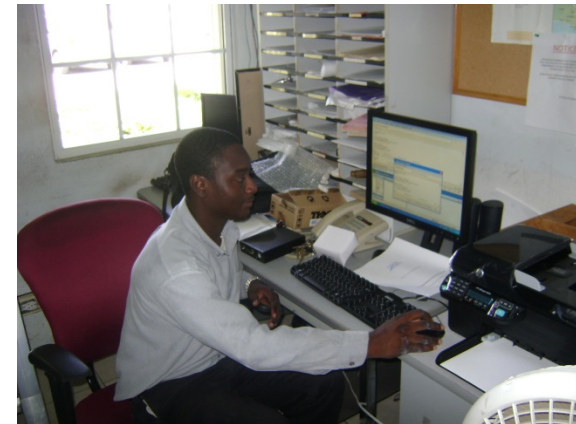
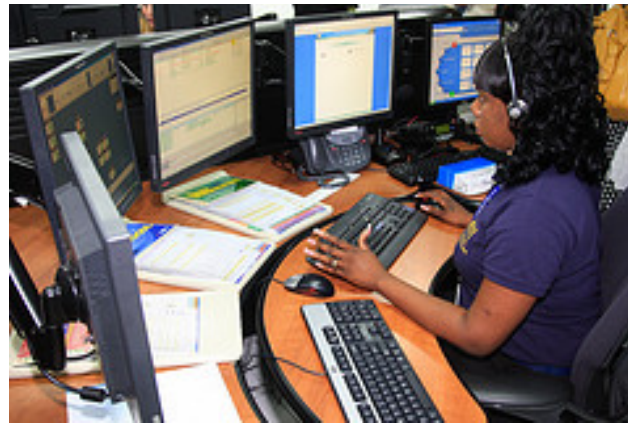
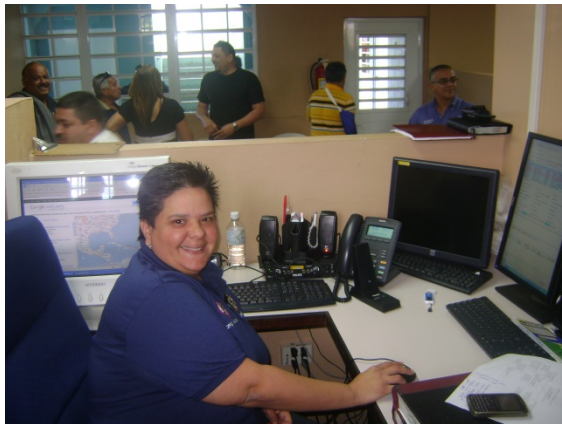
National Warning Centres (NTWC)

- ❑ Officially designated by the government
- ❑ Monitor earthquake/tsunami data and information
- ❑ Assess information to determine local threat
- ❑ Issue tsunami warnings and other related statements within their country
- ❑ Follow established National Standard Operation Procedures
- ❑ Research & Public Education (with stakeholders)



Tsunami Warning Focal Points (TWFP)

- ❑ 24 x 7 point of contact (office, operational unit or position, not a person)
- ❑ Officially designated by the NTWC or the government
- ❑ Receives and disseminates tsunami information
- ❑ Follows established National Standard Operation Procedures.
- ❑ The TWFP may or not be the NTWC



Disaster Management Offices

(National and Local Authorities)

- * Receive Warnings/Alerts from NTWC/TWFP
- * Activate local public alert systems as needed
- * Decide on & manage Evacuations/Response
- * Determine and Communicate 'All Clear' (safe to return)
- * Signage
- * Public Education (with other stakeholders)



Emergency Services

- * Support DMO/Local Authorities with
 - * Public alerting
 - * Evacuation
 - * Law & Order
 - * Response after tsunami has struck
(Search and Rescue, etc)



Media (radio, television)

- ❖ Convey Official Warnings (National & Local)

But also:

- * Convey Unofficial Warnings

Therefore:

- * Can cause or counter public response

*International media can mis-report warning regions/
countries causing public confusion*



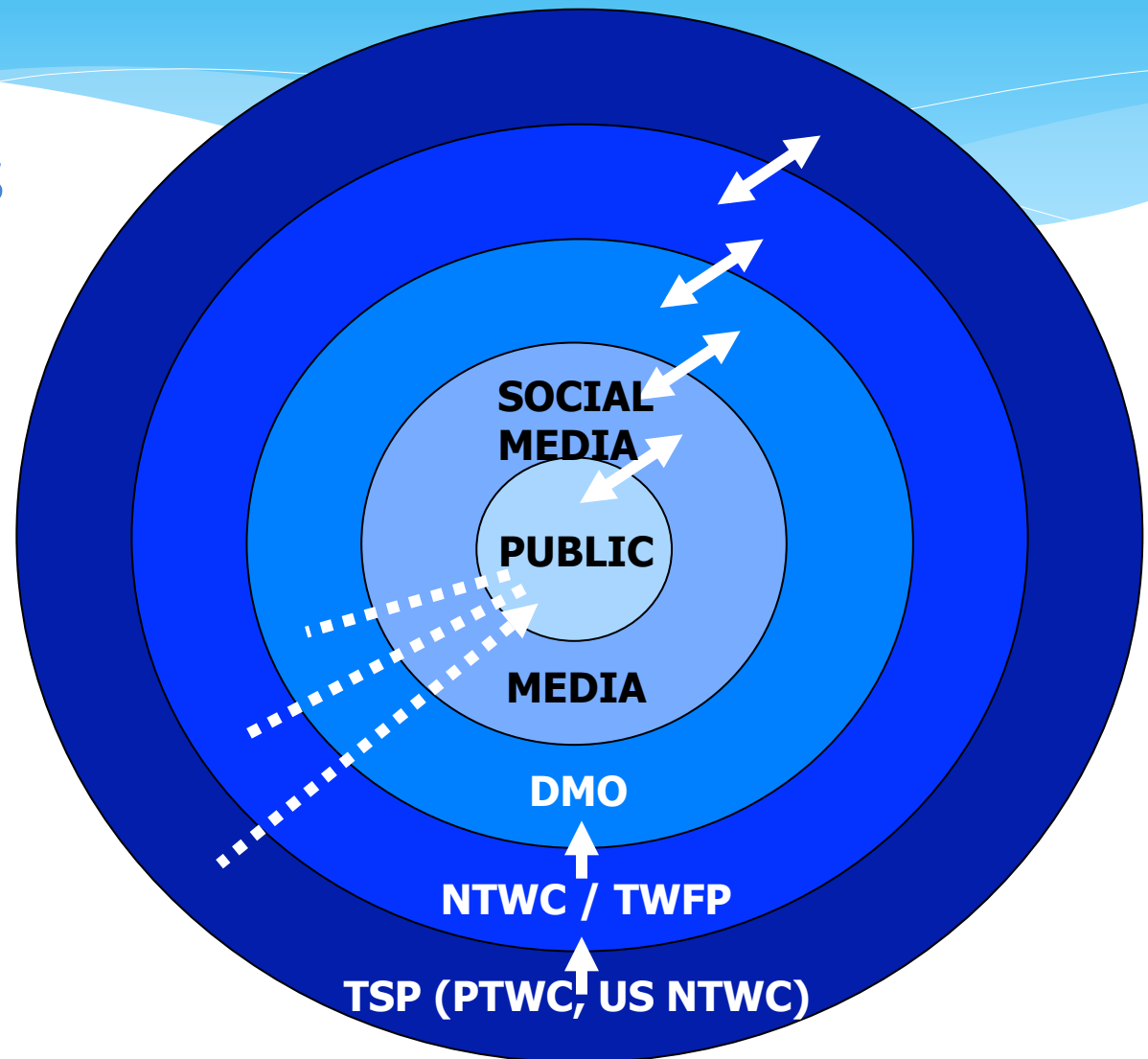
Public

- * End Receiver of Warnings/Alerts
- * Convey Official and Unofficial Warnings
- * To minimize their confusion, they must be educated to understand:
 - * Official Warnings (how will they be warned)
 - * Natural Warnings (what to look out for)
 - * Where and What to do
 - ☐ Evacuation zones
 - ☐ Routes & Safe zones
 - * How to respond if evacuation zones are not defined

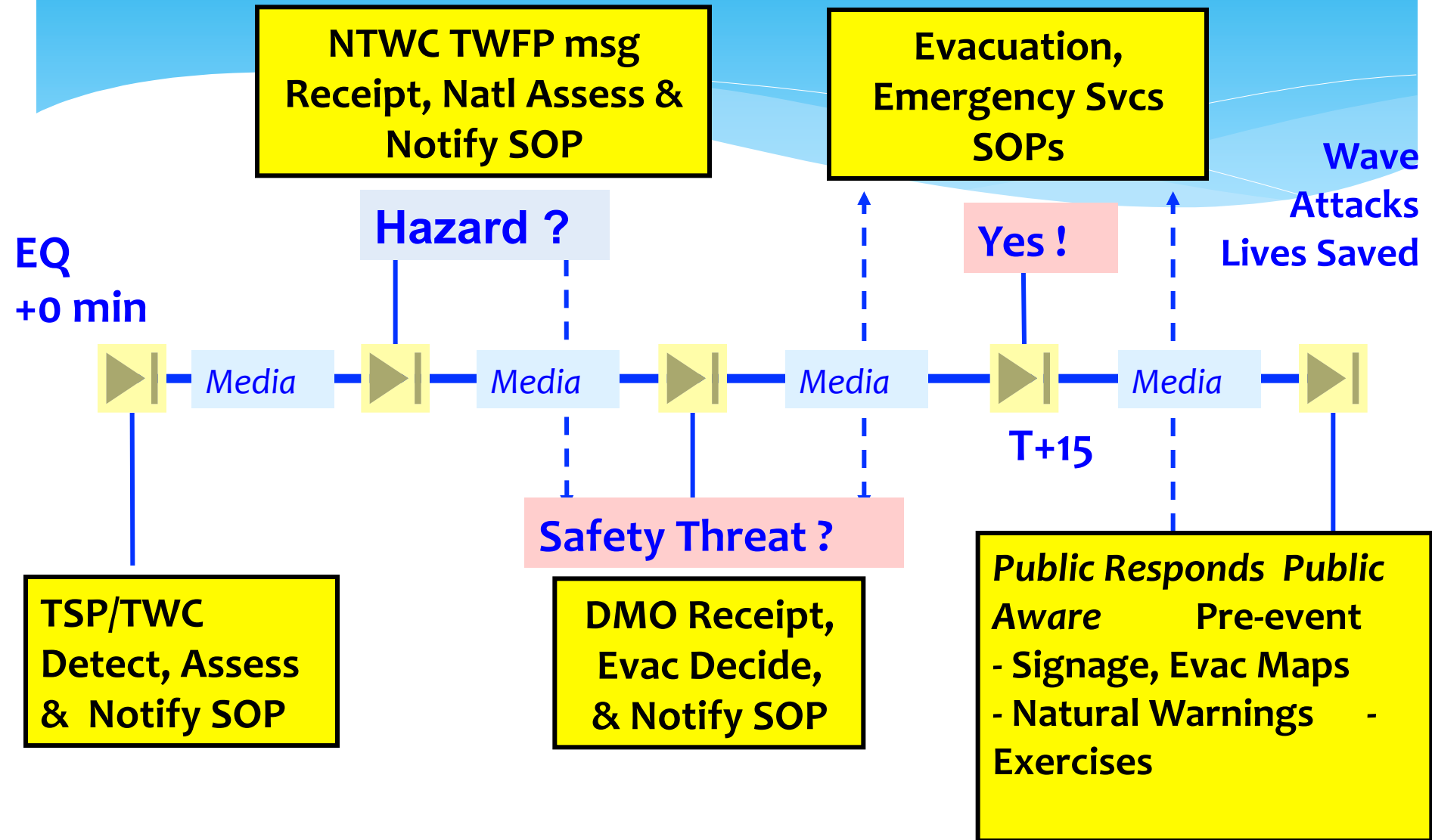


End-to-End Tsunami Warning

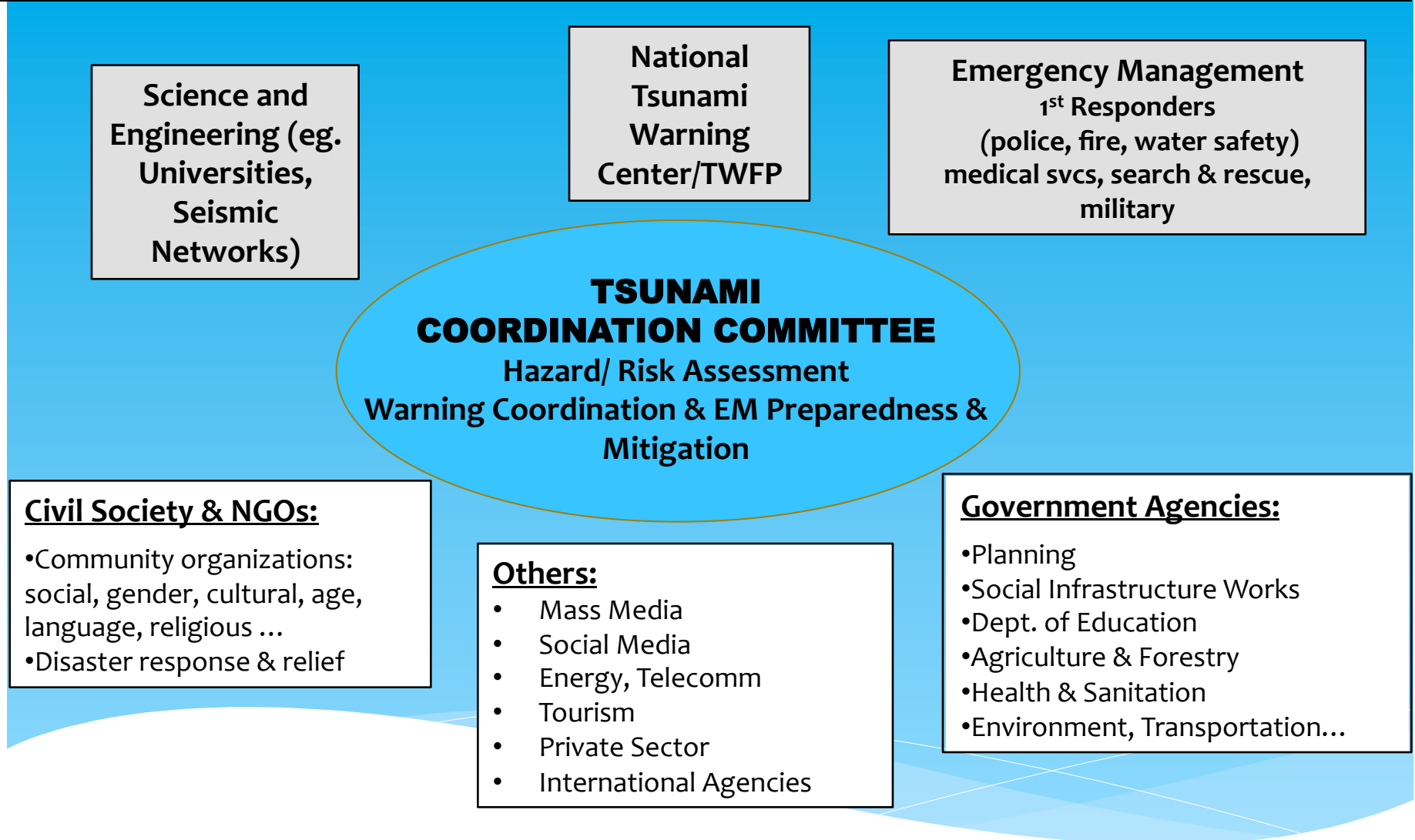
Stakeholder
Relationships



End (Start)-to-End Warning SOP – Activities



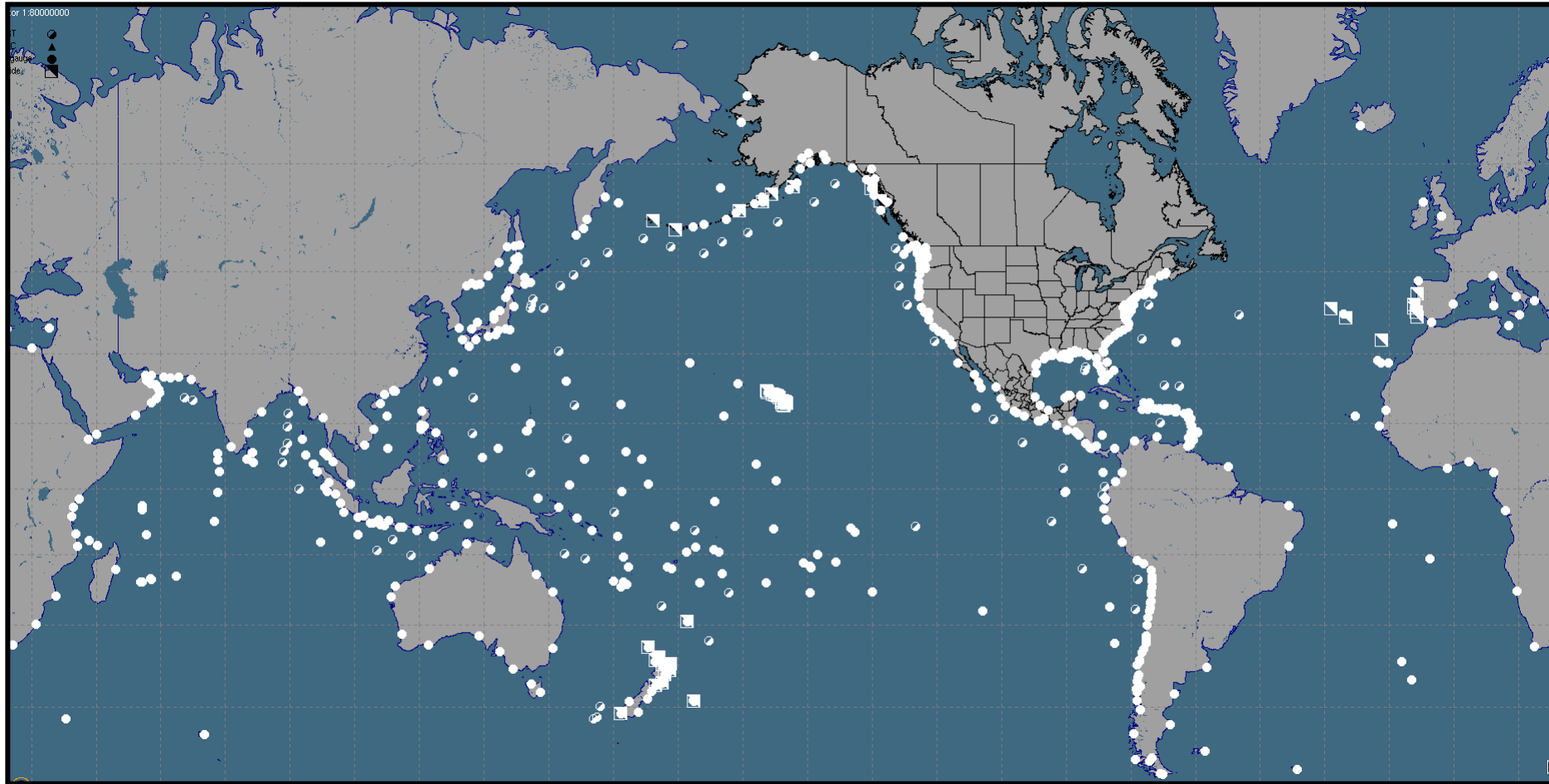
Stakeholder Coordination is Essential



Observational Data: > 500 Seismic Stations



Observational Data: > 400 Sea Level Stations



PTWC Operational Activities

- Responded to >5000 global earthquakes that triggered PTWC seismic alarms
 - Analyzed and Issued Observatory Messages for 581 global earthquakes ($M_w > \sim 5.5$).
 - Issued PTWS Tsunami Bulletins for 79 Pacific earthquakes ($M_w \geq 6.5$)
 - 54 Tsunami Information Bulletins
 - 5 Tsunami Warnings
- New Products 10/1/2014 -----
- 19 Tsunami Information Statements
 - 3 Tsunami Threat Messages

PTWC Warnings or Threats

- 04/01/2014 Northern Chile
 - Earthquake Magnitude 8.2
 - Issued 8 min / Canceled 296 min
 - >3 m runups in northern Chile
 - Some tsunami damage but no casualties
- 04/03/2014 Northern Chile
 - Earthquake Magnitude 7.7
 - Issued 8 min / Canceled 76 min
 - Up to 0.74 m on nearest coastal gauges
 - No damage or casualties

PTWC Warnings or Threats

- 04/12/2014 Solomon Islands
 - Earthquake Magnitude 7.6
 - Issued 5 min / Canceled 81 min
 - 0.02 m on Coral Sea DART gauge
 - No tsunami damage or casualties
- 04/13/2014 Solomon Islands
 - Earthquake Magnitude 7.4
 - Issued 10 min / Cancel 126 min
 - 0.01 m on Coral Sea DART gauge
 - No tsunami damage or casualties

PTWC Warnings or Threats

- 04/19/2014 Solomon Islands
 - Earthquake Magnitude 7.5
 - Issued 9 min / Cancel 71 min
 - 0.11 m on nearest coastal gauge
 - No tsunami damage or casualties
- 10/14/2014 Central America
 - Earthquake Magnitude 7.3
 - Issued 19 min (upgrade) / Cancel 43 min
 - No tsunami observed
 - No damage or casualties

PTWC Warnings or Threats

- 11/15/2014 Halmahera, Indonesia
 - Earthquake Magnitude 7.1
 - Issued 10 min / Cancel 119 min
 - 0.09 m on nearest coastal gauge
 - No damage or casualties
- 03/29/2015 New Ireland
 - Earthquake Magnitude 7.5
 - Issued 5 min (upgrade) / Cancel 161 min
 - 0.5 m on nearest coastal gauge
 - No damage or casualties

Other Notable Events

- 03/16/2014 Northern Chile
 - Earthquake Magnitude 6.7
 - Information Bulletin Issued 6 min
 - Up to 0.26 m on nearby coastal gauges
 - No damage or casualties
- 04/18/2014 Guerrero, Mexico
 - Earthquake Magnitude 7.2
 - Information Bulletin Issued 12 min
 - 0.43 m on coastal gauge at Acapulco
 - No damage or casualties

Other Notable Events

- 06/23/2014 Kermadec Islands
 - Earthquake Magnitude 6.9
 - Information Bulletin Issued 8 min
 - 0.13 m on coastal gauge at Raoul Island
 - No damage or casualties
- 07/11/2014 Honshu, Japan
 - Earthquake Magnitude 6.5
 - Information Bulletin Issued 9 min
 - 0.20 m at Ofunato, Japan
 - No damage or casualties

Other Notable Events

- 10/09/2014 East Pacific Rise
 - Earthquake Magnitude 7.1
 - Information Bulletin Issued 10 min
 - 0.47 m at Easter Is and 0.08m at San Felix Is
 - No damage or casualties

Other PTWC Activities

- ❑ Implemented new domestic tsunami products for American Samoa and Guam/CNMI
- ❑ Implemented Enhanced Products for the PTWS on October 1, 2014
- ❑ Participated in the Pacific Wave 15 Exercise
- ❑ Moved to the Inouye Regional Center in Pearl Harbor
- ❑ Continued development of new operations software for both PTWC and USNTWC.



Essential Tsunami Preparedness: Tsunami Evacuation Plans, Maps, and Procedures Training 1: Tsunami Inundation Modeling using ComMIT 27-31 July 2015 Tegulcigalpa, Honduras

Thank You
