UNESCO/IOC – NOAA ITIC Training Program in Hawaii (ITP-TEWS Chile)
TSUNAMI EARLY WARNING SYSTEMS
AND THE PACIFIC TSUNAMI WARNING CENTER (PTWC) ENHANCED PRODUCTS
TSUNAMI EVACUATION PLANNING AND UNESCO IOC TSUNAMI READY PROGRAMME
19-30 August 2024, Valparaiso, Chile

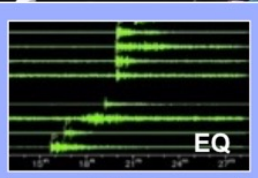
SOPs and Checklists:
TER operations
Private Sector SOPs
Developing timeline-driven SOPs

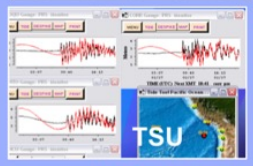
Dr.Laura Kong
UNESCO/IOC – NOAA International Tsunami Information Center

End-to-End Tsunami Warning

SAVING LIVES BY EARLY WARNING

EQ
Tsunami





Alert System

Emergency Alert System
& Mass Media

Public

TWC - Science

Intl / Natl

DMO / EMA – Safety

Natl / Prov / Local Govt

Community

Race against Time

LIVES
SAVED

EQ
T=0

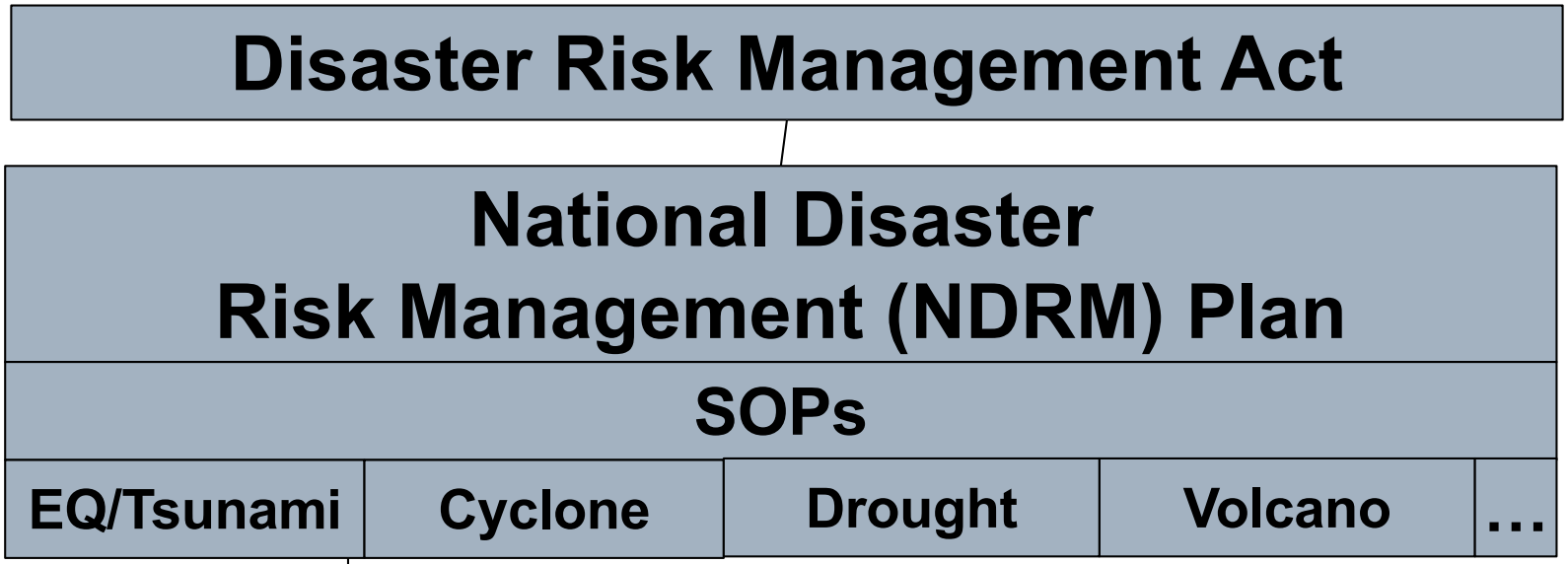
WAVE
T=20 min

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

Legislative basis for SOPs



Requires coordination

Justify financing for

Emergency Response

- Warning for communities
- Evacuation procedures

Disaster Prevention

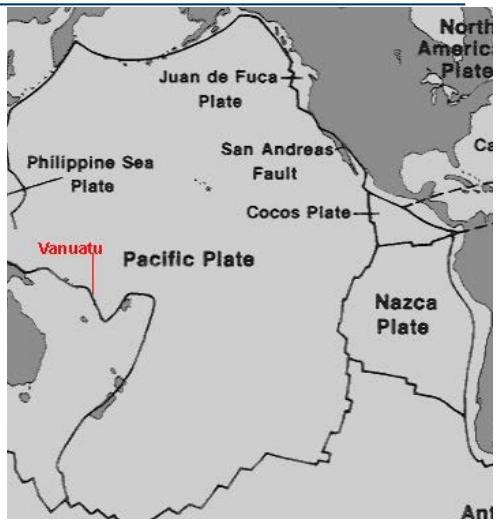
- Risk assessments (hazard maps)
- Equipment upgrading
- Drills

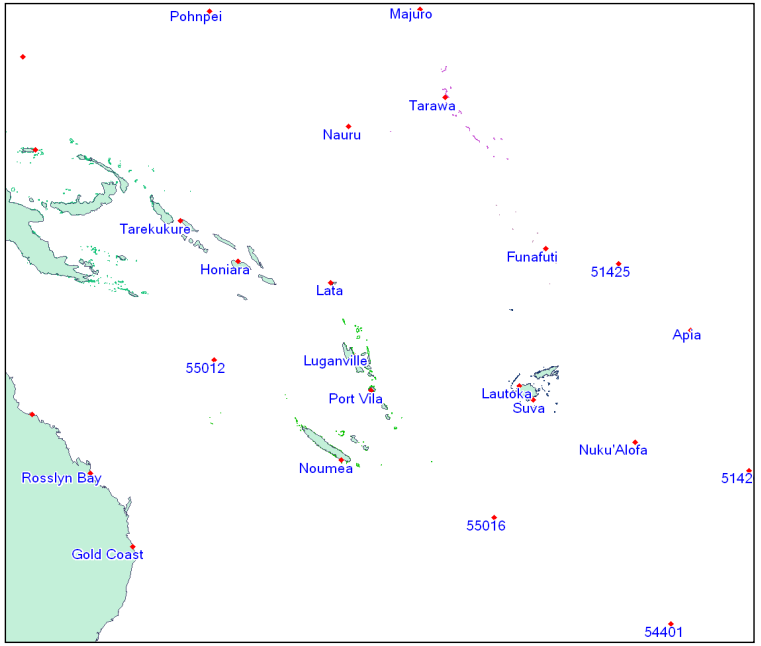
Tsunami Response Plan - topics

- 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 - topics

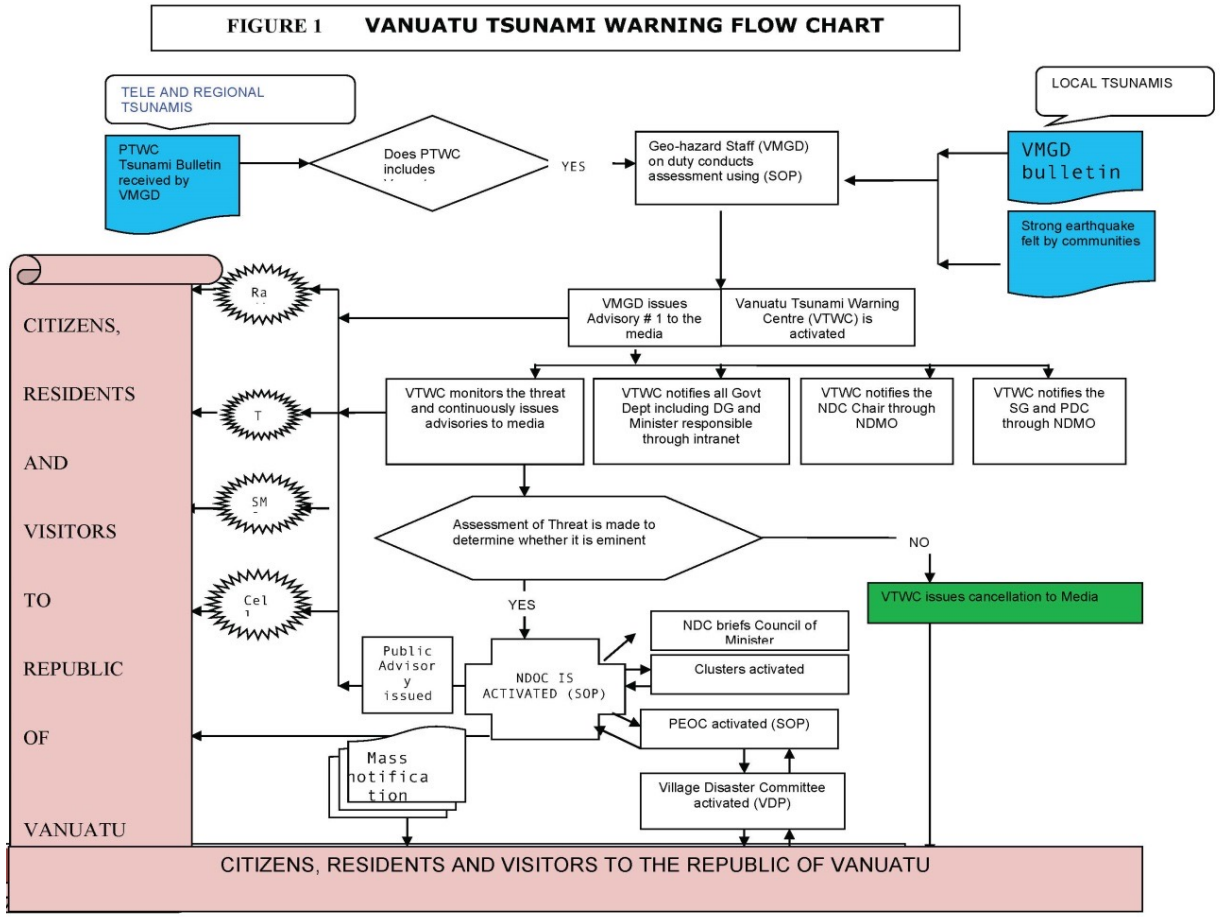
- **Introduction**
  - Plan purpose, objectives, development and review
- **Tsunami Risk Profile**
  - From earthquakes
  - From volcanoes
- **Tsunami Awareness, Education and Preparedness**
  - Roles & responsibilities
- **Alert & notification systems**
- **Observations & Warnings**
  - Seismic
  - Volcanic
  - Sea level
  - Authority to issue warnings
  - Detection,





Vanuatu example – topics (continued)

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



Concept of operations

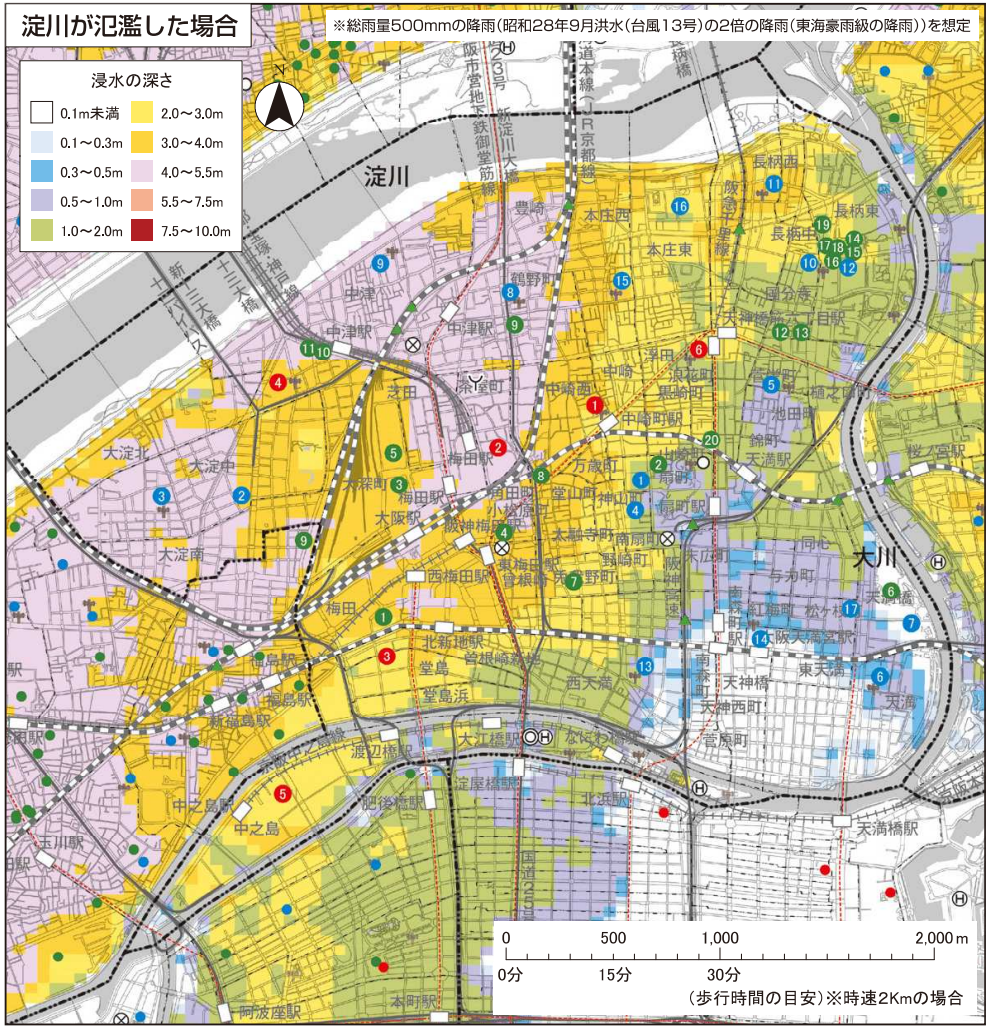
Setting the scene…

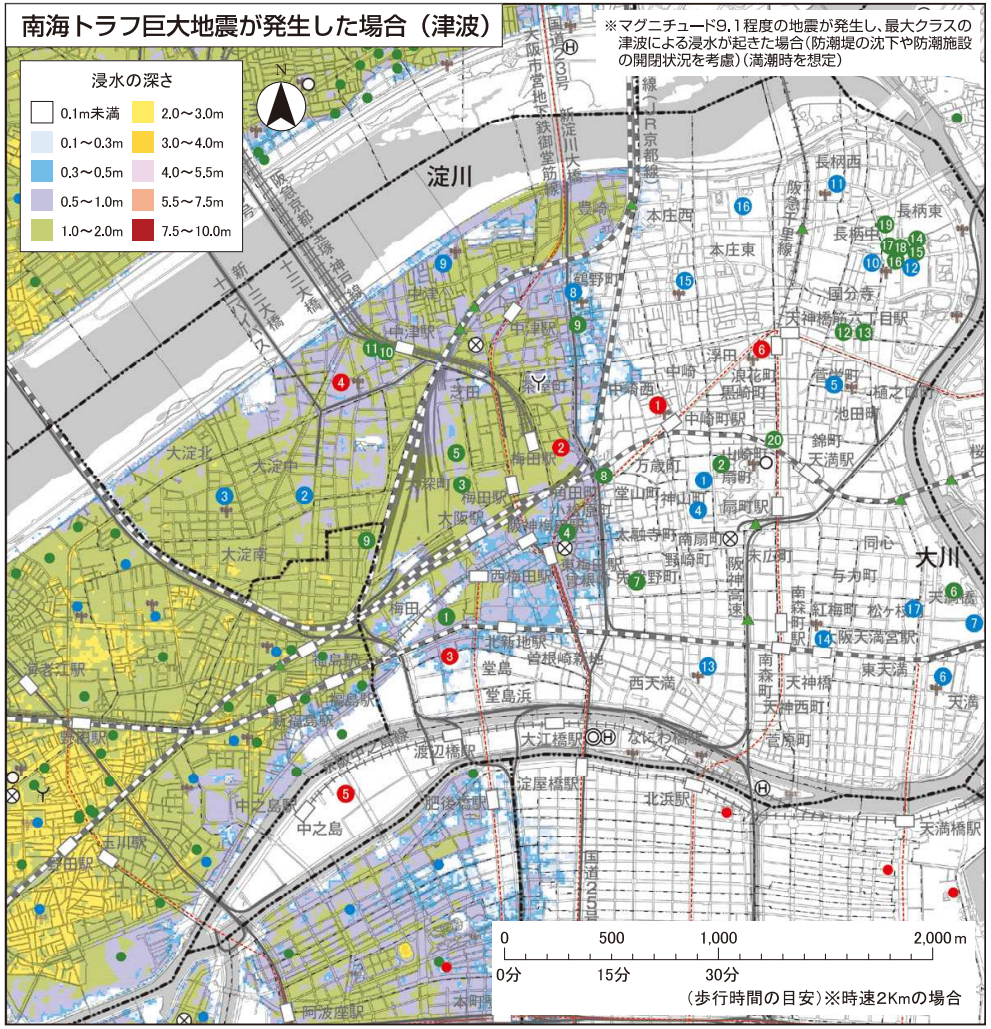
Tsunami Planning Template	
General	The purpose of this document is to assist in developing basic tsunami response planning for local communities. Response plans will be written specifically for the evacuation of populations living in coastal areas and inland water ways. This document focuses on a timeline 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.
Assumptions	Planners should understand the following assumptions this template makes: • 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	• 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	• 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)	• 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, Inundation Map

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

How to do: Timeline-driven SOP

# of Minutes after Earthquake	Activities	Agencies Responsible	Comments
0 – Strong ground shaking felt			
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 Fernadez 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 Group Plan & EOC
Police						ve National h/Warning	Confirm recpt Watch/Wng to MCDEM
Fire						ve National h/Warning	Confirm recpt Watch/Wng to MCDEM
MOH						ve National h/Warning	Confirm recpt Watch/Wng to MCDEM. Inform DHB's. Wng level Yellow
DPMC (DESG)						Receive National Watch/Warning	Confirm recpt Watch/Wng to MCDEM

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 NEMA 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		Standby/deploy as per instructions	
MCDEM Strategic					dvise DESC	

STEPS

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

	NDO		Operations		Logistics		PIM
	Controller		Planning Intelligence		Policy		EMA's

Timeline-driven SOP: NZ NEMA detail

Estimated time to complete steps 4–8: 30 minutes ongoing until a cancellation message is issued		
Step	**Event and action**	**Responsibility**
4	When a *National Advisory – Tsunami: Potential Threat to NZ* or a *National Warning –Tsunami: Threat to NZ* 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:

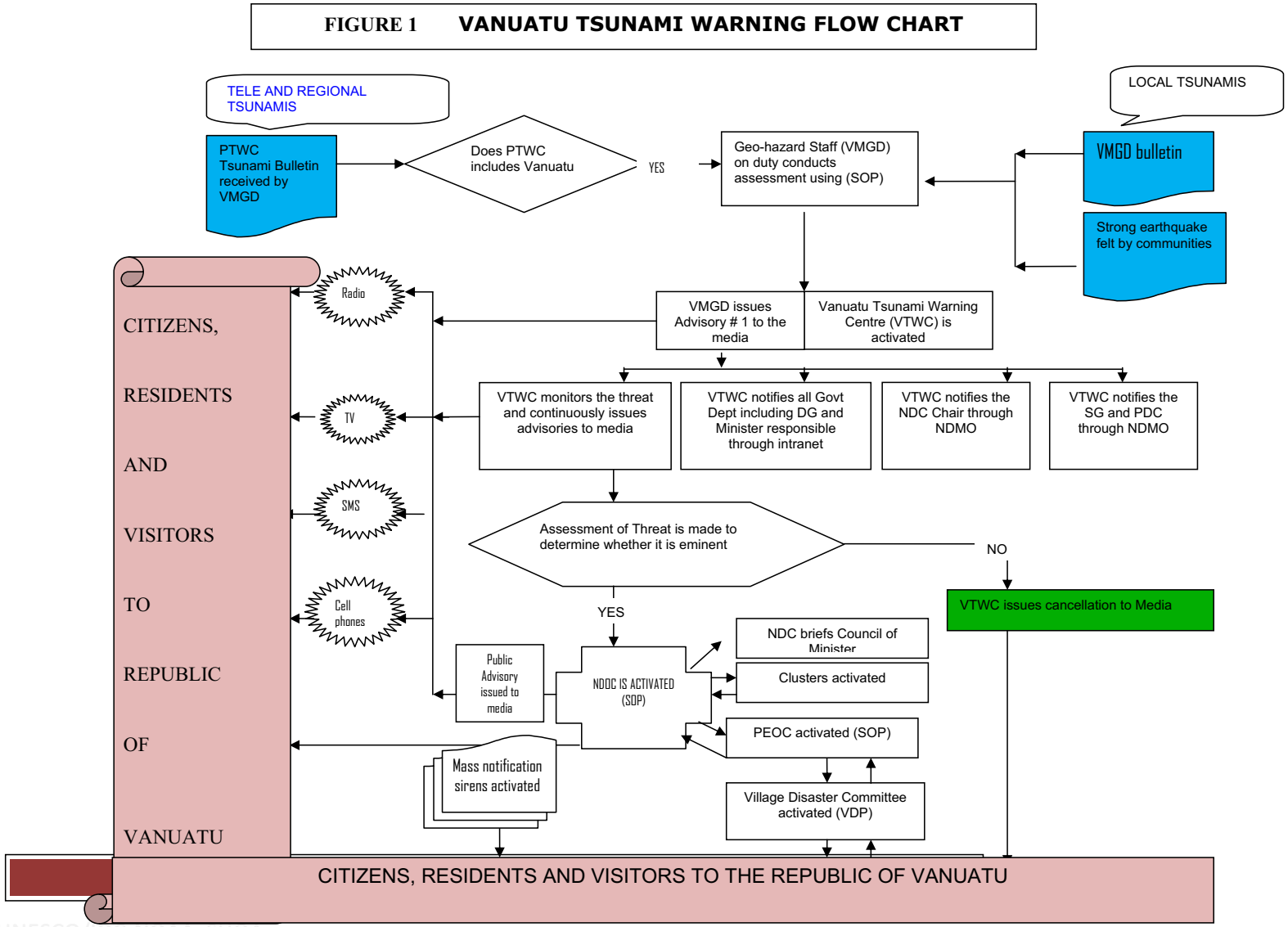
- Steps to be followed
- Decision Tree
- Systems or subsystems involved

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)



Tsunami Evacuation - Checklists

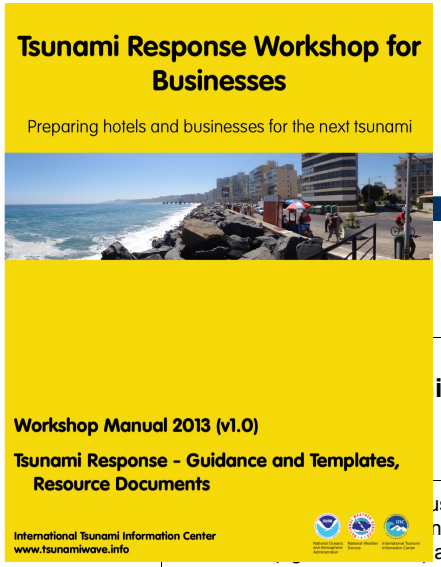
Evacuation Checklist		
This is a simple checklist to use when doing an evacuation. Make sure to include the date, who filled out the checklist, and the time each task was completed by.	Date: _____	
	By:	Time:
Tsunami message received	_____	_____
Call in staff	_____	_____
Activate emergency centers / 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 Evacuation - Businesses

i Evacuation Responsibilities Checklist for Businesses

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

Local Tsunami Evacuation Responsibilities Checklist for Businesses

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.	Earthquake Origin Time: 0000	
	Department(s)	Time (mins):
Strong and/or prolong earthquake ground shaking felt		+ 1
Alert staff and clients / activate communication devices to initiate evacuation process		+ 3
Guide clients to safety locations / provide supplies		+ 5
Tsunami Warning public alerts received		+10
Protection of key equipment		+10
Removal of key documents		+10
Initiate recall of off duty disaster response workers		+15
Obtain accountability of staff and clients		+30
Assess whether waves are damaging to facilities		+60
Obtain reports of any staff/client injuries and casualties		+120
Determine when to declare “All Clear” to staff / clients		+120
Prepare for post tsunami impact operations		+120

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	SHELTERS STOCKED	MONITORING OF ALERTS (24/7)	EVACUATION ALERT OF STAFF	EVACUATION ALERT OF CLIENTS	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

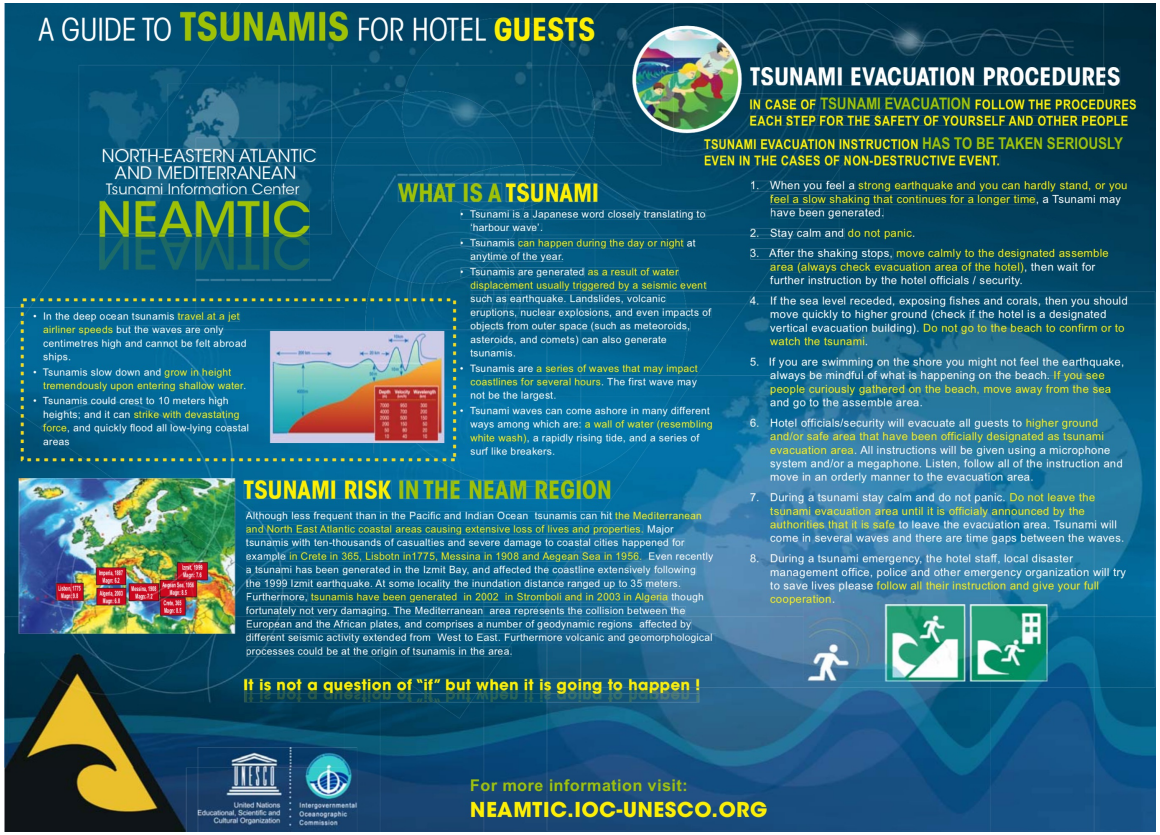
DISASTER RESPONSE GUIDEBOOK for Hotels and Motels on Washington's Coast

Washington Military Department

Emergency Management Division

JULY 2006

Tsunami Response - Hotels



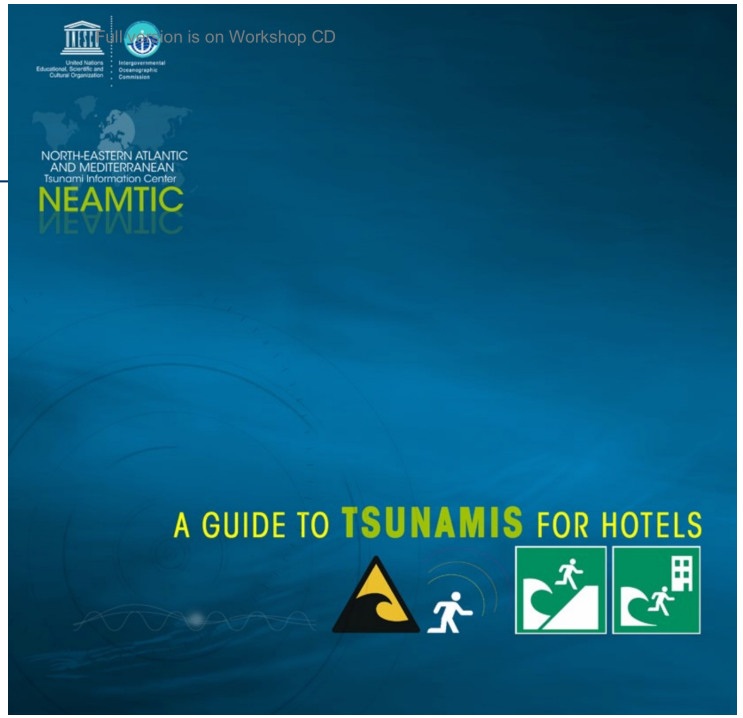


Table of CONTENT

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 defendable post-event

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