

2.2 RESPONDING RAPIDLY & EFFECTIVELY

- Evolution of SOPs
- Alert Levels
- Decision Support Tools



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2012 National Tsunami Plan



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EARTHQUAKE	PRODUCT TYPE	DESCRIPTION
4.5 ≤ M ≤ 6.7 Magnitude and shallow (≤ 70km) within Tonga's EEZ	Local Information Bulletin	Issued to response agency members only
≥ 6.8 ≤ 7.5 Magnitude and shallow (≤ 70km) OR Mercalli Intensity ≥ 8 observed directly within Tonga's EEZ	Urgent tsunami Alert	Issued to whole of Tonga
≥ 7.6 and shallow (≤ 70km) OR Mercalli Intensity ≥ 9.0 observed directly within Tonga's EEZ	Urgent Tsunami Warning	Issued to whole of Tonga

2012 National Tsunami Plan

• ALERT LEVELS & BULLETINS



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ALERT LEVELS & BULLETINS	Tongan Terminology	DESCRIPTION
URGENT TSUNAMI WARNING	<i>fakatokanga peaukula fakavavevave</i>	refers to a warning that is in force following a felt shallow earthquake (≤ 70 Km depth) or 7.6M or more verified from GSU within the Tonga EEZ before any information is received for PTWC or observed intensity of 9 or more on the Mercalli Intensity scale. This warning is based on the magnitude, depth and intensity of the earthquake alone with no <u>verification that any tsunami wave has been generated</u> .
URGENT TSUNAMI ALERT	<i>fanongonongo ke tokateu fakavavevave na'a hoko ha peaukula)</i>	refers to an alert to the public and all response agencies informing that a shallow (≤ 70 km in depth) earthquake of $6.8 \leq M < 7.6$ magnitude has occurred within the EEZ of Tonga and reported from PTWC or GSU or any verified source (or estimated Intensity 8 on Mercalli intensity scale by direct observation) but it is not yet known whether a tsunami wave has been generated.
TSUNAMI WARNING	<i>fakatokanga peaukula</i>	refers to confirmation that a tsunami has been generated and that a warning is in force.
LOCAL INFORMATION BULLETIN	<i>fakamatala mofuike fakalotofonua)</i>	refers to an alert of an earthquake greater than or equal to magnitude 4.5 and less than or equal to 6.7 with the depth of ≤ 70 km within the Tonga EEZ. Local Information Bulletins will be issued by the TMS in consultation with the GSU unit, USGS and PTWC and will be distributed to members of the NEMC as a watch only and not to the general public. Warnings may follow.
TSUNAMI INFORMATION BULLETIN	<i>fakamatala mofuike fakavaha'apule'anga</i>	an alert of an earthquake ≥ 6.5 issued by the PTWC for anywhere in the world. This message will be distributed to the NEMC as information only and not to the general public.
CANCELLATION	<i>kaniseli o ha fakatokanga ke tokateu pea ha fakatokanga peaukula</i>	Refers to the cancellation of any tsunami warning or alert which has been issued earlier.
ALL CLEAR	<i>fanongonongo fakaataa ke foki ki 'api</i>	message is issued by the National Controller through NEMO to inform people that the threat or hazard has now passed and it is safe to return home. However, all safety precautions should be taken when moving back.

PTWC PRODUCT DISSEMINATION

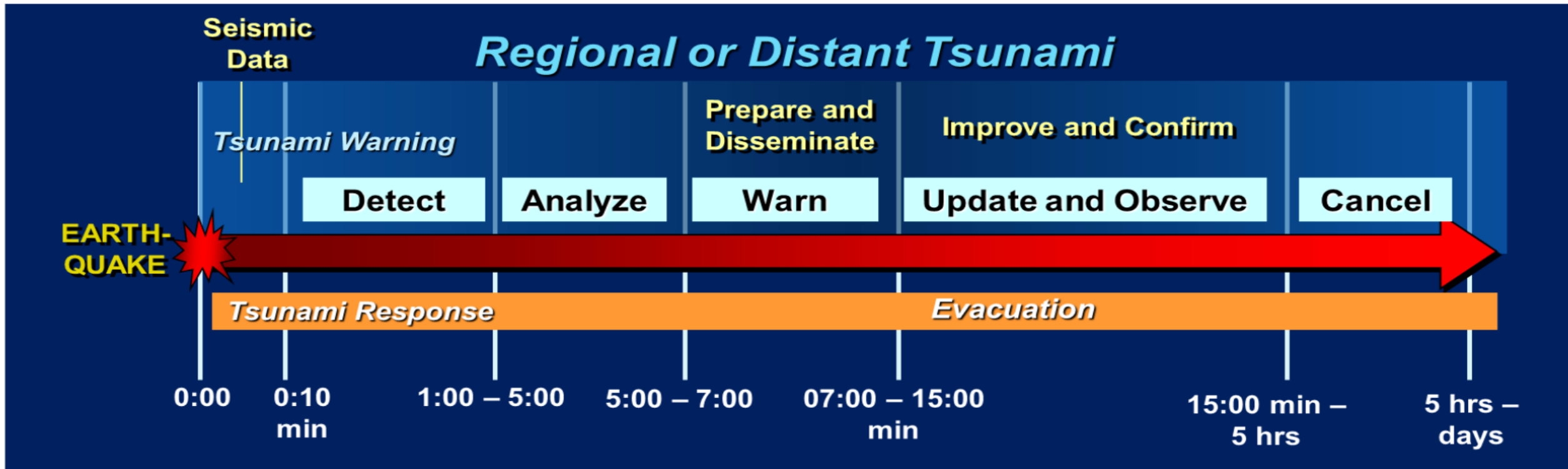


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Typical PTWC Timeline



2014 PTWC INTERNATIONAL TSUNAMI MESSAGES



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ALERT LEVEL	POTENTIAL HAZARDS	PUBLIC ACTION
MAJOR THREAT	Dangerous coastal flooding and/or strong and unusual currents dangerous to those in or very near the water	Seek more information, follow instructions from national and local authorities
INFORMATION STATEMENT	Minor waves at most	No action suggested other than normal caution around the sea

2014 PTWC INTERNATIONAL TSUNAMI MESSAGES



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- **Tsunami Threat Message** – A tsunami threat message is issued to officially designated national authorities of the PTWS or CARIBE EWS when a potential or confirmed tsunami is forecast to affect some or all coasts within those systems. Estimated arrival times for the first wave are provided for select locations. When sufficient data have been received to forecast tsunami waves, the message is updated to include this information. Messages also emphasize that a tsunami can adversely impact people, structures, and ecosystems on land or in nearshore marine environments. National authorities will determine the appropriate level of alert for each country and may issue additional or more refined information and instructions. Threat messages may be updated based on new information, data and analysis.

A **final tsunami threat message** is issued when the Pacific Tsunami Warning Center determines there is no further threat or that tsunami waves are now below threat levels in most places and are diminishing.

Tsunami Information Statement – A tsunami information statement is issued to national authorities when an earthquake or tsunami has occurred of interest to the message recipients. In most cases, information statements are issued to indicate there is no threat of a tsunami and to prevent unnecessary evacuations. Information statements may be upgraded to tsunami threats based on updated information and analysis.

2.2 TERMINOLOGY/ GLOSSARY



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Definitions

1. **Tsunami**
2. **Tsunami Warning**
3. **Tsunami Urgent Warning**
4. **Tsunami Advisory**
5. **Tsunami Marine Warning**
6. **Tsunami Watch**
7. **Tsunami Information Statement**
8. **Earthquake Information**
9. **Local Tsunami**
10. **Regional Tsunami**
11. **Distant Tsunami**
12. **Tsunami Warning Cancellation**
13. **Tsunami All Clear**
14. **Tsunami Earthquake**
15. **Tsunami Amplitude**

2.2 Key Considerations

- Terminology
- Tsunamigenic Earthquake Sources
- Earthquake Monitoring & Detection
- Volcano Monitoring & Detection
- Landslide (underwater) Monitoring & Detection
- Tsunami Monitoring & Detection
- Tsunami Emergency Alert & Response Actions
- **DISASTER RISK MANAGEMENT ACT 2021**
- **Disaster Risk Management Policy Framework 2023-2030**
- **NDRM Regulations**
- Lessons Learnt from Tsunami Drills
- HTHH Tsunami Alert Procedures



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Elements of SOP to be in Place

- Flowcharts,
- criteria tables,
- Timelines,
- checklists,
- Pre-scripted templates



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PTWC PRODUCT DISSEMINATION

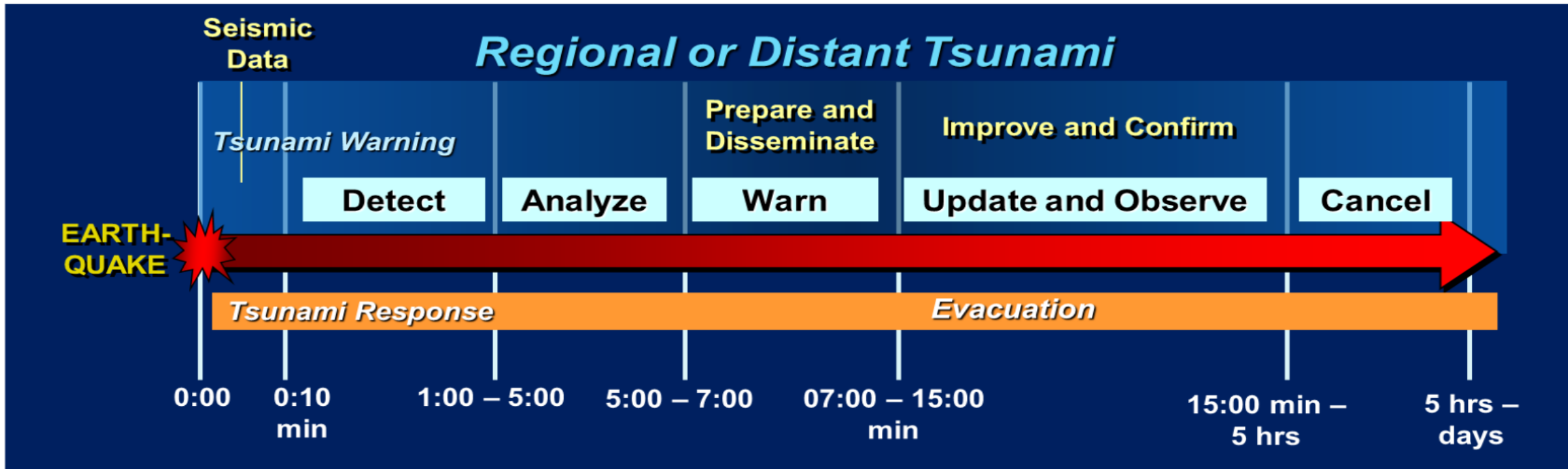


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Typical PTWC Timeline



Tsunami Service Providers (PTWC)



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The roles and responsibilities of a TSP (*Tsunami Watch Operations. Global Service Definition Document. IOC Technical Series No. 130, 2016*) are:

- Determine and provide timely initial earthquake information
- Determine more specific threat information using output from scenario databases produced by tsunami models, using earthquake source information and verified by sea level information
- Provide timely tsunami forecast information for use in preparation and issuing of national tsunami warnings by NTWCs/TWFPs
- Monitor tsunami propagation and provide updated information (observed tsunami amplitude measurements) in priority
- Provide timely standardized Situation Reports (SitReps) for use by other TSPs and NTWCs, as mandated by each ICG
- Serve as a backup centre to other TSPs, if required
- Serve as an NTWC for the country in which it resides

NTWC CORE Responsibilities



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The core responsibilities of the NTWC are:

- To receive, directly or through the designated country national Tsunami Warning Focal Point (TWFP), earthquake and tsunami information from the TSP(s) of its choice, and optionally, to independently monitor seismicity and tsunamis in real time.
- To analyse all information received and assess the tsunami threat for that country.
- To issue timely tsunami warnings or cancellations to EMAs and other stakeholder agencies in accordance with its National Tsunami Warning and Emergency Response Plan

NTWC Seismic Event Response Steps

Earthquake – (Analog or Digital Alarm paging Duty Staff)

1. Detect and analyse large earthquake
2. Assess tsunami threat based on pre-determined criteria
3. Issue initial tsunami warning message
4. Receive and/or carry out further seismic analysis and receive/calculate tsunami forecast
5. Detect and analyse sea level data for tsunamis
6. Re-assess tsunami threat
7. Issue supplementary warning message
8. Repeat steps 4-7 until “No dangerous tsunami waves coming ashore”
9. Issue tsunami warning cancellation message

Box 3.7.1 Principal NTWC event response steps on receipt of earthquake data

Emergency Management Response Steps



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The core responsibilities of the EMA in a tsunami warning are:

- To receive official tsunami warning and cancellation messages from the NTWC.
- To conduct further threat assessments and decide appropriate action.
- To communicate the warnings, with instructions, via public alerting systems and the media.
- To activate appropriate emergency response measures, including deciding and managing evacuations.
- To communicate the “All Clear” when the threat is over.

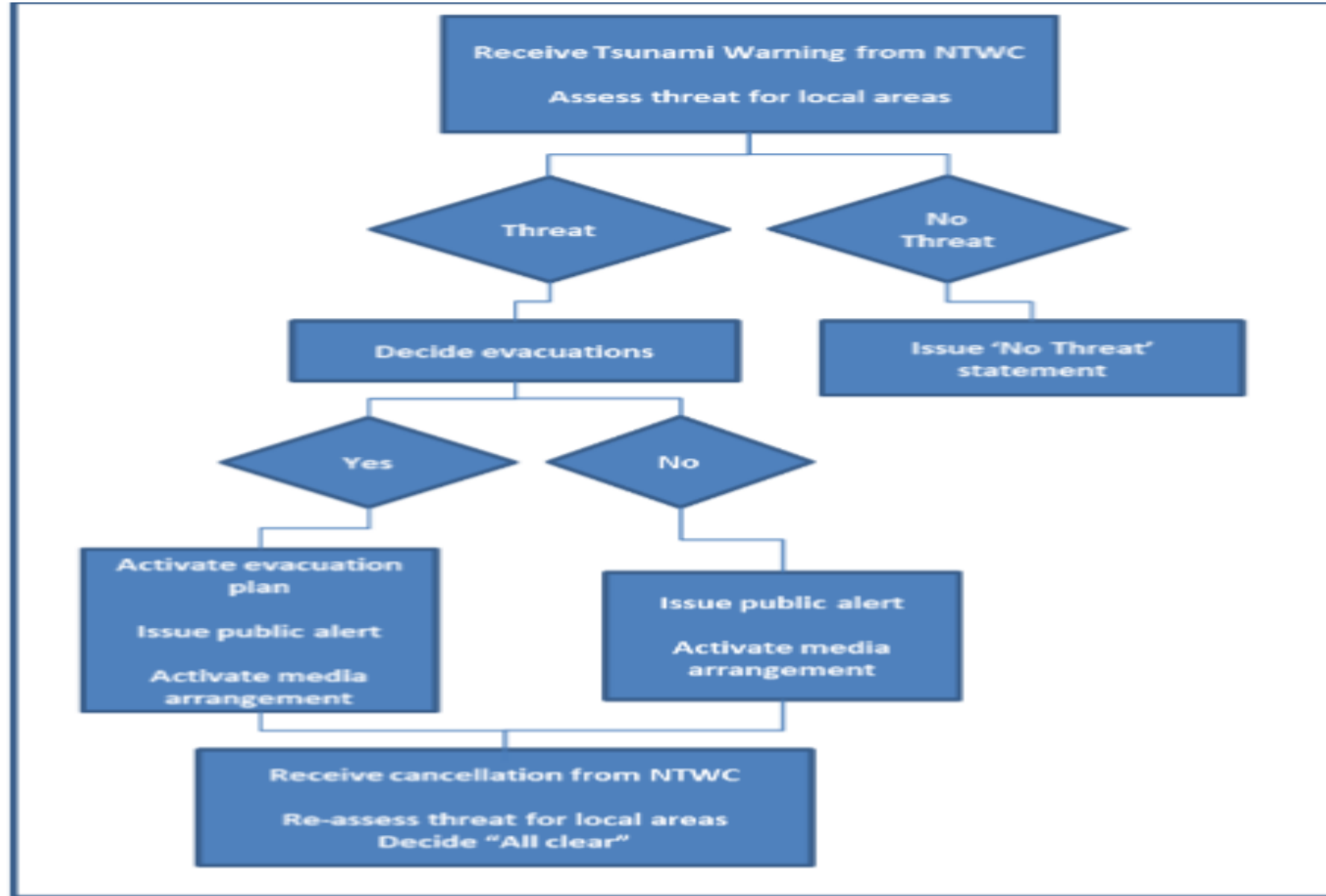
Box 4.2 EMA core responsibilities in a tsunami emergency (subject to national protocols)

Simplified Flowchart for EM Response Process



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Development of TER Plans and SOPs

- **Plans & SOP for Public Awareness**
- **Plans & SOP for Receipt of Warning –Media**
- **Plans & SOP for Public Notification**
- **Plans & SOP for Evacuations**



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UNDERSTANDING TSUNAMI ALERTS

KNOW YOUR EVACUATION ZONES - [HONOLULU.GOV/TSUNAMIEVAC](https://hawaii.gov/tsunami)



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ALERT TYPE	DEFINITION	ACTION	ALERT METHOD
 TSUNAMI INFORMATION STATEMENT	NO TSUNAMI IMPACT IS EXPECTED AT THIS TIME. ALERT TYPE MAY CHANGE ONCE MORE INFO IS KNOWN.	NO ACTION IS NECESSARY AT THIS TIME. BE AWARE SINCE ALERT TYPE MAY CHANGE.	ALERTS MAY BE ISSUED VIA HNL.INFO UNDER CERTAIN CIRCUMSTANCES
 TSUNAMI WATCH	TSUNAMI IS POSSIBLE. ALERT TYPE MAY CHANGE ONCE MORE INFO IS KNOWN.	BE PREPARED TO ACT. KNOW YOUR EVACUATION ZONES & STAY TUNED TO RADIO/TV.	HNL.INFO & SOCIAL MEDIA
 TSUNAMI ADVISORY	WIDESPREAD FLOODING NOT EXPECTED, BUT WAVES WILL CREATE DANGEROUS CONDITIONS IN AND NEAR THE WATER.	STAY OUT OF BEACH AREAS & AWAY FROM WATERWAYS.	HNL.INFO & SOCIAL MEDIA
 URGENT TSUNAMI WARNING (LOCAL)	DESTRUCTIVE TSUNAMI WAVES EXPECTED TO IMPACT LOW-LYING COASTAL AREAS <u>WITHIN MINUTES.</u>	<u>IMMEDIATELY</u> MOVE TO HIGH GROUND, INLAND, OR 4TH FLOOR OR ABOVE IN BUILDING WITH 10+ STORIES. EVACUATE MAP AREAS IN RED WITH SOLID LINE.	OUTDOOR SIRENS, MOBILE PHONE ALERTS, NOAA WEATHER RADIO, & TV/RADIO TAKE ACTION IF YOU SEE NATURAL WARNING SIGNS, LIKE STRANGE OCEAN BEHAVIOR
 TSUNAMI WARNING	DESTRUCTIVE TSUNAMI WAVES EXPECTED TO IMPACT LOW-LYING COASTAL AREAS.	MOVE TO HIGH GROUND, INLAND, OR 4TH FLOOR OR ABOVE IN BUILDING WITH 10+ STORIES. EVACUATE MAP AREAS IN RED WITH SOLID LINE.	OUTDOOR SIRENS, MOBILE PHONE ALERTS, NOAA WEATHER RADIO, TV/RADIO, HNL.INFO, & SOCIAL MEDIA
 EXTREME TSUNAMI WARNING	UNLIKELY, BUT PLAUSIBLE WORST CASE SCENARIO. DESTRUCTIVE TSUNAMI WAVES EXPECTED TO IMPACT FURTHER INLAND.	MOVE TO HIGH GROUND, INLAND, OR 4TH FLOOR OR ABOVE IN BUILDING WITH 10+ STORIES. EVACUATE MAP AREAS IN RED WITH SOLID LINE AND YELLOW WITH DOTTED LINE.	OUTDOOR SIRENS, MOBILE PHONE ALERTS, NOAA WEATHER RADIO, TV/RADIO, HNL.INFO, & SOCIAL MEDIA

KNOW YOUR EVACUATION ZONES - [HONOLULU.GOV/TSUNAMIEVAC](https://hawaii.gov/tsunami)

