



Kingdom of Tonga

# MINISTRY OF MEIDECC

## Tonga Meteorological & Maritime Services & National Disaster Risk Emergency Management Office (NDRMO)

Ministry of Meteorology, Energy, Information, **Disaster Management**, Environment, Climate Change & Communications (MEIDECC)

**NDRMO**

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# Kingdom of Tonga

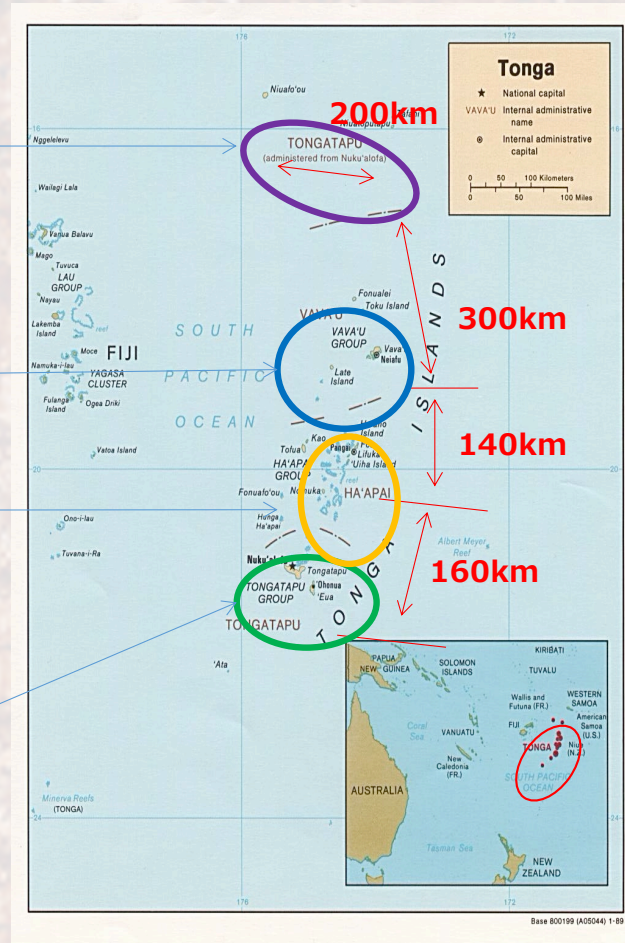


Niuas Group

Vava'u Group

Ha'apai Group

Tongatapu Group  
(Tongatapu & 'Eua)



- Total Pop: 100,209

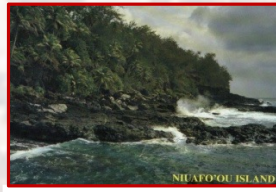
- 176 islands (40 inhabited)

- Total Land Area: 748 sq. km

- Total EEZ: 700,000 sq. km



- ❖ Volcanic Eruptions
- ❖ Earthquake
- ❖ Tsunami
- ❖ Flooding
- ❖ Tornadoes
- ❖ Drought
- ❖ Tropical Cyclones



Mohemohe 'a Kuli Fafangu, Niufo'ou I he 1946



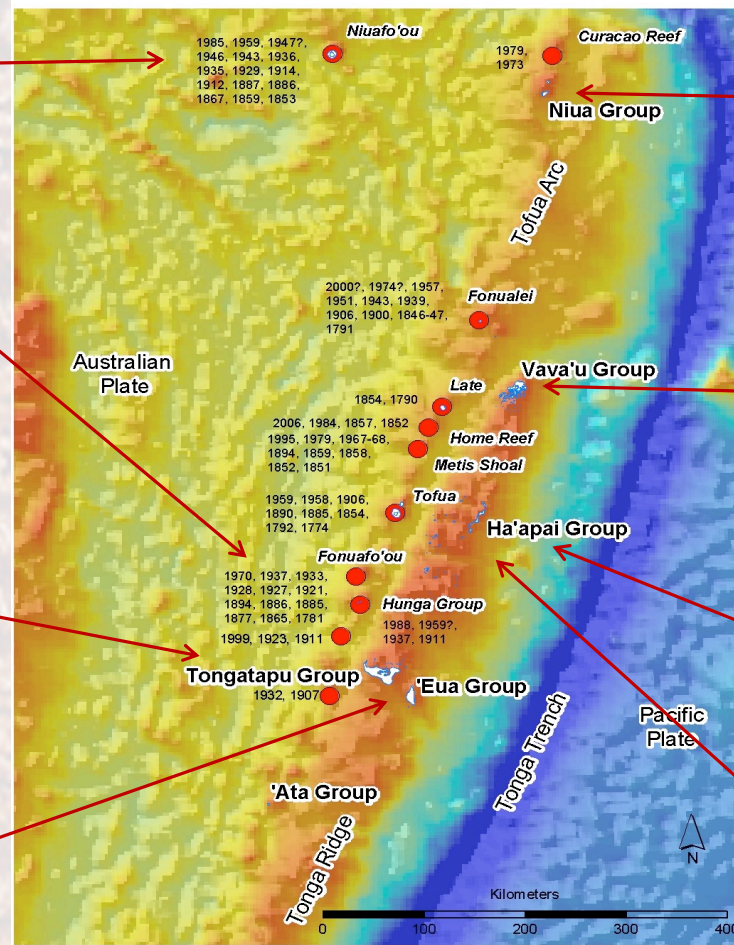
15 March 2009, Hunga Tonga Hunga Ha'apai Erupted



Tornado, Ha'akame 'i Sepitema 2004



Storm Surges in Eua – \$1.4 million



Tsunami 2009



TC Waka 2001(\$104m)



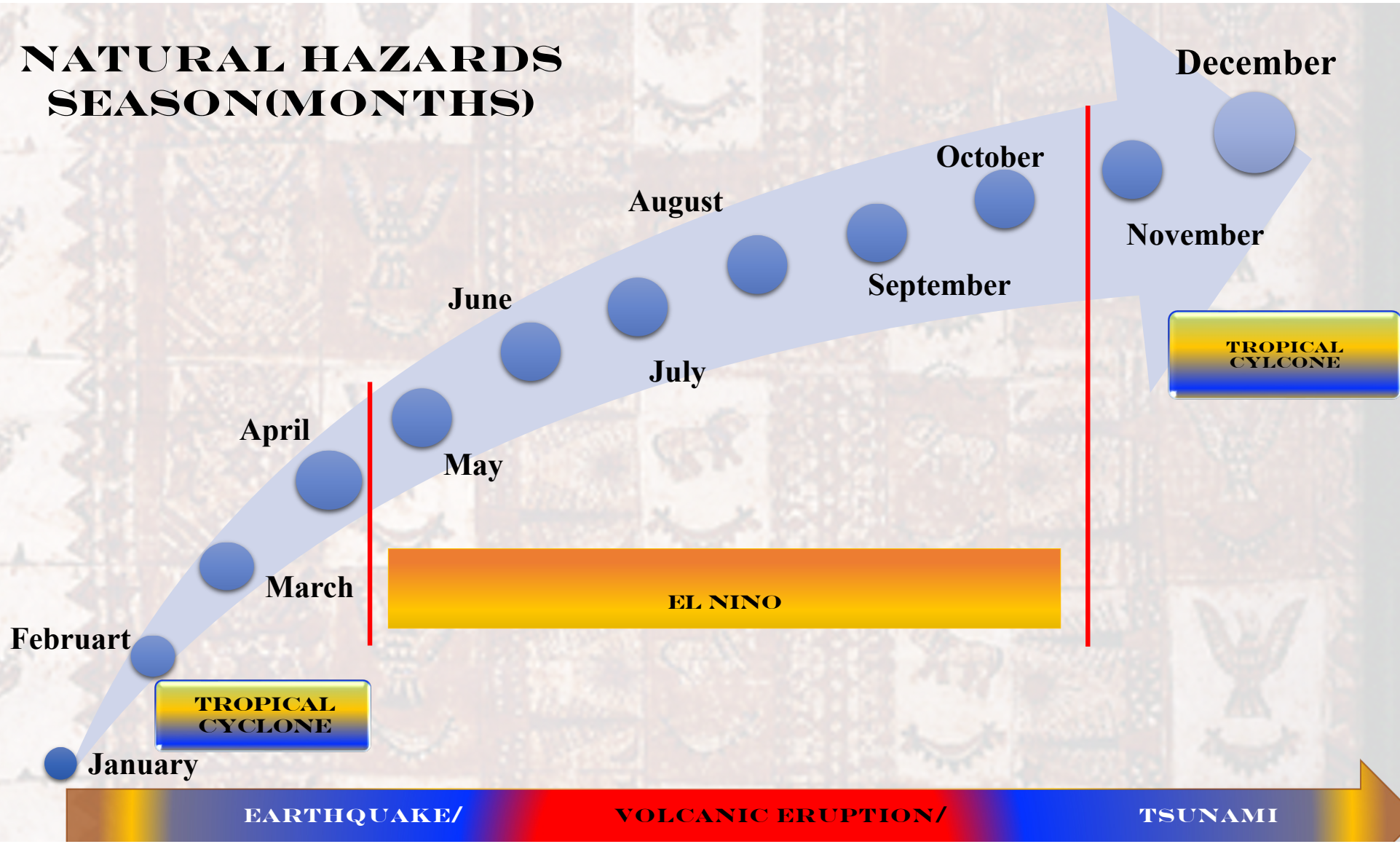
Earthquake in Ha'apai, 4<sup>th</sup> May, 2006 (7.8 magnitude)



Coastal Inundation, Lifuka 2009



# NATURAL HAZARDS SEASON(MONTHS)



**TROPICAL CYCLONE**

**TROPICAL CYCLONE**

**EL NINO**

**EARTHQUAKE/ VOLCANIC ERUPTION/ TSUNAMI**





# **Tonga Meteorological & Maritime Services**

## Outline of the FTWC Tsunami SOP

- The TMS under the administration of the Ministry of MEIDECC is **responsible for the provision of warning and advisory services for tsunamis threatening to affect or has the potential to affect the Kingdom of Tonga. The TMS is the UNESCO Inter-Governmental Oceanographic Commission (UNESCO/IOC) recognized Tsunami Warning Focal Point (TWFP) for Tonga and provides a 24/7 tsunami watch.**
- The Tsunami Warning Service of the TMS is provided in close collaboration with the National Emergency Management Office (NEMO) of MEIDECC and the Geological Services Unit (GSU) of the Ministry of Lands and Natural Resources (MLNR) as stipulated in the National Tsunami Plan.



# Outline of the FTWC Tsunami SOP

- **TSUNAMI WARNING SERVICE FOR TONGA:**

- **Warnings associated with a Local Tsunami**

- A local tsunami is defined as a tsunami wave that is generated from a nearby source where it can reach the coast within 1hr (or less) of an earthquake.
- Due to the close proximity of the Tonga Trench (tectonic plate boundary) to Tonga's islands (generally about 250km to 300km away), a locally generated tsunami wave may arrive at a coast within minutes of an earthquake.
- As such it may or may not be possible to issue a tsunami warning to communities in time.

- **Warnings associated with Regional and/or Ocean-wide tsunami**

- If an earthquake occurs in the Pacific Basin triggering a tsunami or having potential to cause one, the Pacific Tsunami Warning Centre (PTWC) will issue tsunami information statements and/or tsunami threat messages. These messages will include both earthquake information and wave height forecasts.
- Travel times of 1 to 3 hrs (Regional) and >3hrs (Ocean wide events)
- TMS will also provide Significant Earthquake Advisories for earthquakes happening in the Pacific Ocean of  $M \geq 6.5$  and  $\leq 100$ km deep on advice from the PTWC or the GSU.
- For Earthquakes happening within Tonga's EEZ, the Geological Survey Unit (GSU) of the Ministry of Lands and Natural Resources will be the Official Source of the Earthquake Information.

# FTWC WARNING TEMPLATES

- FTWC TSUNAMI TEMPLATE 1: Urgent Tsunami Advisory/Warning
- FTWC TSUNAMI TEMPLATE 2: Significant Earthquake Advisory (SEA)
- FTWC TSUNAMI TEMPLATE 3: Tsunami No Threat Advisory (TNTA)
- FTWC TSUNAMI TEMPLATE 4: Tsunami Marine and Coastal Warning (TMCW)
- FTWC TSUNAMI TEMPLATE 5: Tsunami Alert (TA)
- FTWC TSUNAMI TEMPLATE 6: Tsunami Warning (TW)
- FTWC TSUNAMI TEMPLATE 7: Tsunami Marine and Coastal Warning (TMW) :CANCELLATION
- FTWC TSUNAMI TEMPLATE 8: Tsunami Alert (TA) :CANCELLATION
- FTWC TSUNAMI TEMPLATE 9: Tsunami Warning (TW) :CANCELLATION



## KEY THRESHOLDS/CRITERIA(S)

Criteria	Duty Forecaster	Type of Warning/Advisory	Emergency response
(1) Earthquake <b>7.1SM</b> and <b>&lt;100km</b> deep detected with tsunami travel time of 1hr or less reported from either PTWC or GSU  (2) Violent ground shaking observed from an unverified earthquake lasting at least 30sec and difficult to remain standing.	Activate and disseminate <b>FTWC TSUNAMI TEMPLATE1</b>	<b>Urgent Tsunami Advisory</b>	Evacuate tsunami threat area and coastlines.  Turn on tsunami sirens available (Note: include operation SOP chart for duty officer)

Comments:

## KEY THRESHOLDS/CRITERIA(S)

Criteria	Duty Forecaster	Type of Advisory/Alert/Warning	Emergency Response Action
Earthquake <b>6.5M</b> and <b>≤100km</b> deep has been detected anywhere in the Pacific Ocean	Activate and disseminate <b>FTWC TSUNAMI TEMPLATE 2</b> to NEMC only	<b>Significant Earthquake Advisory (SEA)</b>	Monitor
Expected tsunami wave height <b>&lt;0.3M</b> or an earthquake <b>&gt;7.1M</b> has occurred in the Pacific Basin or an earthquake has been felt in Tonga and assessment has	Activate and disseminate <b>FTWC TSUNAMI TEMPLATE 3</b> to all outlets	<b>Tsunami No Threat Advisory (TNTA)</b>	Monitor

Comments:



## KEY THRESHOLDS/CRITERIA(S)

Expected wave height $0.3M \leq H \leq 1M$ with expected arrival time of $<3hrs$	Activate and disseminate <b>FTWC TEMPLATE 4</b> to all outlets	<b>Tsunami Marine and Coastal Warning (TMCW)</b>	Sound Siren Evacuate coastal area  Conduct radio interviews after each warning is released
Expected wave height is $H \geq 1M$ with expected arrival time of $3hr \leq T < 6hr$ or a tsunami has occurred anywhere on earth which requires attention	Activate and disseminate <b>FTWC TEMPLATE 5</b> to all outlets	<b>Tsunami Alert (TA)</b>	Prepare to evacuate tsunami threat area  Conduct radio interviews after each alert is released
Expected wave height is $H \geq 1M$ with expected arrival time of $<3hrs$	Activate and disseminate <b>FTWC TEMPLATE 6</b> to all outlets	<b>Tsunami Warning (TW)</b>	Sound Siren Evacuate tsunami threat area  Conduct radio interviews after each warning is released

Comments:

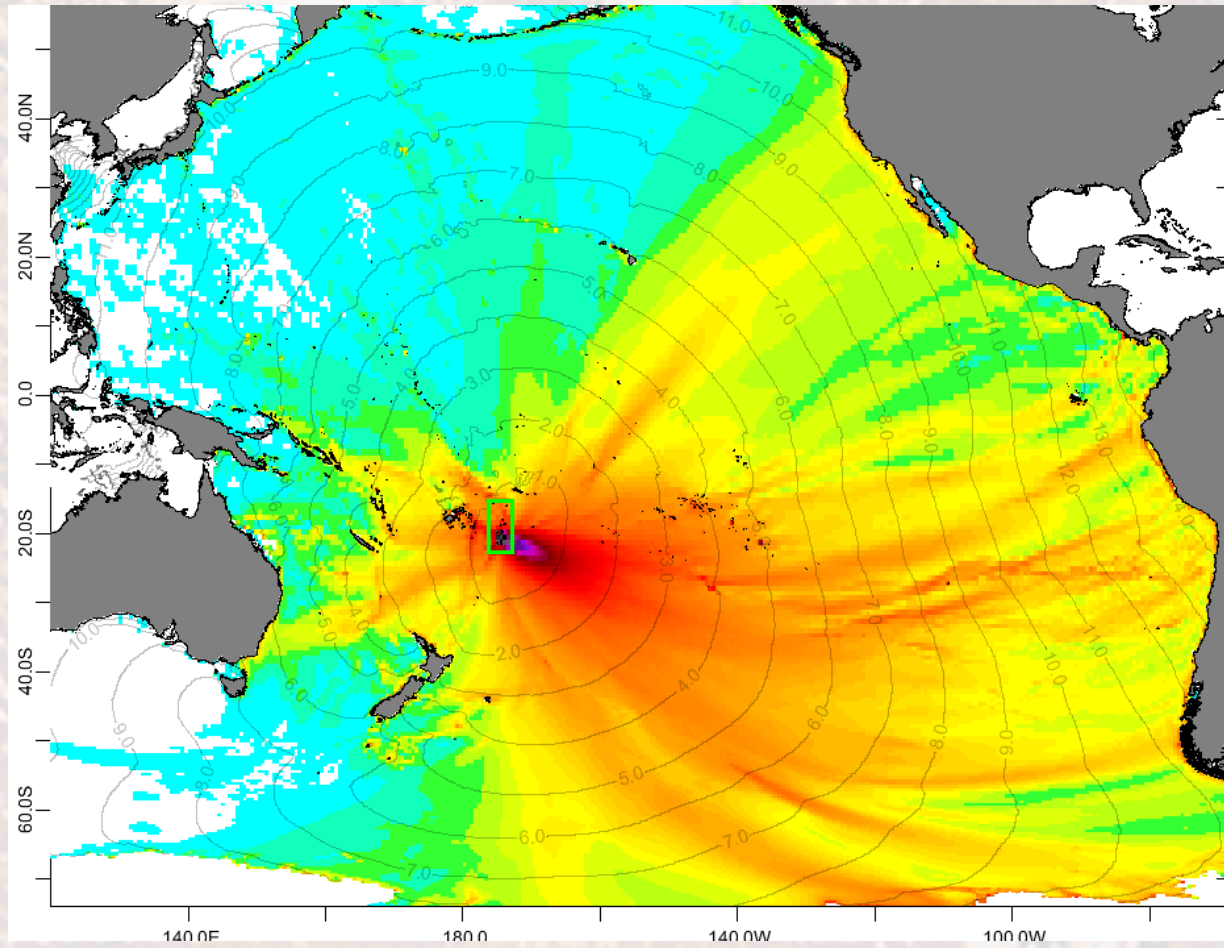
## KEY THRESHOLDS/CRITERIA(S)

Advisory/Alert/Warning	Cancellation criteria and templates
<b>Tsunami Marine and Coastal Warning (TMW)</b>	<p>Cancel when the expected wave height has been verified through sea level monitoring equipment to be below <b>0.3M</b> within the warning period (3hr&lt;T) with advice of possible strong currents remaining within the next 12 to 24 hours.</p> <p><b>Duty Forecaster activate and disseminate FTWC TSUNAMI TEMPLATE 7</b></p>
<b>Tsunami Alert (TA)</b>	<p>Cancel when expected wave height has been verified through sea level monitoring equipment to be below <b>1M</b> within the alert period (3hr≤T&lt;6hr). Downgrade to Tsunami No threat Advisory or Tsunami Marine and Coastal Warning when wave recorded is between 0.3m to 1m or cancel outright if less than 0.3m.</p> <p><b>Duty Forecaster activate and disseminate FTWC TSUNAMI TEMPLATE 8</b></p>
<b>Tsunami Warning (TW)</b>	<p>Cancel when expected wave height has been verified through sea level monitoring equipment to be below <b>0.3M</b> within the warning period.</p> <p>Downgrade to Tsunami Marine and Coastal Warning if wave height verified is between 0.3m to 1m</p> <p><b>Duty Forecaster activate and disseminate FTWC TEMPLATE 9</b></p>

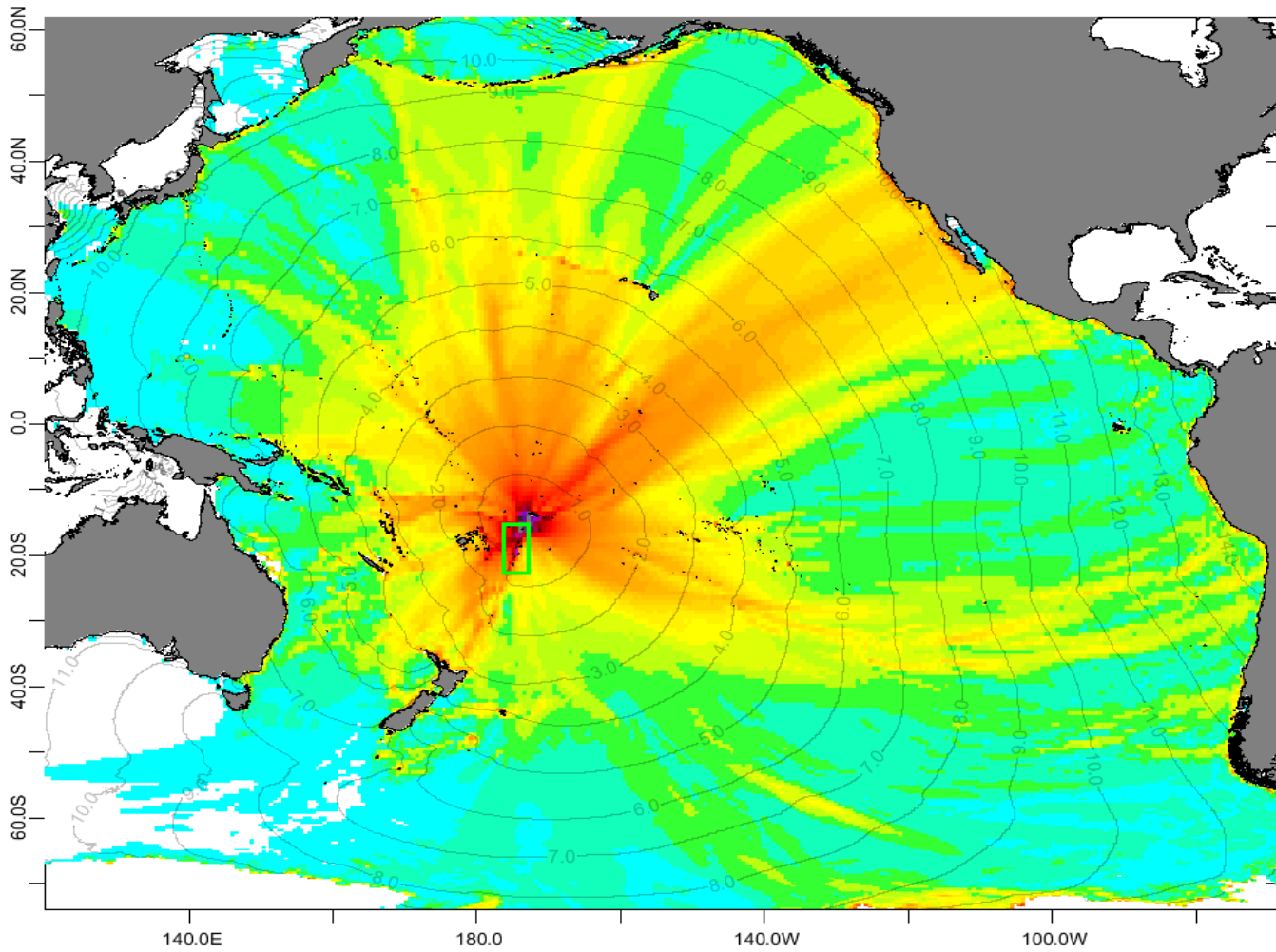
Comments:



### Tonga: M9.1 Tonga Trench to East

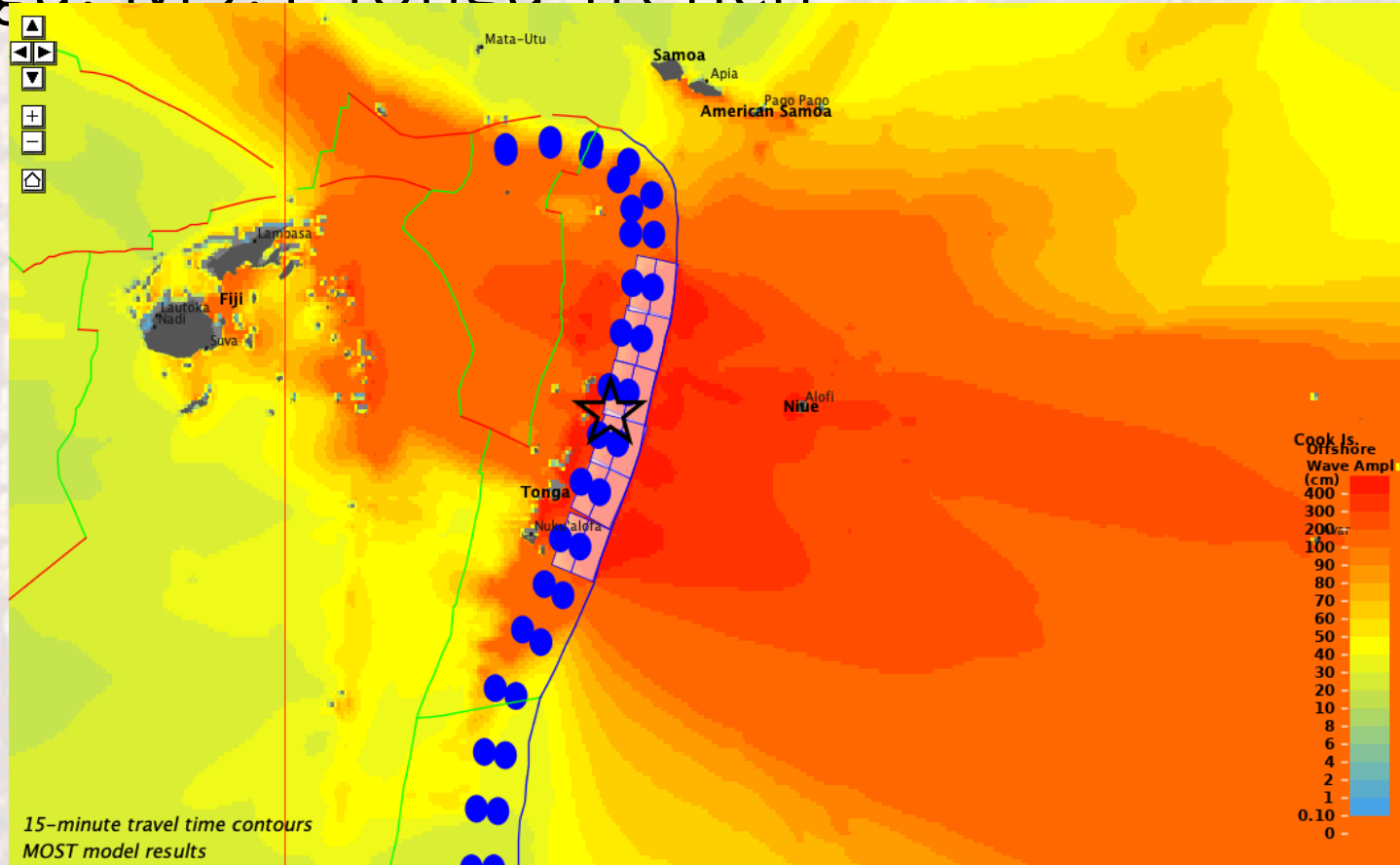


## Tonga: M8.8 Tonga Trench to the North

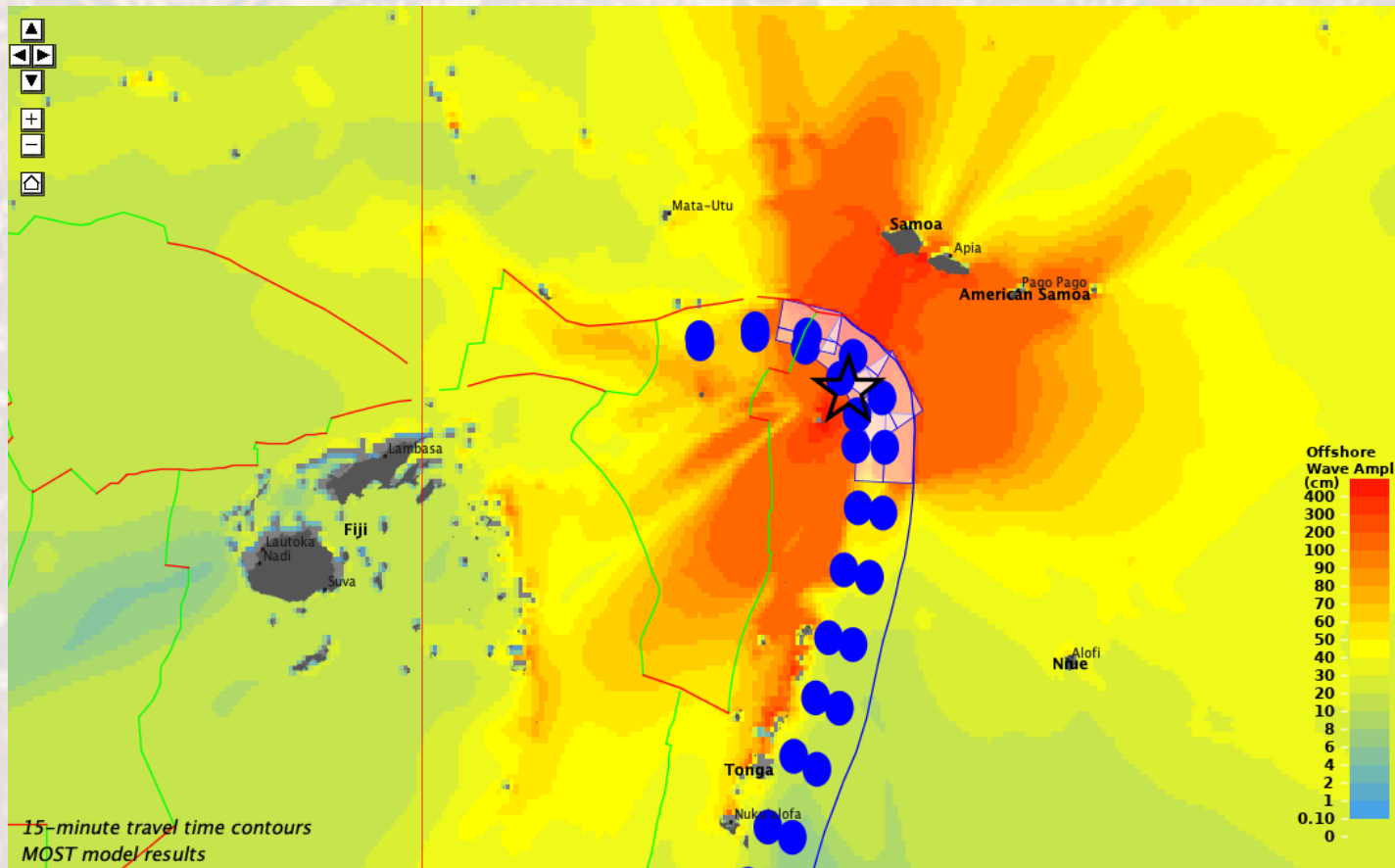




# Tonga: M9.1 Tonga Trench

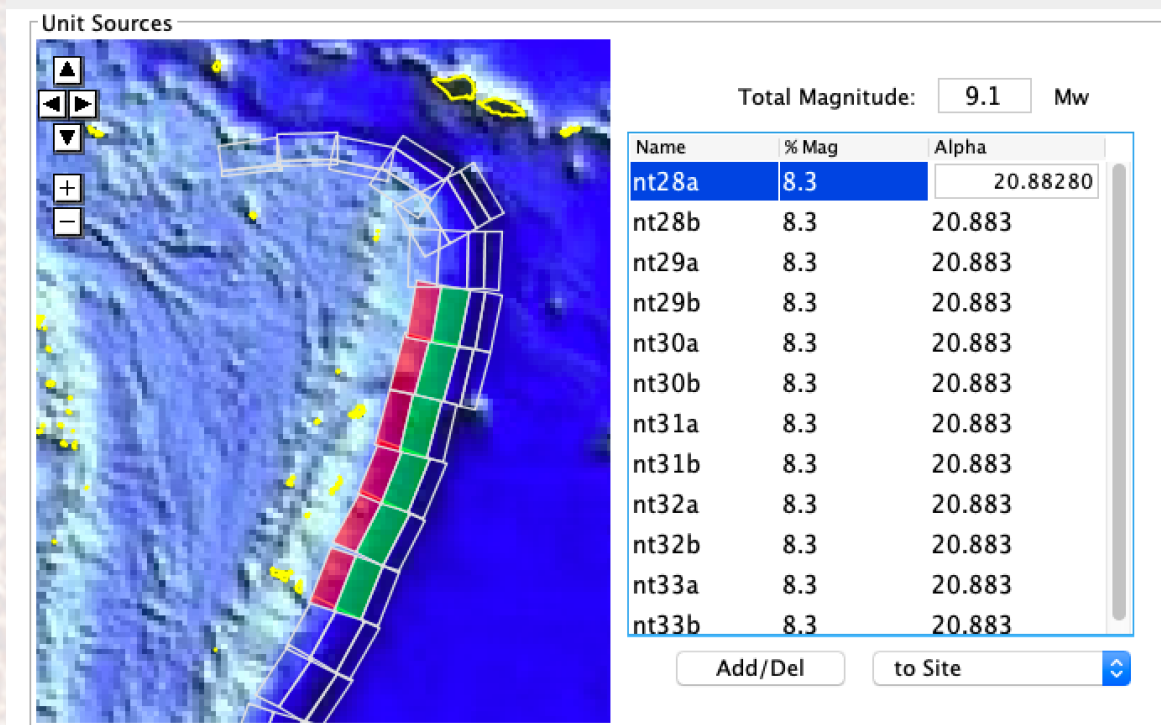


# Tonga: M8.8 Tonga Trench North

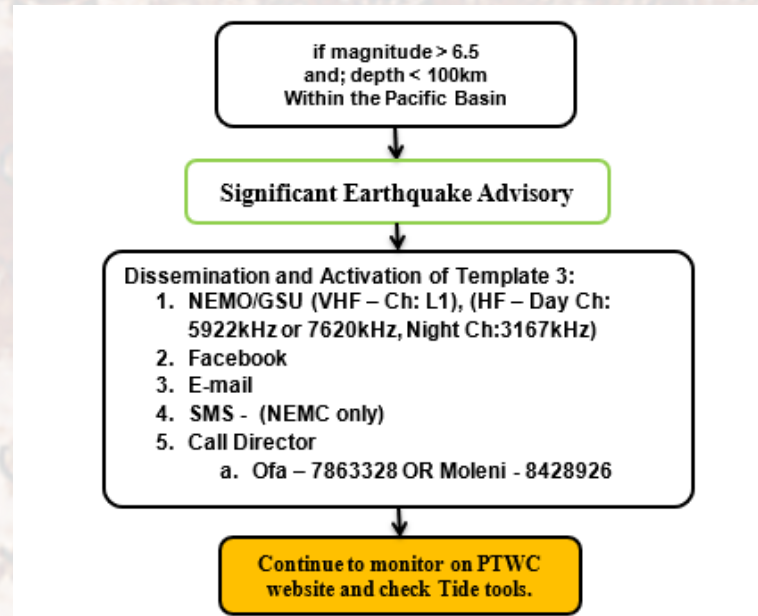
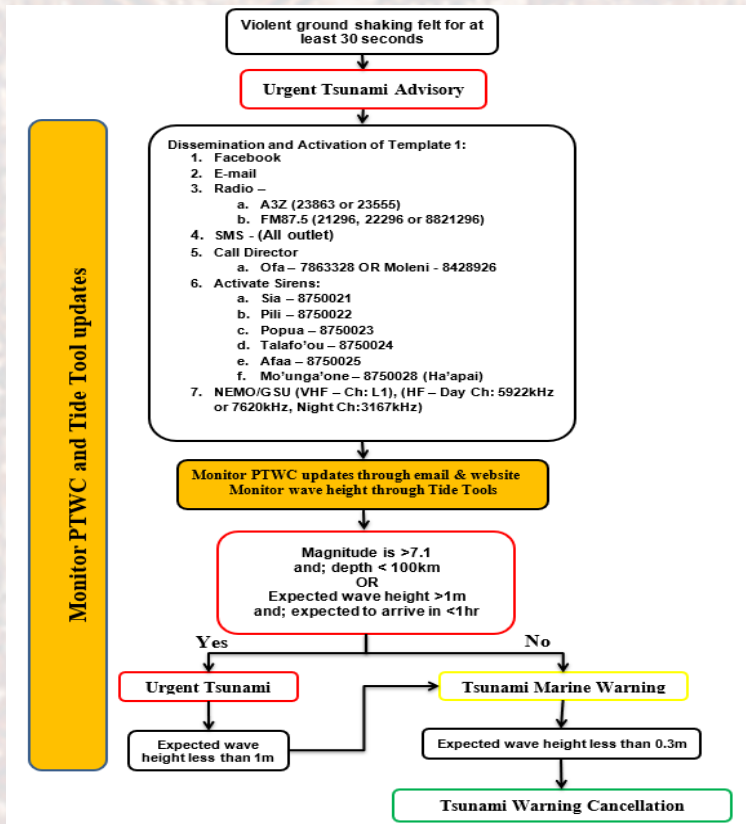




## M9.1 Tonga Trench, homogeneous



# Operational Flow chart





# Dissemination Channels of Tsunami Services

- Email (distribution list)
- Website
- SMS Text messages (Digicel service provider only)
- Facebook
- Radio Interview (local and foreign)
- Briefings to NEMC
- Coast Radio Section to Mariners
- PTWC Collaboration (internally to TMS)

# Key issues with current SOP

- Entire SOP Needs to be updated and Reviewed
- Thresholds/Criteria(s) needs to be reviewed
  - Arrival times of tsunami
  - Reduce warning templates
- Dissemination to Social Media Platforms should be included
- The need to include worse case scenario(s) into our SOP for quick references and Tsunami Travel Times
  - Local Source events
- Conduct Routine SOP exercises
- Possibility to include MMI (Modified Mercalli Intensity) Scale into our SOP
- Review FTWC Warning Templates & SMS text templates
- Review and upkeep distribution list
- To react to any earthquake information received from international source agencies (ORSNET,RIMES,USGS,PTWC)
- Needs a system to input automatically parameters into templates before sending out
  - Automatic Tsunami warning dissemination system/tool
  - A GUI Tsunami Decision support Tool
- Minimum Checklist needed to go thru that all activities/steps are completed
- The need for all duty officers in Tongatapu and Outer islands to report to base any felt earthquake events at any time.



# Challenges/Limitations & Ways Forward

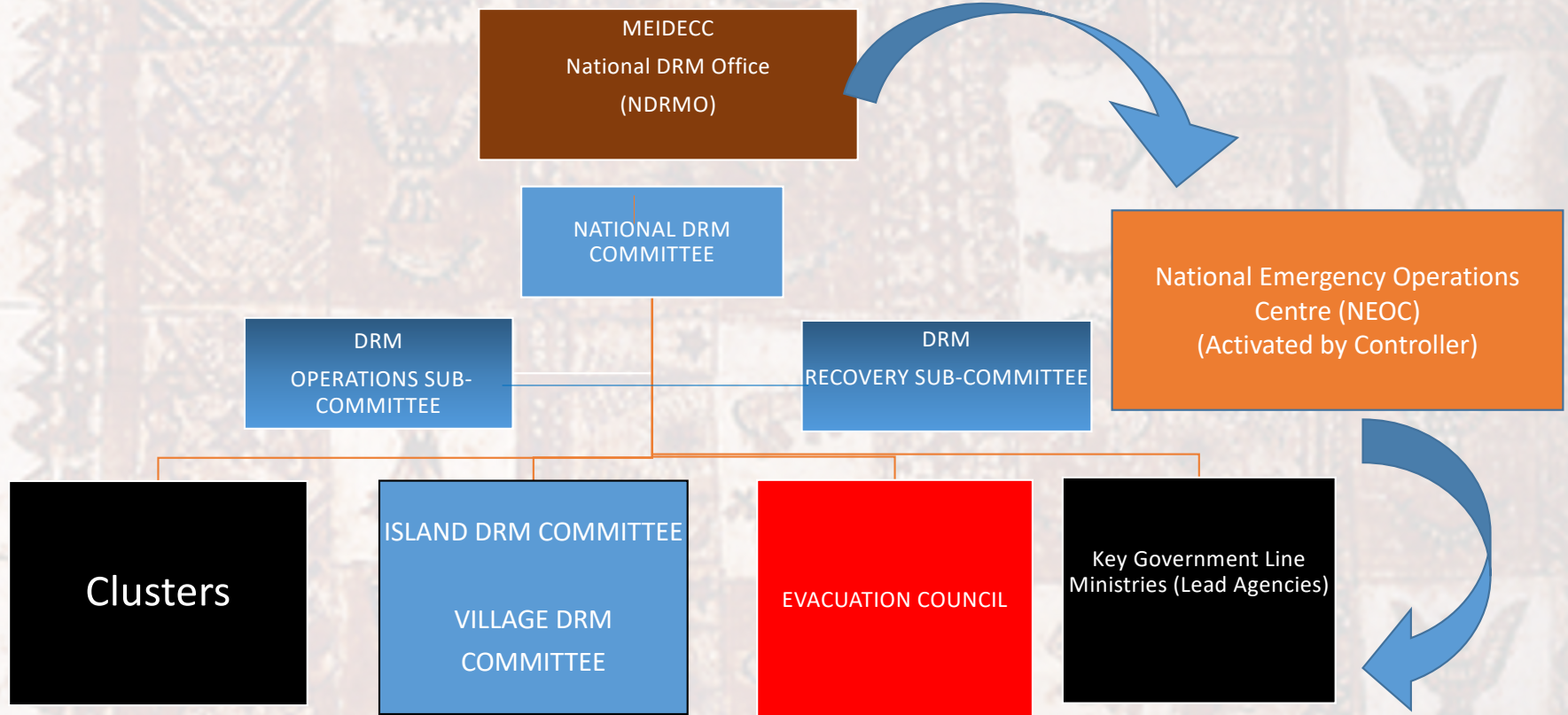
- Incorporate Tsunami Competency aspects into SOP
  - Tier 1 and 2
  - Validity of competency periods for watch keepers
- Incorporate scenarios and tsunami model results
- On-going trainings, exercises partnerships and short-term trainings
- Establishment of updated FTWC Tsunami SOPs
- More Frequent community awareness and educational programs
- Respond to PTWC Scheduled and Unscheduled Monthly Test Messages



**National Disaster Risk Emergency Management Office  
(NDRMO)**

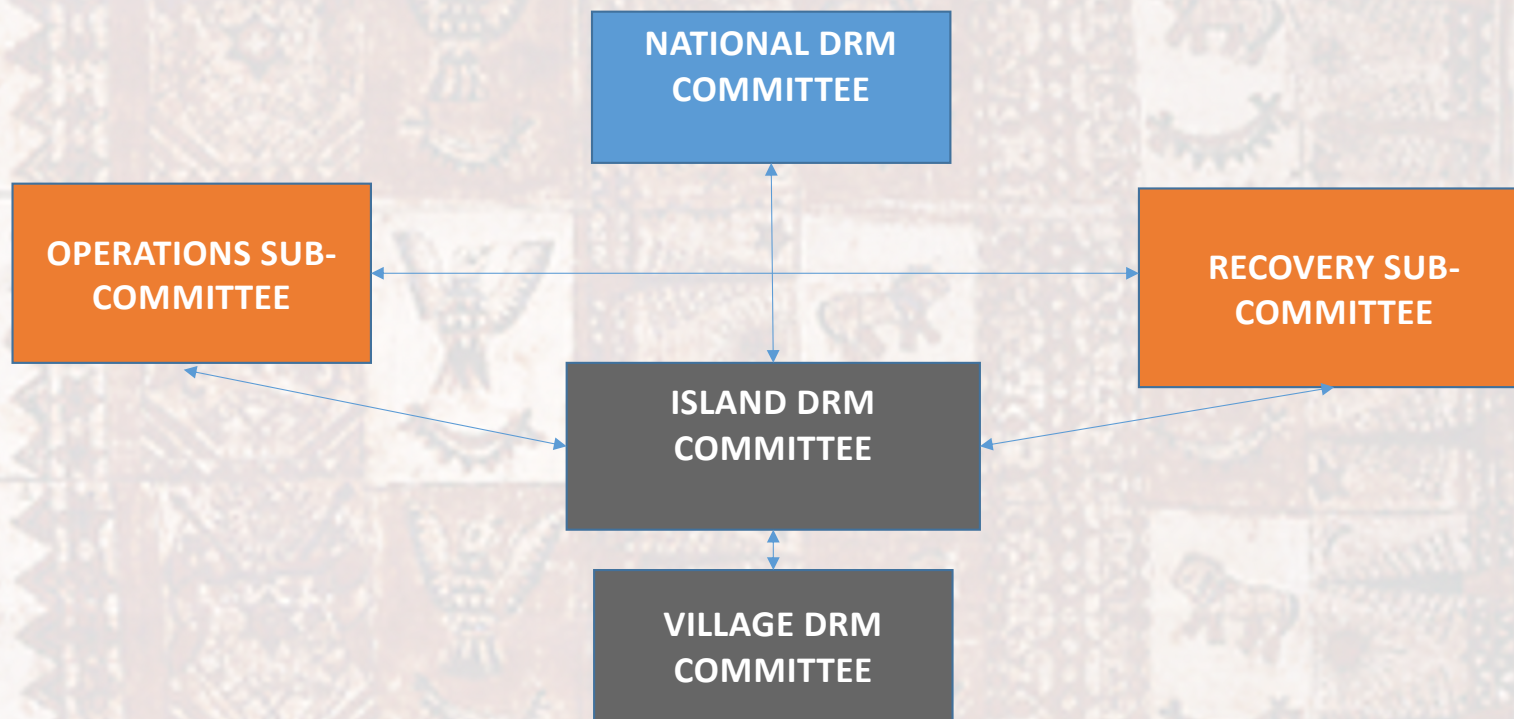


# Emergency Management Structure



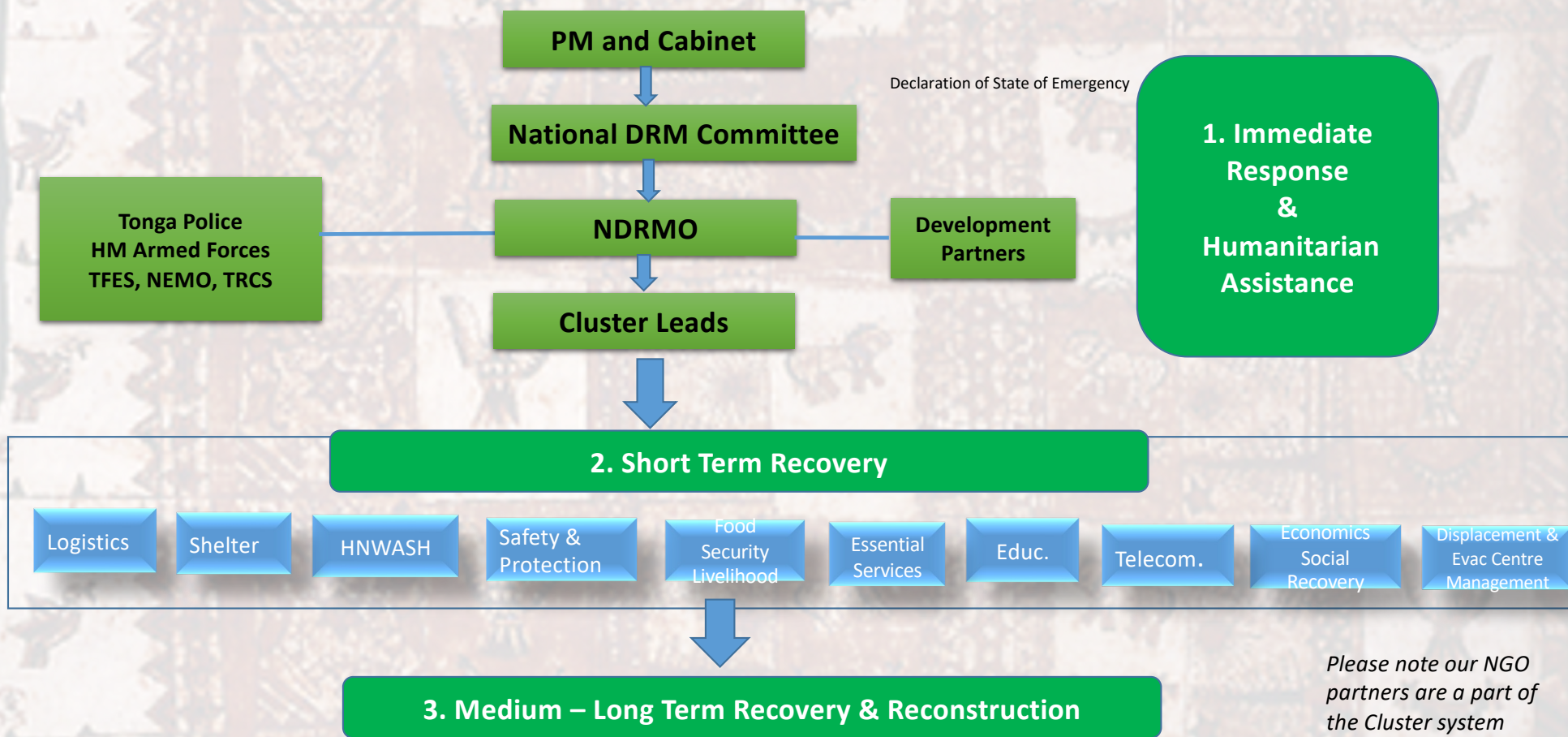
# National and Sub-National Committees

*(does not include Clusters)*

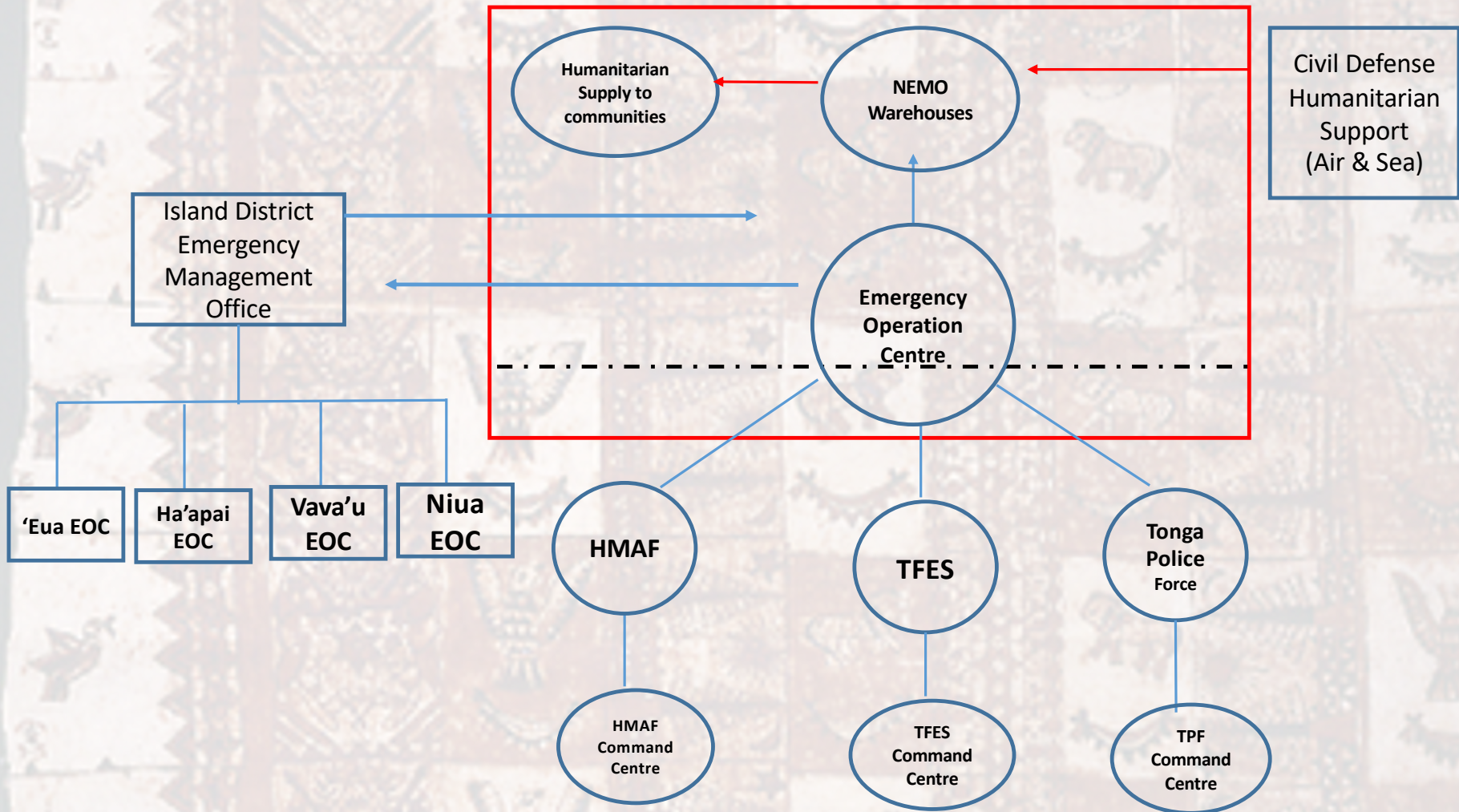




# Emergency Operation Structure



# National Emergency Coordination Centre Links to District Emergency Operation Centres and First Responders Command Centres



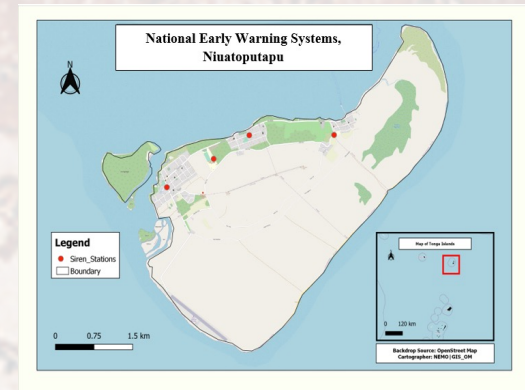
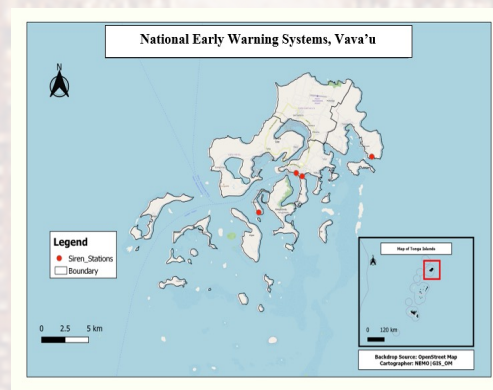
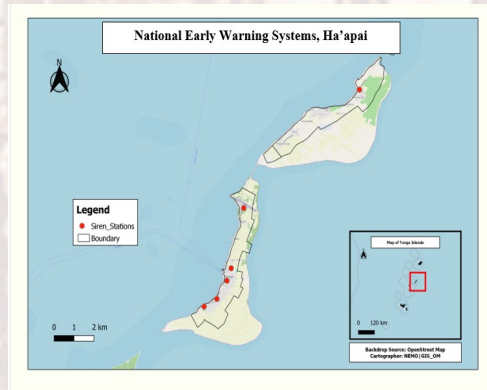
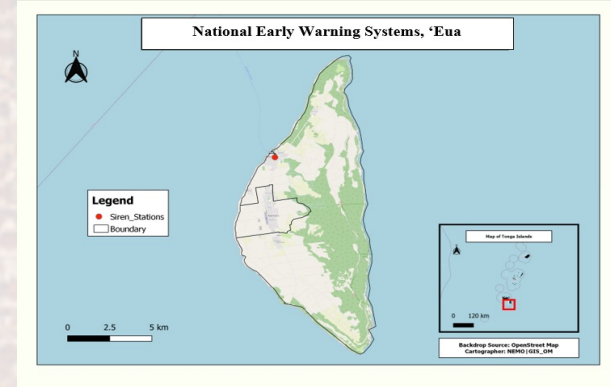
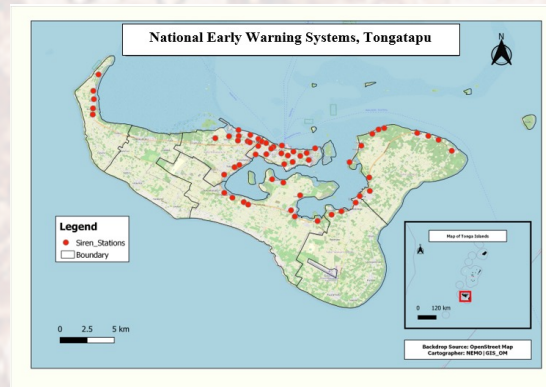


The background of the slide is a traditional Tongan quilt, known as a 'kolo' or 'kolo kolo'. It features a grid of squares, each containing a different symbol or pattern. These symbols often represent various aspects of Tongan culture, such as the national emblem (a bird with wings spread), a fish, a tree, or a crown. The quilt is made of light-colored fabric with dark brown or black patterns.

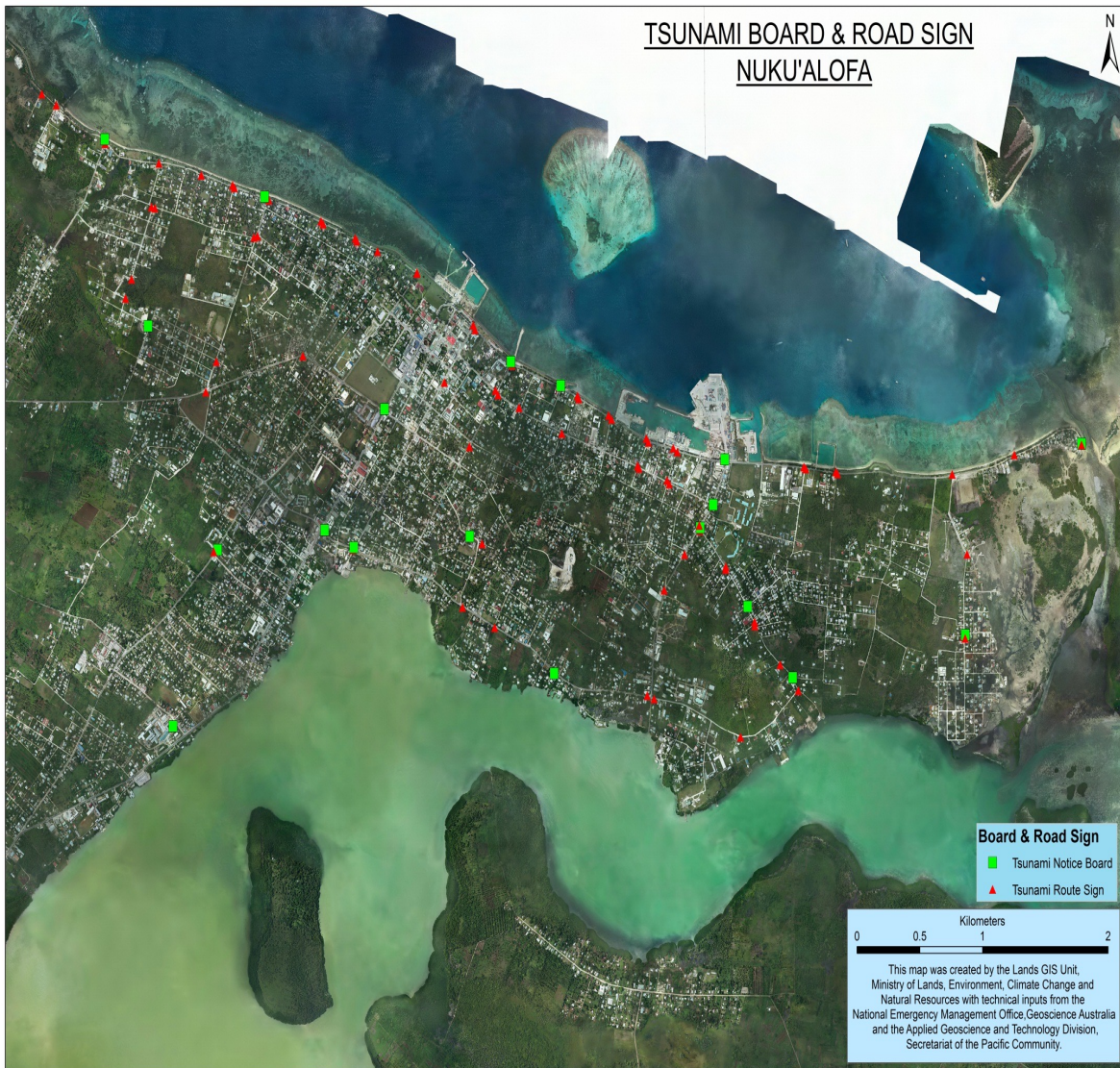
# **Tsunami Mitigation Efforts in Tonga**

# National Early Warning System

Location	Quantity
Tongatapu	60
'Eua	1
Ha'apai	6
Vava'u	4
Niuatoputapu	4
<b>TOTAL</b>	<b>75</b>







## Tsunami Sign Board & Route Signs



Location	Identified Funding
Tongatapu	NEMA
Outer Islands (HP, VV, Eua & Niua)	PREP



# GREATER NUKUALOFA TSUNAMI EVACUATION MAP



## KALASI KEHEKEHE 'E TOLU 'OE PEAU KULA:

1. PEAU KULA FAKA-LOTO FONUA PE LOCAL TSUNAMI: LAU MINITI PE, A'U MAI E 'ULUAKI PEAU
2. PEAU KULA FAKAFEITU'U PE REGIONAL TSUNAMI: HOUA 1-3, A'U MAI 'AE ULUAKI PEAU
3. PEAU KULA FAKA-MAMANI LAHI PE DISTANT TSUNAMI: HOUA 3 PE LAHI HAKE, A'U MAI 'ULUAKI PEAU

PEAU KULA  
 • KO HO'O FAKATOKANGA MOE NGAHI FAKA'ILONGA FAKA-NATULA 'OE PEAU KULA HE VAVE TAHA OI HE HO'OMANA MAUA OUA TEKE TOE TAHA OI HE FAKA-TU'AMANA  
 • KAPAU 'OKU MAUA OI HE 'ULUAKI PEAU MA'OLLINGA OI TAHA OI HE FAKA-TU'AMANA TAUPOTU  
 • NOFO MA'U AI PEAU KULA MAUA OI HE TAHA KUA MALU KEKE POU



## NGAAHI FAKA'ILONGA FAKA-NATULA 'OE PEAU KULA



ME'A KE FAI KE HAOFKI AI HO'O MO'UI:  
 • 'ILO'I E NGAHI FEITUU HUFANGA MOE HALA OFI TAHA KIAI  
 • MANATU'I E NGAHI FAKA'ILONGA FAKA-NATULA 'OE PEAU KULA  
 • FA'U HA PALANI FAKAFAMILI PE FAKA-KOLO  
 • FAKA-FANONGO MA'U PE KI HE FAKATOKANGA MOE FALE'I MEI HE MA'U MAFAI

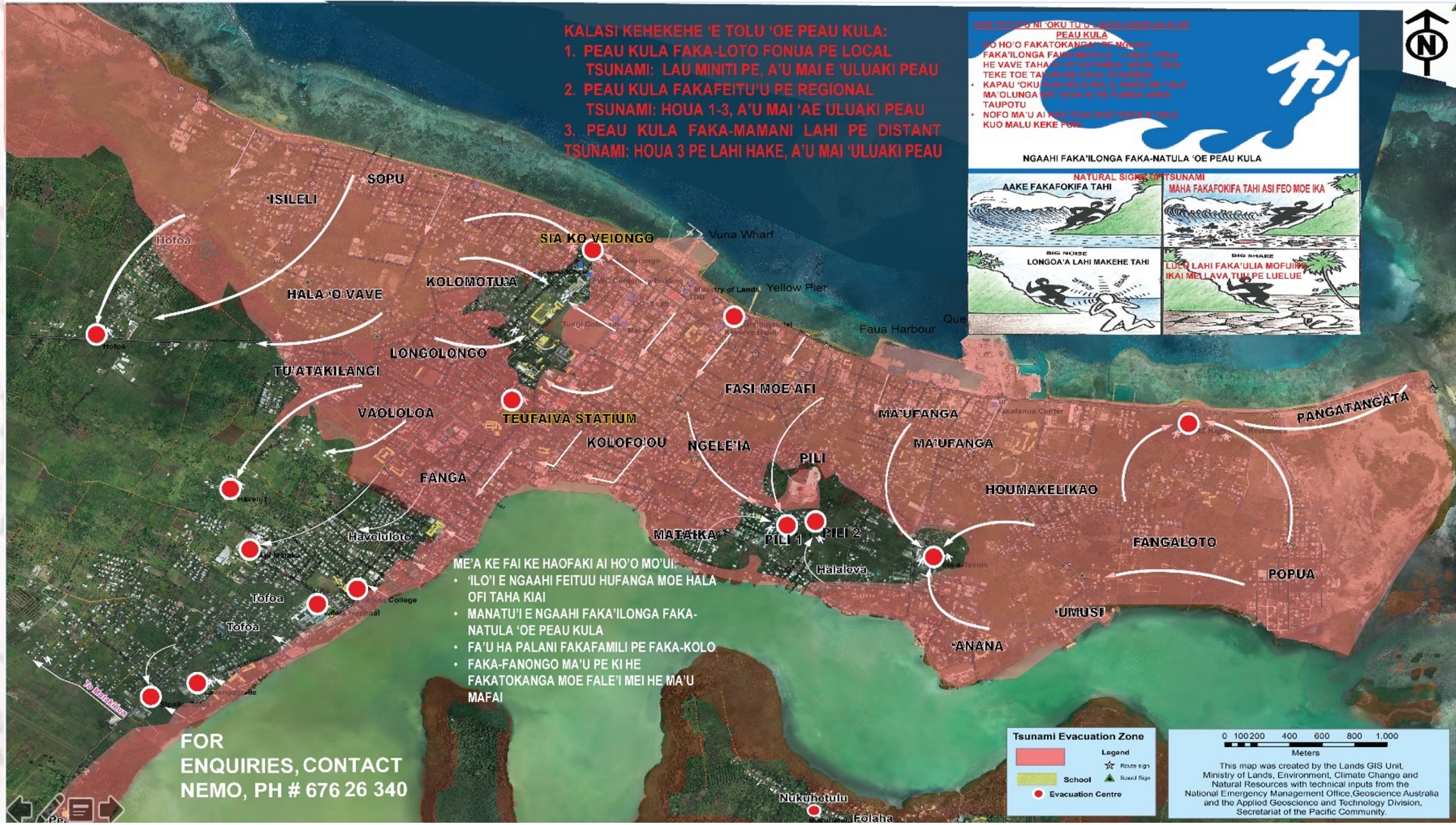
FOR ENQUIRIES, CONTACT  
 NEMO, PH # 676 26 340

**Tsunami Evacuation Zone**

Legend  
 [Red Area] Evacuation Zone  
 [Green Star] School  
 [Red Circle] Evacuation Centre  
 [Green Triangle] Route Sign  
 [Blue Triangle] Road Sign

0 100 200 400 600 800 1,000  
Meters

This map was created by the Lands GIS Unit, Ministry of Lands, Environment, Climate Change and Natural Resources with technical inputs from the National Emergency Management Office, Geoscience Australia and the Applied Geoscience and Technology Division, Secretariat of the Pacific Community.





# COMMUNITY AWARENESS



**DRR Sensitisation for District and Town Officers**



**Agencies/ Organisations**



**People Living with Disabilities**



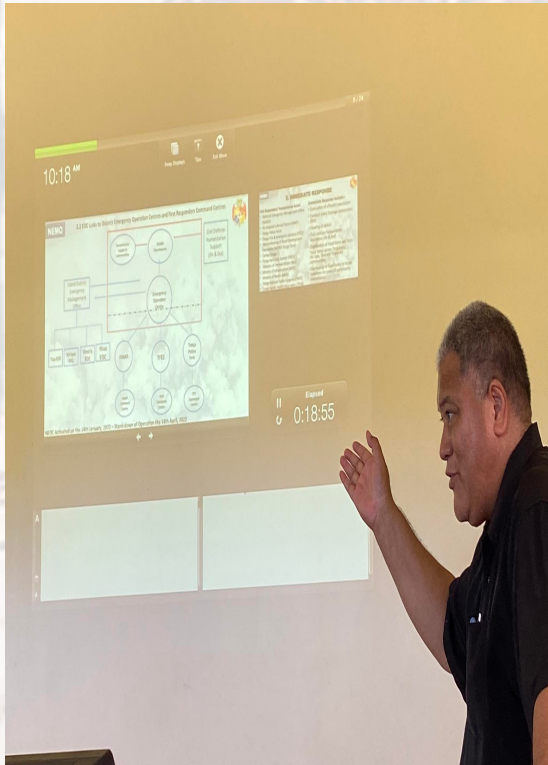
**Communities**



**Schools**



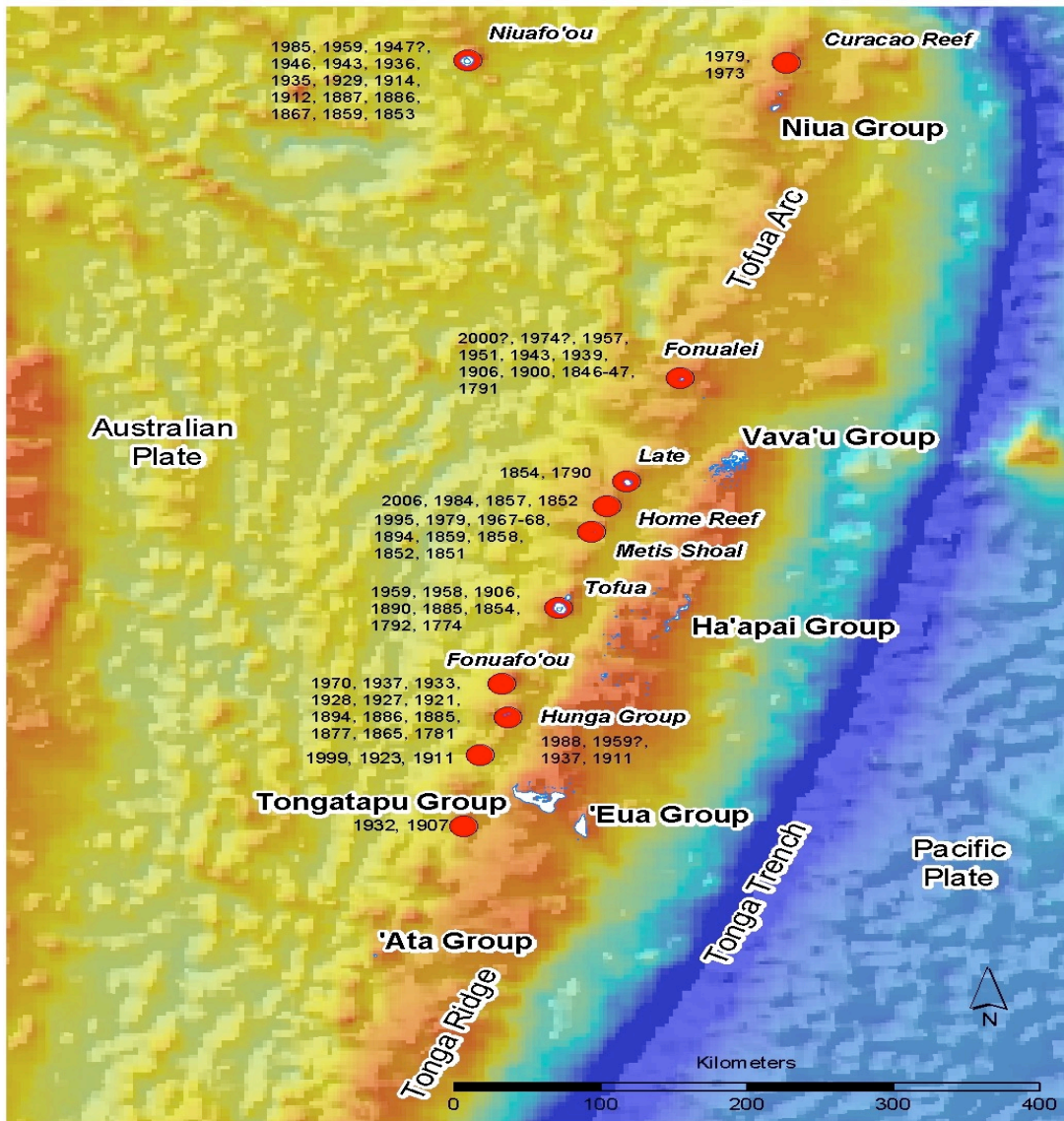
# Table- Top Exercise for First Responders in the Emergency Operation Centre(s)







# **TSUNAMI DRILLS**



## Tsunami Ready Communities



Island Group	Number of Communities
Tongatapu	16
'Eua	2
Ha'apai	13
Vava'u	5
Niu's	2
<b>Total</b>	<b>38</b>

\* Note: While the numbers seem ambitious, the approach will be divided into phases as some initiatives are already in place



Technical Working Group  
Chair (NDRMO)

Geohazard (2  
members)

Tonga Meteorological  
Services (2 Members)

National Emergency  
Management Office (1)

**Design the Tsunami Drill**

- Identify the at-risk communities
- Engage and coordinate with the stakeholders
- Ensure maps and hazard, risk information is up to date available for all scenarios, including evacuation routes and safe zones
- Create a plan to be followed in each community
- Align with responsible agencies and emergency plans for the community

**Evaluate the Communications for the Community**

- Align with the responsible agencies what communication needs to be sent out to the community, such as sirens and preparedness information

Align communication strategies among all stakeholders.

**Test the expected outcomes.**

- Community expectations
- Design team expectations
- Effectiveness of the drill

**Streamline the process.**

- Ensure that the tsunami drill is delivered consistently in every community
- Correct any changes needed in the evacuation routes, safe zones, signs, etc.

- **TOR**
- **Field Assessment SOP**
- **A tsunami exercise plan**

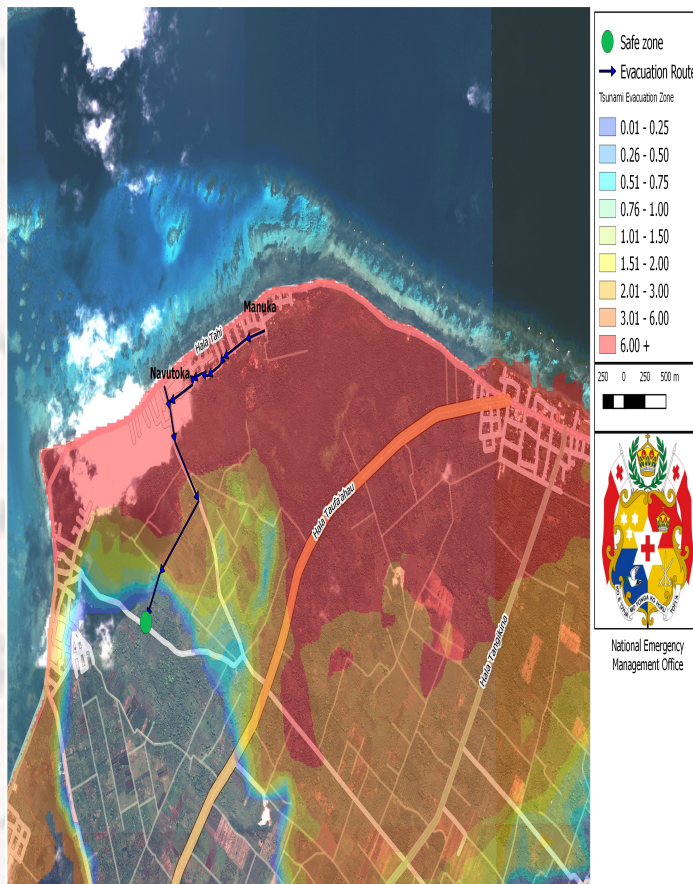
## Field Assessments of Tsunami Evacuation Routes





# TSUNAMI HAZARD MAPS

TSUNAMI EVACUATION MAP - Navutoka & Manuka



There are identified capacity to develop these, however technical support is still needed to strengthen the capacities of these local officers (Geology, GIS and NEMO)



# NEMO

*Exercise Piha: 2013  
Vahe Hahake  
Nukuleka - Afa*



*Exercise Safely to  
Safety: 2017  
GPS Kolomotu'a*



*Exercise Safely to Safety: 2021  
Lifuka Schools  
EOC at Ha'apai*



*Pictures 3 & 4: Children from the GPS Pangai evacuating their classrooms and following their evacuation routes to their assembly zones*



*Picture 5 & 6: Students from Tailulu and St. Joseph Colleges evacuating their school premises and following their evacuating routes to the assembly areas.*



*Pictures 7 - 10: Teachers from GPS Tongaleleka, Ha'apai High School, St. Joseph College, Tailulu College and GPS Pangai taking roll and final head count at each of their respective assembly areas.*



*Picture 11 - 13: First Responders from the Tonga Red Cross Society, His Majesty's Armed Forces, and Tonga Fire & Emergency Services helping distressed students/child get to the assembly areas*

GPS Tongaleleka, GPS Pangai, GPS Koulo, Ha'apai High School, Tailulu College and St. Joseph College students were the participants, with the First Responders supporting in the safe evacuation from the physical locations to the meeting points/ assembly areas, with Tonga MET supporting with the broadcasting. Further instruction was disbursed by EOC in Lifuka.

Ha'apai's EOC was staffed by NEMO, the First Responders, MEIDECC Officers and volunteer officers from the Governor's Office and the Ministry of Revenue and Customs.



On Friday 5<sup>th</sup> November 2021, the World Tsunami Day was marked with program conducted by the Geo-Hazards Unit of Ministry of Land and Natural Resources, with the support of NEMO (with key focus on disaster risk management – prevention, mitigation, preparedness, response, recovery) and Tonga MET (with key focus on early warning systems).

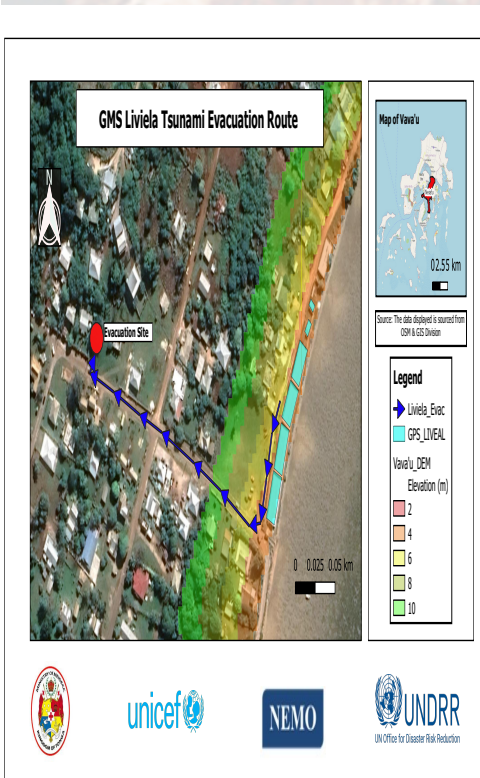


The exercise was made possible with the collaboration of all emergency agencies – HMAF, Tonga Police, Tonga Fire & Emergency Services, NEMO, Tonga Meteorological Services.



# Highlights of Safely to Safety Tsunami Drill 2022

## GPS Live!a, Vava'u





# GPS Nukuleka & GPS Navutoka





# Tsunami Drill at Tongatapu



Tonga Meteorological Centre



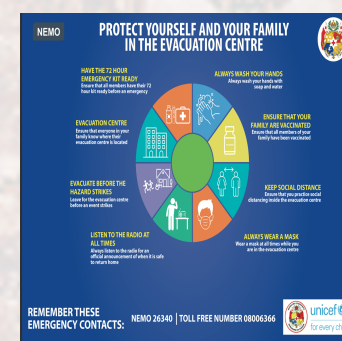
# Emergency Operation Centre





# Information, Education & Communication Materials

IEC Materials	Status	Way Forward
<ul style="list-style-type: none"> <li>1 minute Radio Jingles (English, Tongan, Japanese, Fijian)</li> </ul>	Completed (currently on broadcast)	<ul style="list-style-type: none"> <li>Mandarin</li> <li>French</li> </ul>
1 minute videos	Completed – Local television, line ministries and private sectors	<ul style="list-style-type: none"> <li>Translation into Fijian, Japanese and Fijian.</li> <li>Tsunami Sign Boards sensitization</li> </ul>
Social media tiles	Completed	Upload onto social media
Brochures	Completed	Printing and dissemination
phamplets	Completed	Printing and dissemination
Tsunami Sign Boards	Ongoing	installation
Banners	Completed	Printing and dissemination
Posters	Completed	Printing and dissemination




Funded by UNICEF

- Foreign Missions to Tonga assisted with the translations
- Need for funding to mass produce for community dissemination

# Tsunami Video Awareness Video Clips







# Malo 'Aupito

Follow us at:

[www.nemotonga.gov.to](http://www.nemotonga.gov.to)

National Emergency Management Office