



UNESCO/IOC – NOAA ITIC Training Program in Hawaii (ITP-Hawaii)
TSUNAMI EARLY WARNING SYSTEMS
AND THE PACIFIC TSUNAMI WARNING CENTER (PTWC) ENHANCED PRODUCTS
TSUNAMI EVACUATION PLANNING AND UNESCO IOC TSUNAMI READY PROGRAMME
7-18 August 2023, Honolulu, Hawaii USA

12.2 SOPs and Checklists:

TER operations

Private Sector SOPs

Developing timeline-driven SOPs

Carolina Hincapie-Cardenas

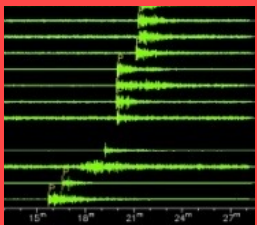
Oceanographer
UNESCO/IOC – NOAA International Tsunami Information Center



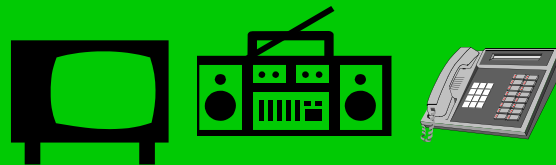


End-to-End Tsunami Warning

Tsunami



Country Alert System



Emergency Alert System & Mass Media

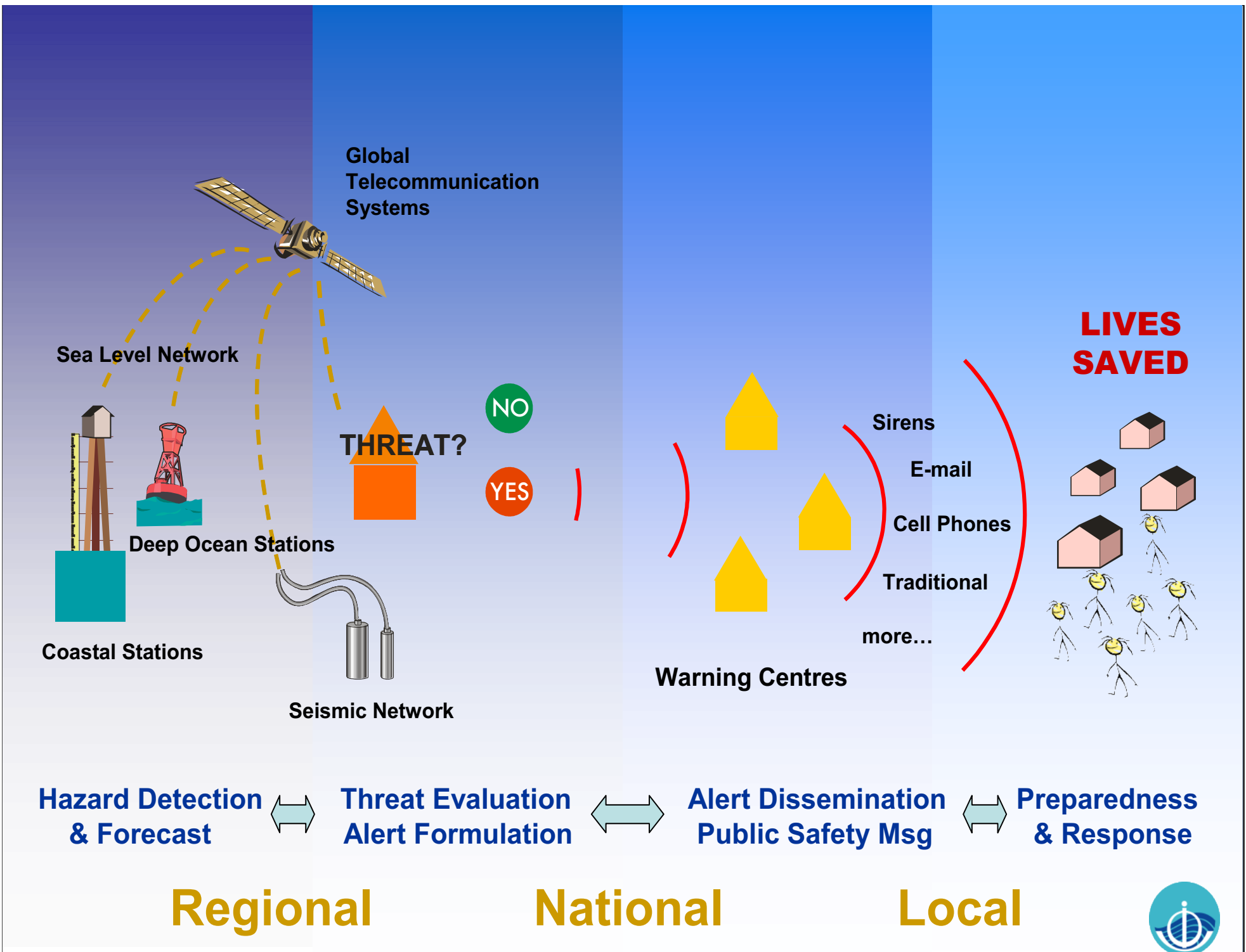
TWC

Intl / Natl

Natl / Provincial / Local Govt



Public



Regional

National

Local

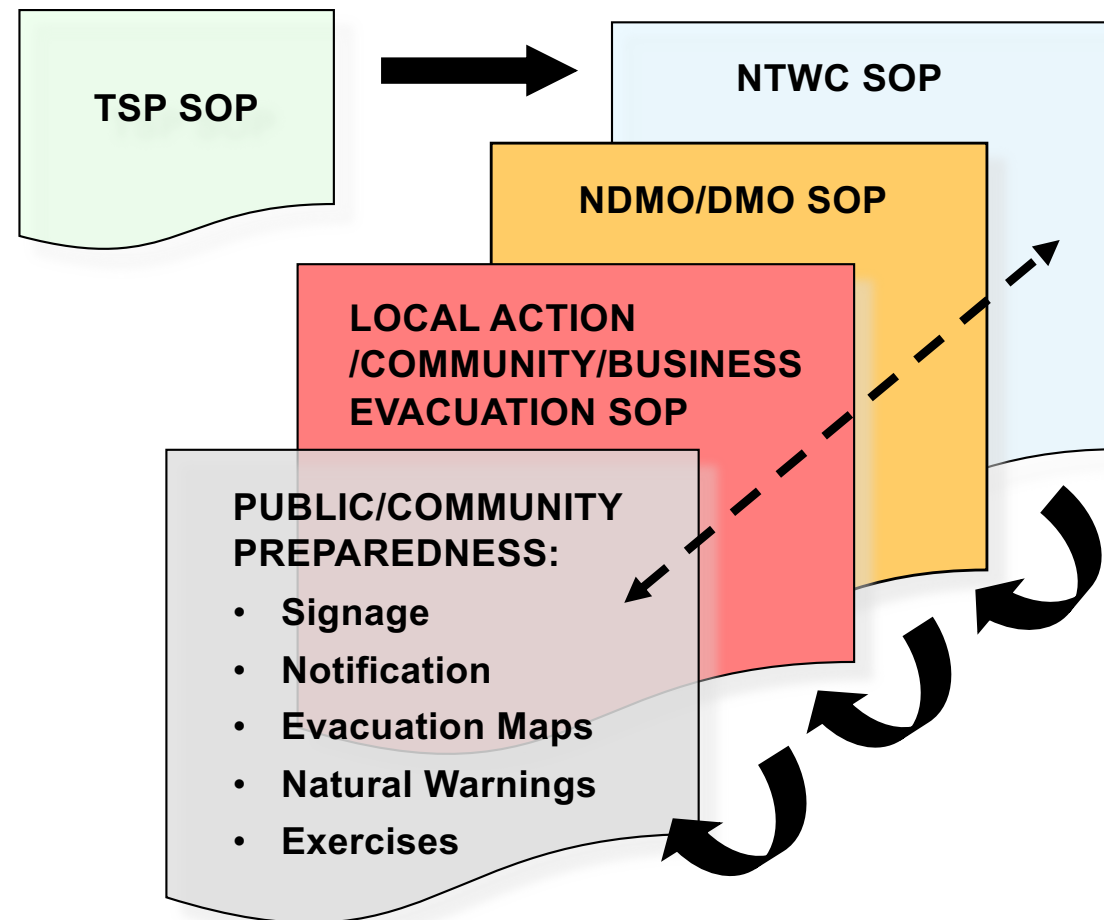


SOP Working Definition

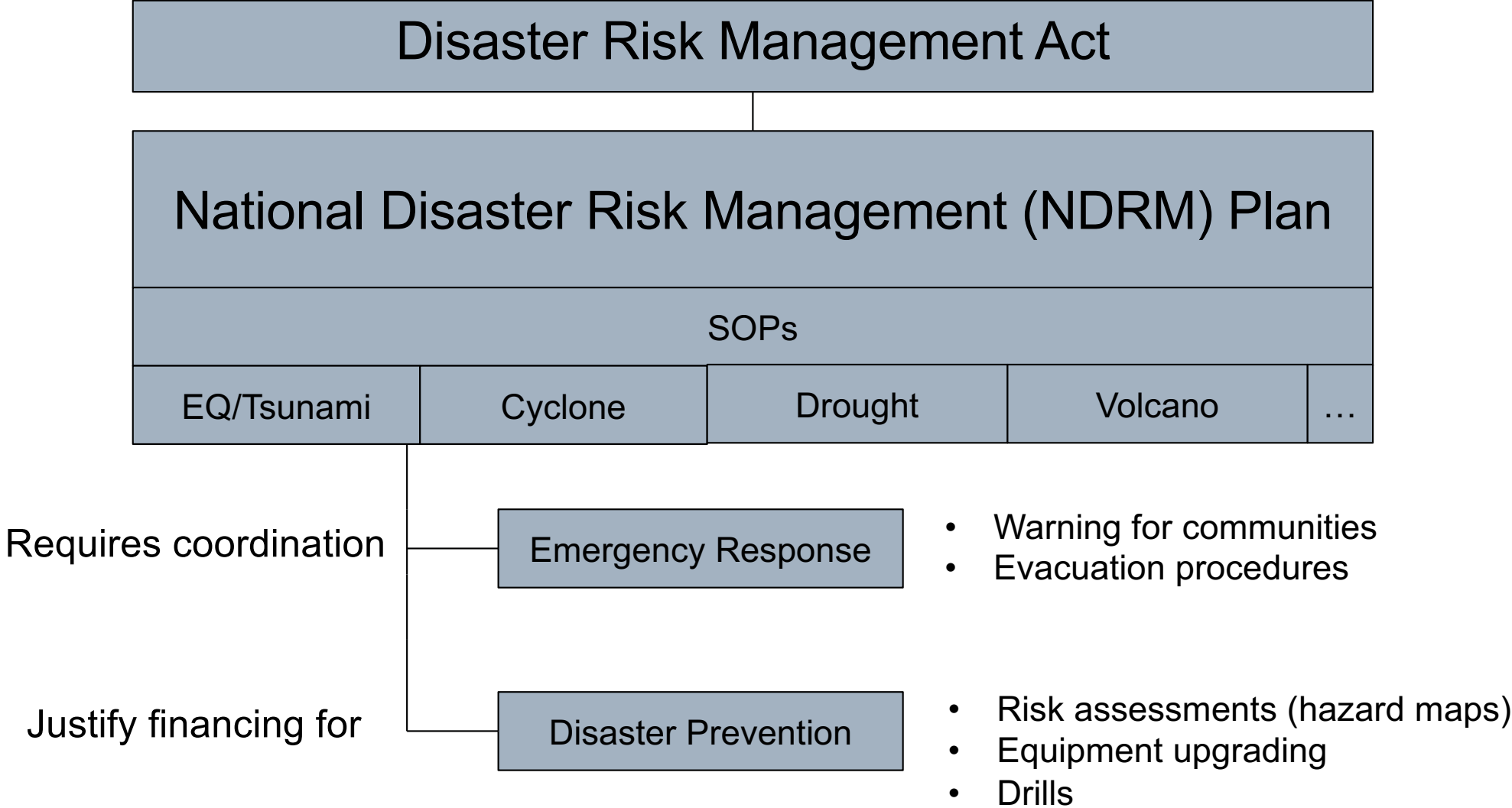
**“A description and procedure
on agreed steps by institutions
used in coordinating who, what,
when, where and how for
tsunami early warning and
response”**

*From Indonesia Local SOP Workshops: Capacity Building for Development
of Local SOPs for Tsunami Early Warning and Response. 2006-2007*

Warning Chain – set of linked SOPs



Legislative basis for SOPs



Tsunami Response Plan

- Concept of Operations
- Stakeholders (structure, roles & responsibilities)
- Risk profile (e.g hazard maps)
- Threat criteria points
- SOPs
 - Flow charts, checklists, logs (e.g. communication flow)
 - Alerting/messaging the public (incl. tourists)
 - Evacuation procedures
 - Assessment of situation/ getting updates
 - All-clear procedures
 - Coordinating international assistance
- Regular exercise

Vanuatu example

□ Introduction

- Plan purpose, objectives, development and review

□ Tsunami Risk Profile

- From earthquakes
- From volcanoes

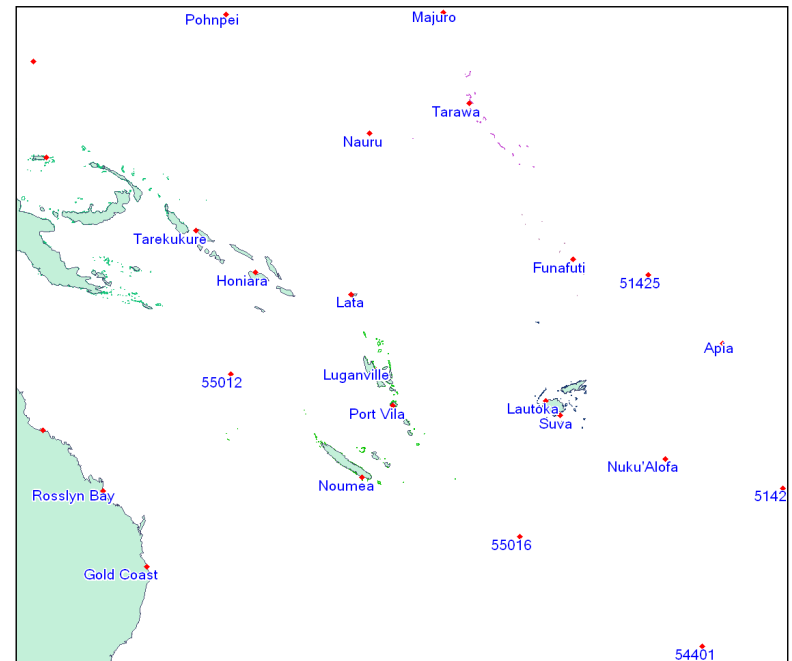
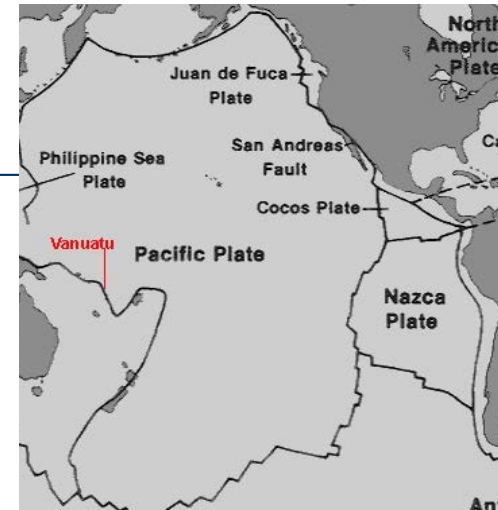
□ Tsunami Awareness, Education and Preparedness

- Roles & responsibilities

□ Alert & notification systems

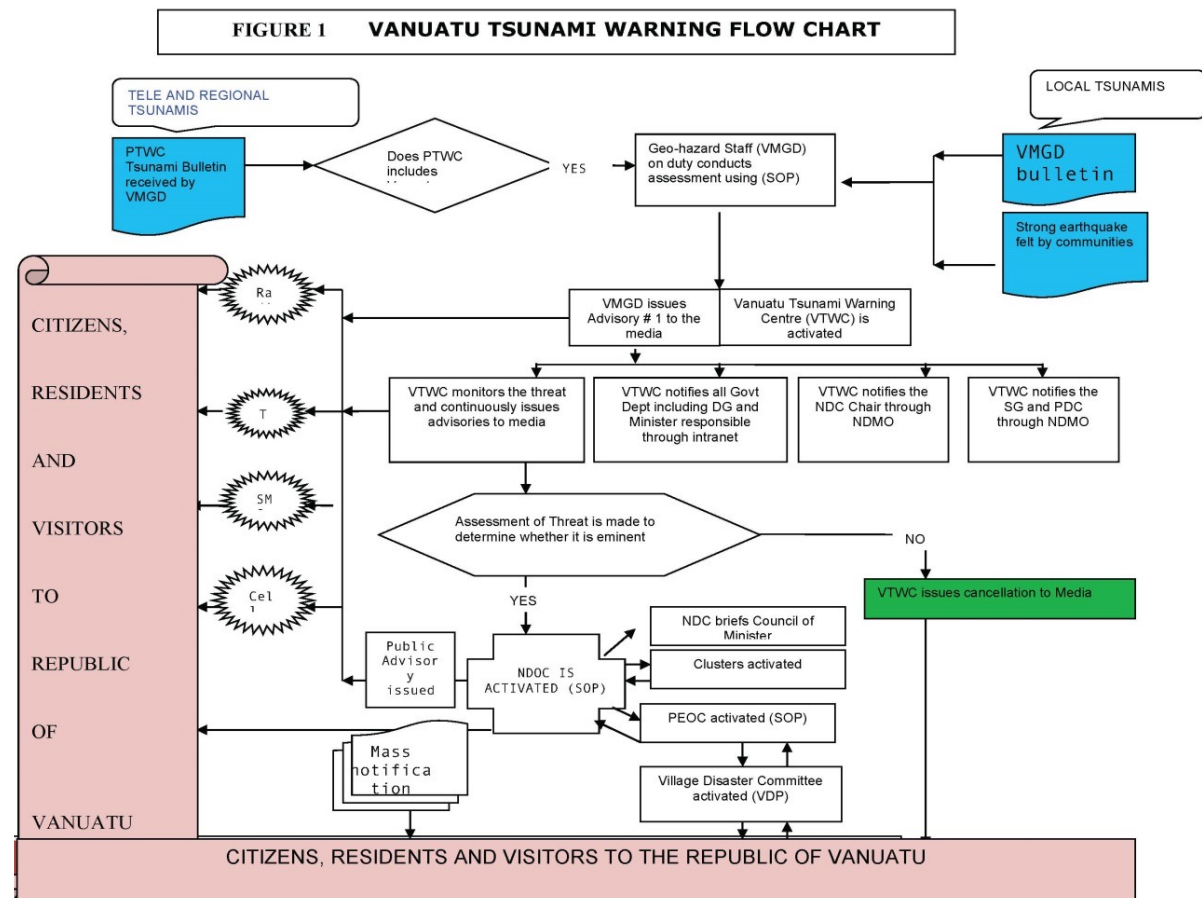
□ Observations & Warnings

- Seismic
- Volcanic
- Sea level
- Authority to issue warnings
- Detection,



Vanuatu example (continued)

- **Warning Dissemination**
 - Methods
 - Responsibility
- **Response**
- **All clear & Cancellation**
 - Authority
 - Dissemination
- **Evacuation**
- **Recovery**



Concept of operations

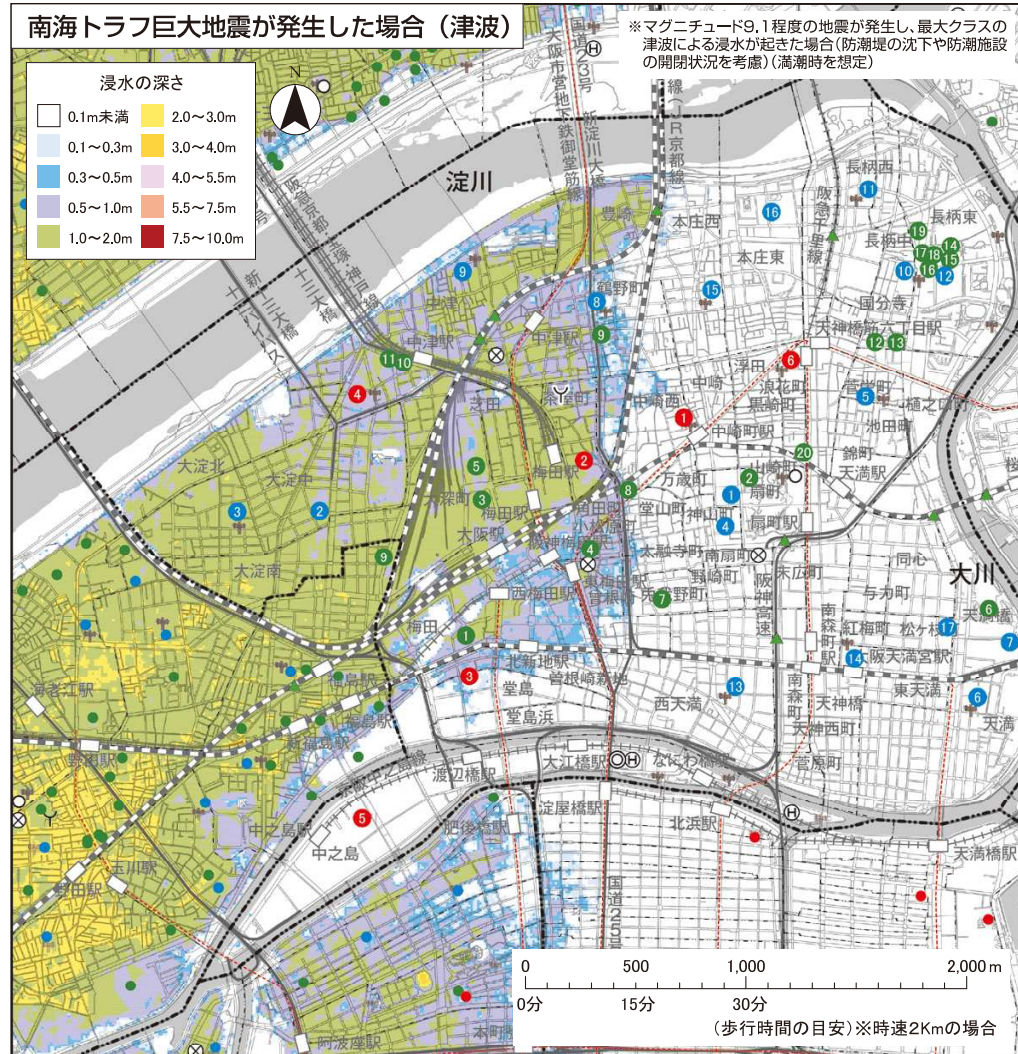
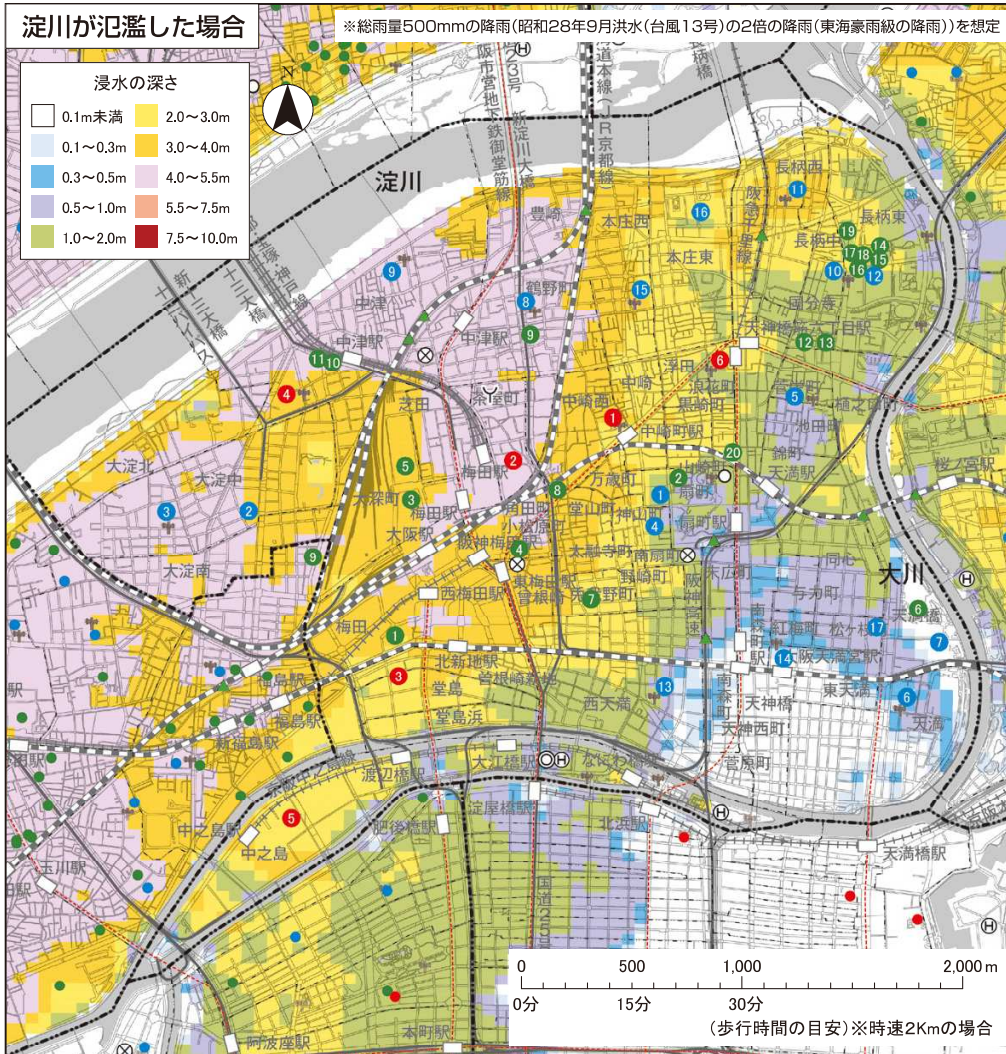
Setting the scene...

Tsunami Planning Template	
General	<p>The purpose of this document is to assist in developing basic tsunami response planning for local communities. Response plans will be written specifically for the evacuation of populations living in coastal areas and inland <u>water ways</u>. This document focuses on a timeline from the receipt of a tsunami warning to the completion of the evacuation. Response plans should focus on saving and protecting the welfare of the general public, protecting critical infrastructure and key resources, and lessen the impacts to individuals, communities, and the environment.</p>
Assumptions	<p>Planners should understand the following assumptions this template makes:</p> <ul style="list-style-type: none">• This document is not meant to be comprehensive. It is meant to help provide basic response capability to tsunamis• Depending on planning needs, important aspects of tsunami response (ie. notification procedures, communication plans and protocol, administrative disaster management, etc) that might be required are not addressed and must be added to the plan• Plans are not permanent. They should be updated regularly to meet increasing levels of sophistication in organization and coordination, alert procedures, communications, and response capabilities• This document is not meant to dictate the planning process.

Stakeholders (roles & responsibilities)

AGENCY	ROLES & RESPONSIBILITIES		
	PREPAREDNESS & MITIGATION	RESPONSE	RECOVERY
NDMO	<ul style="list-style-type: none"> • Coordinate the review and revision of the National Tsunami Plan annually • Facilitate the development of SOPs at national, provincial, Area Council and community level • Facilitate and assist provincial, Area Councils and communities to develop tsunami plans • Work in Partnership with VMGD on the establishment of early 	<ul style="list-style-type: none"> • Work collaboratively with VTWC to facilitate and disseminate timely advise and warning to communities and public • Activate the National Disaster Operation Centre • Work with provincial operation centre to facilitate dissemination of information to communities • Coordinate National Disaster Committee briefings • Organize and facilitate aerial surveillance • Coordinate the flow of information dissemination via outlet (media) 	<ul style="list-style-type: none"> • Activate responding agencies through cluster arrangement • Seek emergency funding support • Coordinate with assistance from provinces, national, regional and international agencies • Coordinate relief assistance to affected populations • Liaise with national government and development partners for reconstruction process

Tsunami Risk Profile (e.g. Hazard Maps)



Source: Osaka City

SOPs (crisis mode) for TER should...

- ❑ Identify actions based on pre-established **threat criteria levels**
- ❑ Indicate **timeline-driven actions**
 - Need rapid actions compared to most other natural hazards (no time to read lengthy detailed manual)
 - Use flow charts, checklists, etc.
- ❑ Define **decision making threshold/procedures for:**
 - Action required, when the action is needed by
 - Steps and procedures, who does what (e.g. authorization)
 - Reporting

Timeline-driven SOP

# of Minutes after Earthquake	Activities	Agencies Responsible	Comments
0 – <u>Strong ground shaking felt</u>			
1-5			
5-15	Tsunami might come		
15-30			
30-60	Tsunami comes		
60+			
1-3 hrs			
3 + hr	All clear: Safe to return		

Timeline-driven SOP – Action, Agency

TSUNAMI ACTION TIME LINE								
Time	E = Earthquake	E + 15mins	E + 30 mins	E + 45 mins	E + 1hr	E + 1hr 30mins	E + 1 hr 30 mins	E + 2hrs
Wave	Eq occurs wave starts				DART buoy		Monkey Island	
RWC								
NWC								
MDO								
Police								
Fire								
Local Authority								

STEPS

1. Identify all agencies with role in response
2. Identify each agency's required actions
3. Arrange each action in respect of time

Timeline-driven SOP Action, Agency - NZ

DISTANT SOURCE TSUNAMI: ACTION TIME LINES FOR CENTRAL CHILE SCENARIO							
Time	E = Earthquake	E + 50mins	E + 1hr	E + 1hr 15mins	T = Tsunami Confirmed (Max E + 2hrs)	E + 2hrs 30mins	E + 3hrs
						T + 30mins	T + 1hr
Wave	Earthquake occurs/wave starts	Juan Fernandez I	DART buoy	San Felix I			
PTWS		Issue Info Bulletin/Watch/Wng			Tsunami confirmed/update		Tsunami confirmed/update
MCDEM response		Receive 1st info/watch/wng PTWC	Consultation between NDO, Nat Controller. Decide activation at M7.5 Verbal Advisory out	NCMC activated. EMA's on standby. Consult with GeoNet. Prepare Advisory/Warning	Advisory out Req Group Plan & EOC activation. Prepare Warning & Request for Broadcast	Req LO's Req GeoNet Rep	National Warning out. Req for broadcast out (if decided). Inform Clusters
MCDEM strategic					Brief Minister, DESG. Advise Watch Group/ODESC activated.		
GeoNet		Receive 1st info/warning PTWC	1'st assessment. Activate Science Panel at M7.5	Inform MCDEM actions taken	2'nd assessment	LO in NCMC	3'd Assessment: Est arrival times, tidal state, wave height range
CDEM Groups						Recive National Watch/Warning	Confirm recpt Watch/Wng to MCDEM. Activate
Police							
Fire							
MOH							
DPMC (DESG)							

STEPS

1. Identify all agencies with role in response
2. Identify each agency's required actions
3. Arrange each action in respect of time

Timeline-driven SOP – NZ MCDEM detail

DISTANT SOURCE TSUNAMI: ACTION TIME LINES FOR MCDEM: CENTRAL CHILE SCENARIO										
Time	E = Earthquake	E + 50mins		E + 1hr		E + 1hr 15mins		E + 2hrs		T = Tsunami Confirmed (Max E + 3hrs)
Wave	Earthquake occurs/wave starts	Juan Fernandez Island		Dart buoy		San Felix Island				
MCDEM Response		Receive 1st info/warning PTWC		Consultation between NDO, Nat Controller.		Consult with GeoNet. Request advisor in NCMC.		Report to NCMC		Finalise Warning
				Decide activation at M7.5>		Inform Director		Sector Advisory out Prepare Warning		EMA's dispatched
				Notify Activation Officer, Comms Manager, EMA's		Verbal alerts out: CDEM Groups		Media Advisory out Prepare Request for Broadcast Update Website		Displays organised: Contacts List Comms Plan MCDEM Checklist
				Notify MCDEM Staff		Activate NCMC Inform NDO when complete		Prepare contacts data		Display organised: Agencies action time lines
				Est contact with GeoNet; PTWC		NCMC Staff Briefing		Inform Clusters: Welfare, Transport, NELC		Display organised: Tsunami travel time
				Verbal Advisory out EM Services				Inform CE DIA		Finalise Request for Broadcast
				Verbal acknowledgements out: Media				Standby/deploy as per instructions		
MCDEM Strategic								Inform Minister		
								Inform DESG. Advise Watch Group/ODESC be activated Inform CE DIA		
	UNESCO/IOC-NOAA SHOA International Tsunami Information Center									
	NDO Controller		Operations Planning Intelligence				Logistics Policy		PIM EMA's	

Timeline-driven SOP: NZ Example

Estimated time to complete steps 4–8: 30 minutes ongoing until a cancellation message is issued

Step	Event and action	Responsibility
4	When a <i>National Advisory – Tsunami: Potential Threat to NZ</i> or a <i>National Warning – Tsunami: Threat to NZ</i> is issued, activate the National Crisis Management Centre.	Duty Manager
5	Open communications or teleconference line for discussions with GNS Science and the TEP for updated assessments.	National Controller
6	Provide updates at least hourly via the NWS and the media. Upgrade advisory to warning if necessary.	Duty Manager
7	Depending on the severity and scope of the anticipated threat, MCDEM may advise the Minister of Civil Defence to declare a state of national emergency.	National Controller
8	Issue a cancellation message when there is no longer a threat or potential threat to New Zealand.	Duty Manager

Flow Charts .Effective Way of Presenting SOPs

Flow charts indicate:

- Steps to be followed
- Decision Tree
- Systems or subsystems involved

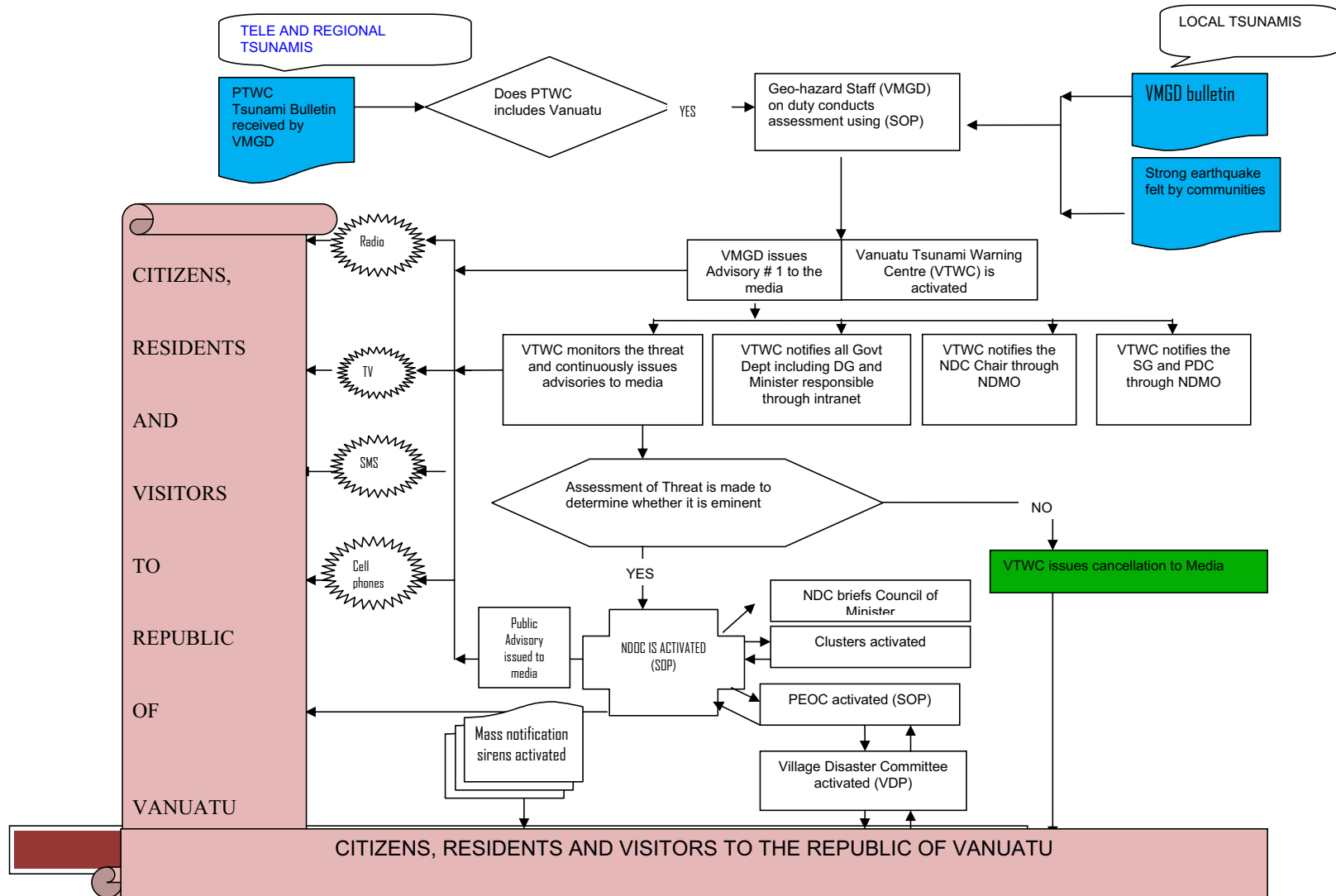
Flow Charts can be nested

BUT, often not useful in real event

- (cannot give answer when there is uncertainty or data lacking)
- (experience is most important)

Flow Chart (Vanuatu example)

FIGURE 1 VANUATU TSUNAMI WARNING FLOW CHART



Tsunami Evacuation - Checklists

Evacuation Checklist		
<p>This is a simple checklist to use when doing an evacuation. Make sure to include the date, who filled out the checklist, and the time each task was completed by.</p>	Date: _____	
	By: _____	Time: _____
Tsunami message received	_____	_____
Call in staff	_____	_____
Activate emergency centers / Notify public safety agencies	_____	_____
Sound public sirens and alarm notifications	_____	_____
Initiate media notifications and evacuation announcements	_____	_____
Initiate evacuation of people away from coast (Tsunami Evacuation Maps)	_____	_____
Put boats/ships out to sea if wave impact time permits	_____	_____
Setup road-blocks and evacuation routes	_____	_____

When?
Where?
What?
Who?

Tsunami Occurrence - Checklists

Tsunami Occurrence Checklist		
This is a simple checklist to use after a tsunami event. Emergency workers should wait for a minimum of two hours or until an "all clear" is given before re-entering evacuation zones.	Date: _____	
	By: _____	Time: _____
Count the number of workers available _____	_____	_____
Decide what need to be done	_____	_____
Assign workers to groups	_____	_____
Assign tasks to groups	_____	_____
Inspect damaged areas	_____	_____
Block off dangerous areas	_____	_____
Search for survivors	_____	_____

When?
Where?
What?
Who?

Tsunami Response Workshop for Businesses

Preparing hotels and businesses for the next tsunami



Workshop Manual 2013 (v1.0)

Tsunami Response - Guidance and Templates, Resource Documents

International Tsunami Information Center
www.tsunamiwave.info



Tsunami Evacuation Responsibilities Checklist for Businesses

	Earthquake Origin Time: <u>0000</u>	
	Department(s)	Time (mins):
Use when doing an evacuation. Responsible for actions and number of minutes after earthquake origin time.		
Tsunami Warning public alerts received	_____	<u>+ 10</u>
Alert staff to prepare to initiate evacuation process	_____	<u>+ 15</u>
Alert clients / activate communication devices to initiate evacuation process	_____	<u>+ 25</u>
Guide clients to safety locations / provide supplies	_____	<u>+45</u>
Protection of key equipment	_____	<u>+45</u>
Removal of key documents	_____	<u>+45</u>
Initiate recall of off duty disaster response workers	_____	<u>+60</u>
Obtain accountability of staff and clients	_____	<u>+60</u>
Assess whether waves are damaging to facilities	_____	<u>tbd</u>
Obtain reports of any staff/client casualties	_____	<u>tbd</u>
Determine when to declare "All Clear" to staff / clients	_____	<u>tbd</u>
Prepare for post tsunami impact operations	_____	<u>tbd</u>

Local Tsunami Evacuation Responsibilities Checklist for Businesses

	Earthquake Origin Time: <u>0000</u>	
	Department(s)	Time (mins):
This is a simple checklist to use when doing an evacuation. List the department(s) responsible for actions and number of minutes (eg + 5 minutes) after earthquake origin time.		
Strong and/or prolong earthquake ground shaking felt	_____	<u>+ 1</u>
Alert staff and clients / activate communication devices to initiate evacuation process	_____	<u>+ 3</u>
Guide clients to safety locations / provide supplies	_____	<u>+ 5</u>
Tsunami Warning public alerts received	_____	<u>+10</u>
Protection of key equipment	_____	<u>+10</u>
Removal of key documents	_____	<u>+10</u>
Initiate recall of off duty disaster response workers	_____	<u>+15</u>
Obtain accountability of staff and clients	_____	<u>+30</u>
Assess whether waves are damaging to facilities	_____	<u>+60</u>
Obtain reports of any staff/client injuries and casualties	_____	<u>+120</u>
Determine when to declare "All Clear" to staff / clients	_____	<u>+120</u>
Prepare for post tsunami impact operations	_____	<u>+120</u>

Roles & Responsibilities - Businesses

Tsunami Emergency Response for Business: Identification of Roles & Responsibility Matrix

Departments	CONTACT INFO	OPERATIONAL CONTROL & TRAINING	DETERMINATION OF EVACUATION OPTIONS	LAYOUT OF EVACUATION ROUTES	SAFETY INFO TO STAFF / CLIENTS	COMMUNICATIONS DEVICES TESTED	MONITORING OF ALERTS (24/7)	EVACUATION ALERT OF CLIENTS	EVACUATION ALERT OF STAFF	GUIDING CLIENTS TO SAFETY	PROTECTION OF KEY EQUIPMENT	REMOVAL OF KEY DOCUMENTS
Security		X										
All										X	X	X
Other												

Tsunami Response - Hotels

CRISIS AND EMERGENCY MANUAL OHR/OHANA

For Educational and training purposes only.
Information is relevant to Hawaii warning system and local conditions. Current as of 1995.

TSUNAMI



Section II
Part 3-1

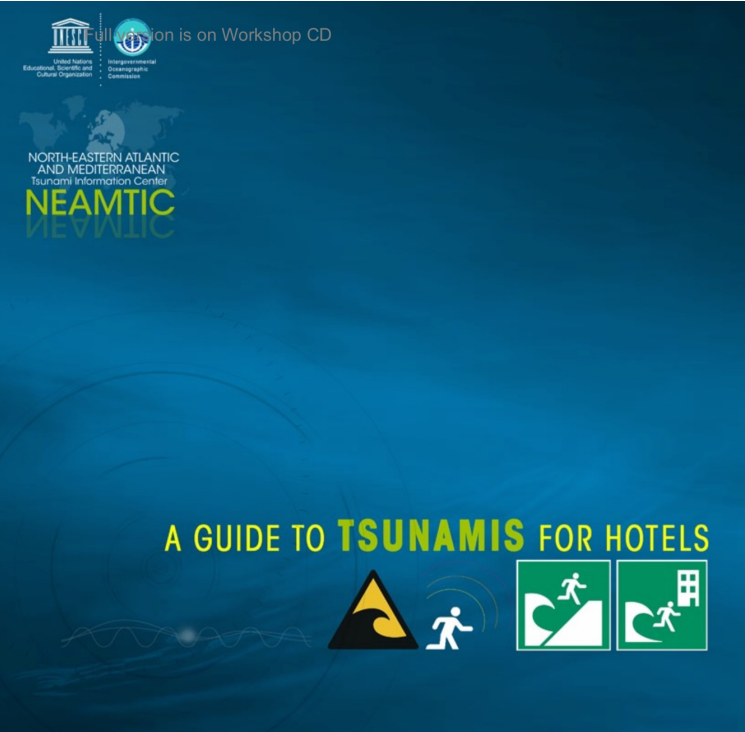
DISASTER RESPONSE GUIDEBOOK for Hotels and Motels on Washington's Coast



Washington Military Department
Emergency Management Division

JULY 2006

Tsunami Response - Hotels



A GUIDE TO TSUNAMIS FOR HOTEL GUESTS

NORTH-EASTERN ATLANTIC AND MEDITERRANEAN Tsunami Information Center
NEAMTIC

WHAT IS A TSUNAMI

- Tsunami is a Japanese word closely translating to 'harbour wave'.
- Tsunamis can happen during the day or night at anytime of the year.
- Tsunamis are generated as a result of water displacement usually triggered by a seismic event such as earthquake, Landslides, volcanic eruptions, nuclear explosions, and even impacts of objects from outer space (such as meteoroids, asteroids, and comets) can also generate tsunamis.
- Tsunamis are a series of waves that may impact coastlines for several hours. The first wave may not be the largest.
- Tsunami waves can come ashore in many different ways among which are: a wall of water (resembling white wash), a rapidly rising tide, and a series of surf like breakers.

In the deep ocean tsunamis travel at a jet airliner speeds but the waves are only centimetres high and cannot be felt aboard ships.

Tsunamis slow down and grow in height tremendously upon entering shallow water.

Tsunamis could crest to 10 meters high heights, and it can strike with devastating force, and quickly flood all low-lying coastal areas

TSUNAMI RISK IN THE NEAM REGION

Although less frequent than in the Pacific and Indian Ocean tsunamis can hit the Mediterranean and North East Atlantic coastal areas causing extensive loss of lives and properties. Major tsunamis with ten-thousands of casualties and severe damage to coastal cities happened for example in Crete in 365, Lisbon in 1775, Messina in 1908 and Aegean Sea in 1956. Even recently a tsunami has been generated in the Izmit Bay, and affected the coastline extensively following the 1999 Izmit earthquake. At some locality the inundation distance ranged up to 35 meters. Furthermore, tsunamis have been generated in 2002 in Stromboli and in 2003 in Algiers though fortunately not very damaging. The Mediterranean area represents the collision between the European and the African plates, and comprises a number of geodynamic regions affected by different seismic activity extended from West to East. Furthermore volcanic and geomorphological processes could be at the origin of tsunamis in the area.

It is not a question of "if" but when it is going to happen !

For more information visit:
NEAMTIC.IOC-UNESCO.ORG

United Nations Educational, Scientific and Cultural Organization | Intergovernmental Oceanographic Commission



TSUNAMI EVACUATION PROCEDURES

IN CASE OF TSUNAMI EVACUATION FOLLOW THE PROCEDURES EACH STEP FOR THE SAFETY OF YOURSELF AND OTHER PEOPLE

TSUNAMI EVACUATION INSTRUCTION HAS TO BE TAKEN SERIOUSLY EVEN IN THE CASES OF NON-DESTRUCTIVE EVENT.

- When you feel a strong earthquake and you can hardly stand, or you feel a slow shaking that continues for a longer time, a Tsunami may have been generated.
- Stay calm and do not panic.
- After the shaking stops, move calmly to the designated assemble area (always check evacuation area of the hotel), then wait for further instruction by the hotel officials / security.
- If the sea level receded, exposing fishes and corals, then you should move quickly to higher ground (check if the hotel is a designated vertical evacuation building). Do not go to the beach to confirm or to watch the tsunami.
- If you are swimming on the shore you might not feel the earthquake, always be mindful of what is happening on the beach. If you see people curiously gathered on the beach, move away from the sea and go to the assemble area.
- Hotel officials/security will evacuate all guests to higher ground and/or safe area that have been officially designated as tsunami evacuation area. All instructions will be given using a microphone system and/or a megaphone. Listen, follow all of the instruction and move in an orderly manner to the evacuation area.
- During a tsunami stay calm and do not panic. Do not leave the tsunami evacuation area until it is officially announced by the authorities that it is safe to leave the evacuation area. Tsunami will come in several waves and there are time gaps between the waves.
- During a tsunami emergency, the hotel staff, local disaster management office, police and other emergency organization will try to save lives please follow all their instruction and give your full cooperation.



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Decision-making threshold/process

- **Based on tsunami arrival times, determine critical decision point for each source / source region**

How long will it take for a community to evacuate?

- **Use a map & table for easy reference**

- **Decide when authorisation is required?
And who will authorise?**

Essential to delegated authority for quick response

Alerting the public/messaging

- **What type of message for who? When?**
 - First responders (local authorities/communities)
 - Line agencies
 - Media (domestic and international)
 - CBOs
 - Donor agencies
 - Tourists
 - Others?

Alerting the public/messaging

- **How do we send the warning messages ?**
 - Radio
 - Other media (including international media)
 - Internet (Facebook, Twitter)
 - Mobile SMS
 - Donor agencies (UNOCHA?)
 - Direct communication
 - What else?

Public warning messages via media

Tsunami warning by Japanese media after the 2011 East Japan Earthquake and Tsunami

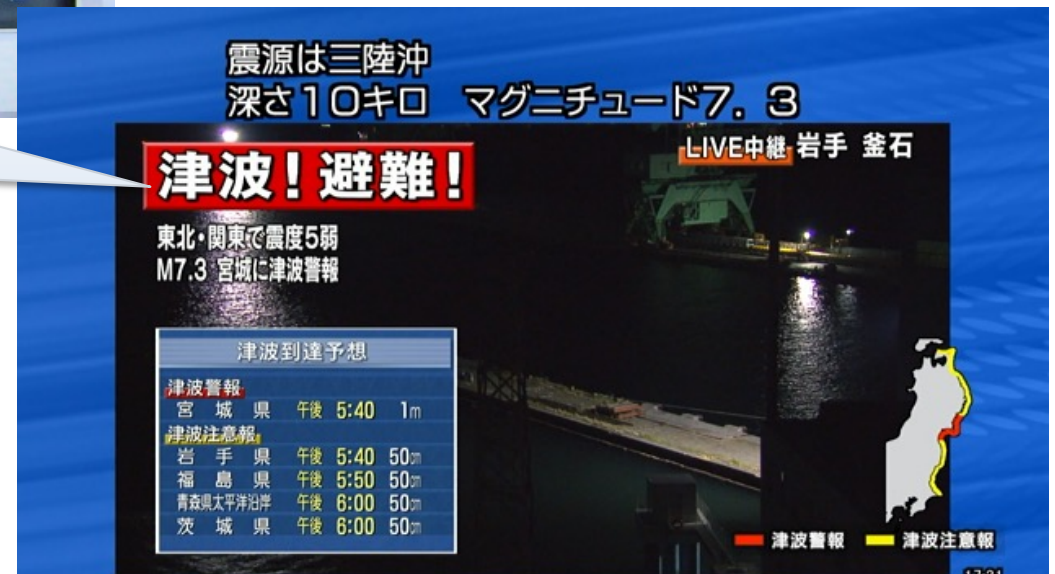


For 2011 East Japan Earthquake class

Evacuate immediately!

Tsunami! Evacuate!

Can everyone get and understand the information to take necessary actions?



SOPs: Practice, evaluate, revise

A perfect warning will be useless if people do not know what to do in case of an emergency



SUMMARY - MOVING FORWARD

- ❑ **Strengthen legal basis**
- ❑ **Develop, test, evaluate & revise SOPs**
- ❑ **KEEP IT CLEAR, CONCISE, SIMPLE**
- ❑ **FOLLOW YOUR PROCEDURES**
- ❑ **Provide actionable messages based on audience**
- ❑ **Good coordination/collaboration between NTWC-DMO**
- ❑ **It becomes your basis for action, and is defensible post-event**



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Thank You

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