



INTERNATIONAL TSUNAMI INFORMATION CENTRE

ITIC TRAINING PROGRAMME (ITP) HAWAII, 7 – 18 AUGUST 2023

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Ministry of Natural Resources
and Environment



Samoa Meteorological Services



Outline

- Geography & Historical Events
- National Tsunami Warning Centre
- Early Warning System
- NEW SOPs based on Enhanced Products
- Tsunami Bulletins
- Tsunami Alert Dissemination: IBL
- Emergency Siren Network & Radio Network
- National Response & Preparedness
- Challenges & Way Forward

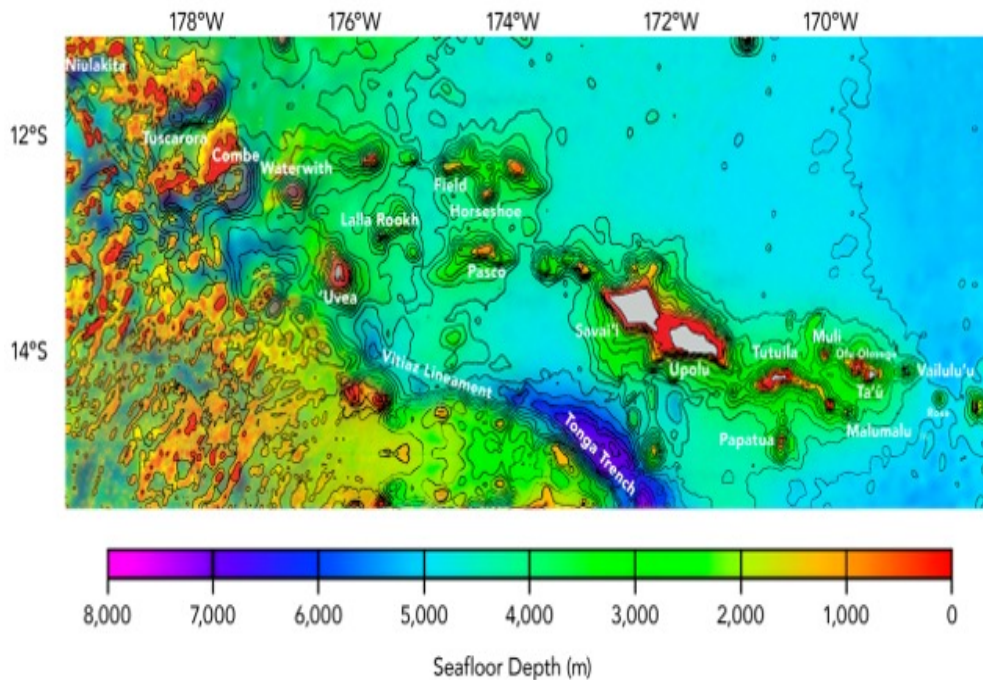
Geophysical & Geological Features of Samoa



- Located in the South Pacific 13.08°S, 171.89°W
 - consists of high volcanic islands, atolls, and submerged reef banks near the southwest margin of the Pacific plate.
- 2 main Islands
 - **Savaii** – 1,707km² max elevation 1858m (Mt Silisili).
 - **Upolu** – 1,119km² max elevation 1,110m (Mt Fito). Total Land Area of 2831 km²
- 2 smaller Islands **Manono & Apolima**
- 5 Islets off the eastern end of Upolu
 - **Nu'utele, Nu'ulua, Namu'a, and Fanuatapu, & Nu'usafe'e.**
- Water Area of 4 km²



Geophysical & Geological Feature of Samoa

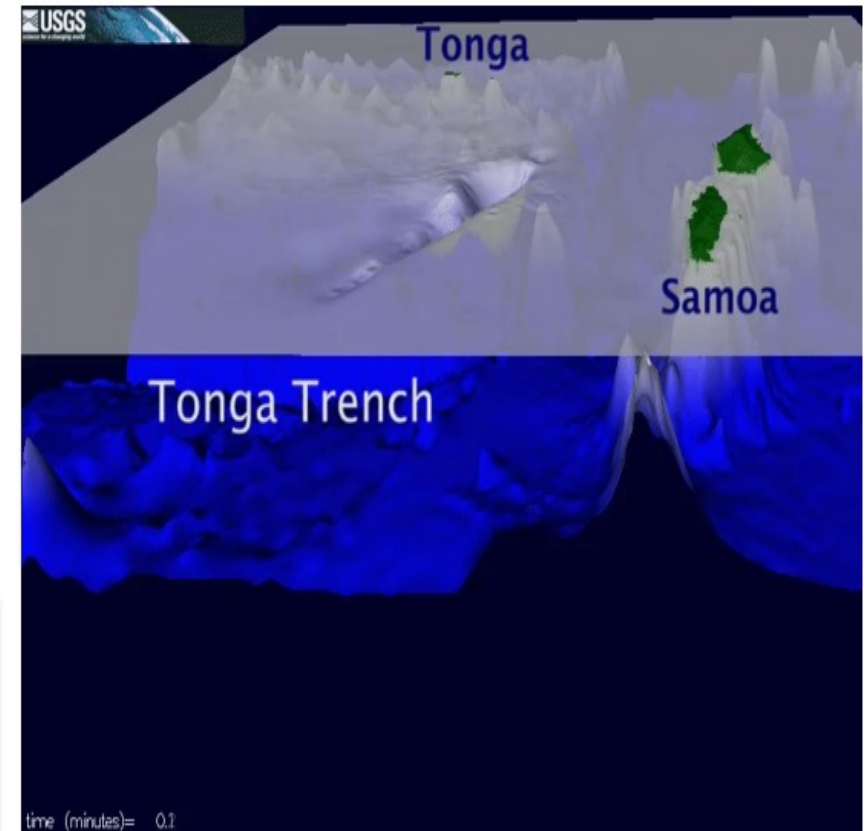
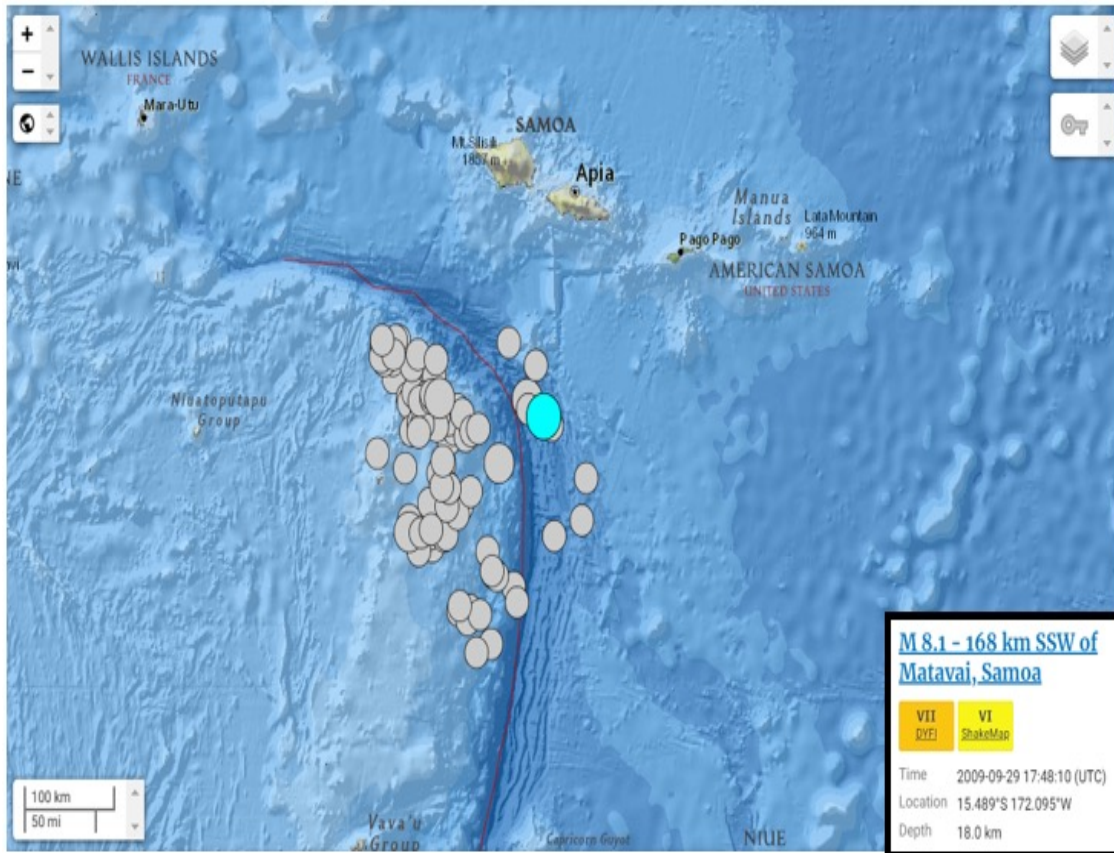


- Samoa archipelago chain consist of 16 islands and seamounts $2,123 \text{ km}^2$



- Mt Matavanu, Savaii
 - Last Erupted August 4th 1902

2009 Tsunami



- On 2009/09/29 an 8.1 M earthquake generated tsunami waves of up to 22 meters.
- 40 Aftershocks 4M+
- Affected the Southern region.

- View point propagation looking west
- Wave travel time ≈ 10 min
- ≈ 190 km from Apia Samoa.

History of Disastrous Earthquakes



History of Disastrous Earthquakes



M 8.1 - 168 km SSW of
Matavai, Samoa

VII

DYFI

VI

ShakeMap

Time 2009-09-29 17:48:10 (UTC)

Location 15.489°S 172.095°W

Depth 18.0 km



- killing at least 192
- Over 200M in damage
- Established a 24/7 National Earthquake and Tsunami Warning Center.
- Upgraded its warning dissemination systems.
- Created community-driven evacuation maps and signage.



Kong, L., P. Dunbar, and N. Arcos (2015).

Post 2009 Tsunami

NTWC Established

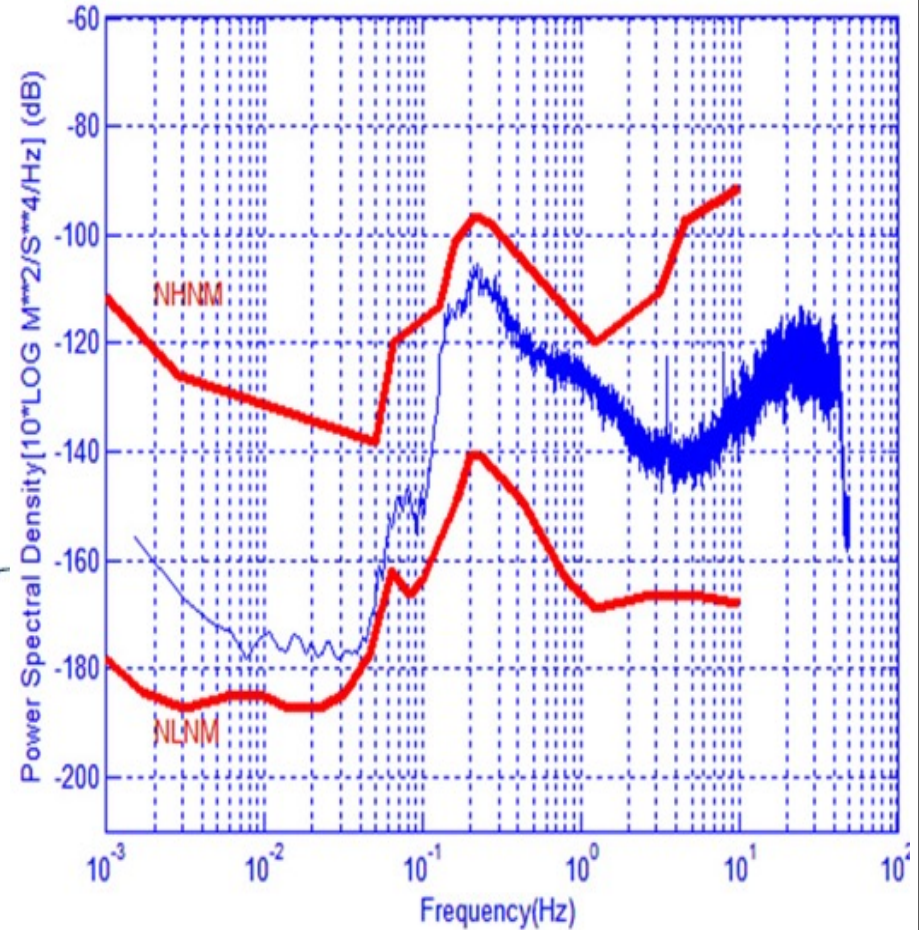
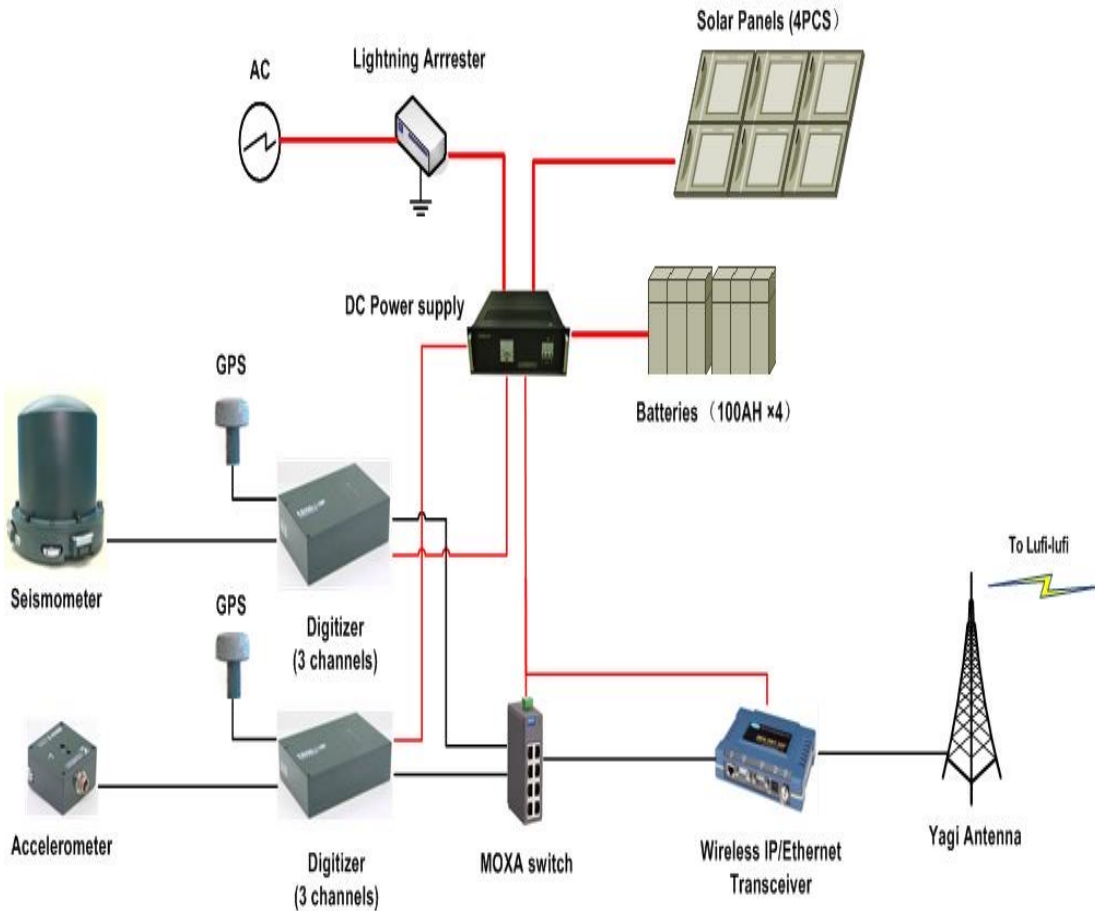


- The Geosciences Section of the Samoa Meteorology Division of MNRE is the focal point for issuing any Tsunami Information or Tsunami Warning for Samoa.
- Samoa established its seismic network in 2012 and has been operational since then.
- Main function of Samoa's NDC includes data collection, data processing, data storage, operation and maintenance and data sharing services.
- Samoa has been relying on outside sources such as PTWC to monitor Tsunami events within our region and distant.

Seismic Network Improved.



Seismic Network



Asau BB Seismograph Station

Power Spectral Density for Afulilo Broadband

SOPs Developed



- To ensure timely, efficient and effective dissemination of tsunami and earthquake information for the safety of everyone.
- To ensure that Geoscience officer (s) on duty is well versed with his/her responsibility and knows well what to do during an earthquake and tsunami event.
- Response is better coordinated.

SOPs for Local Tsunami Alert

Step 1:

SNDC detects earthquake event.

Receive Earthquake/Tsunami Bulletin from PTWC.

Receive locally felt Earthquake/phone call from public

Step 2:

NDC operator analyses event to determine location Magnitude (max 2-3 minutes) Auto pick

Assess immediate threat to Samoa (refer to tide charts/Map and Threshold Table

Officer on duty send text through IPL system. (DMO wireless, Call Radio and TV stations). Fill out template as a backup.

Local events- Region 1 – Take immediate Action

Step 3: Notify ACEO- provide advice based on analysis (Geo team to provide support and analysis, refer to Geo response procedures)

Step 4. Prepare briefing paper for ACEO & CEO

Step 5. Monitor and follow up Actions

Step 6. Cancellation.

SOPs for Regional Tsunami Alert

Step 1:

SNDC detects earthquake event And/or Receive Earthquake/Tsunami Bulletin from PTWC

Step 2:

NDC operator analyses event to determine location Magnitude (max 3-5minutes) Auto pick

Assess immediate threat to Samoa (refer to tide charts/Map and Threshold Table

(Step out and get driver/groundsmen/met technician to assist in calling people while analysing event (after hours)). Fill out template

Step 3

Notify ACEO- provide advice based on analysis (Notify Geo team to provide support and analysis, refer to Geo response procedures)

Step 4:

Call Radio stations

Contact Bluesky,

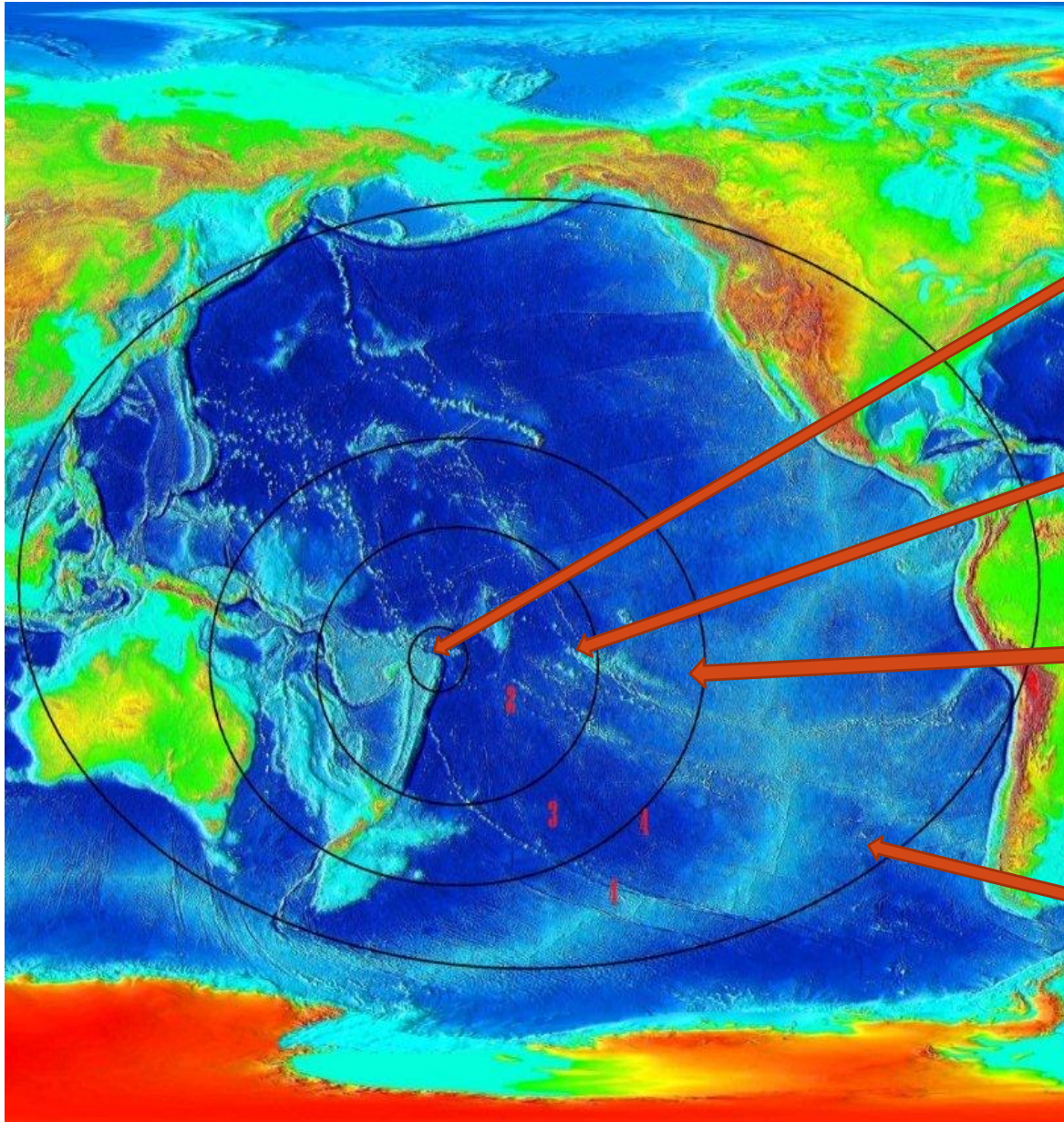
Digicel

Step 5. Prepare briefing paper for ACEO (CEO)

Step 6. Monitor and follow up Actions

Step 7. Cancellation.

Tsunami Alert Classification & Priority



**Region 1: 0-300 km, Samoa –
Tonga region**
Tsunami travel time is within 1
hour

Region 2: 300-2000 km, Vanuatu,
Fiji, North NZ
Tsunami travel time is within 4
hours

Region 3: 2000 – 4000km,
Solomons Islands South NZ,
Tsunami travel time is within 6
hours

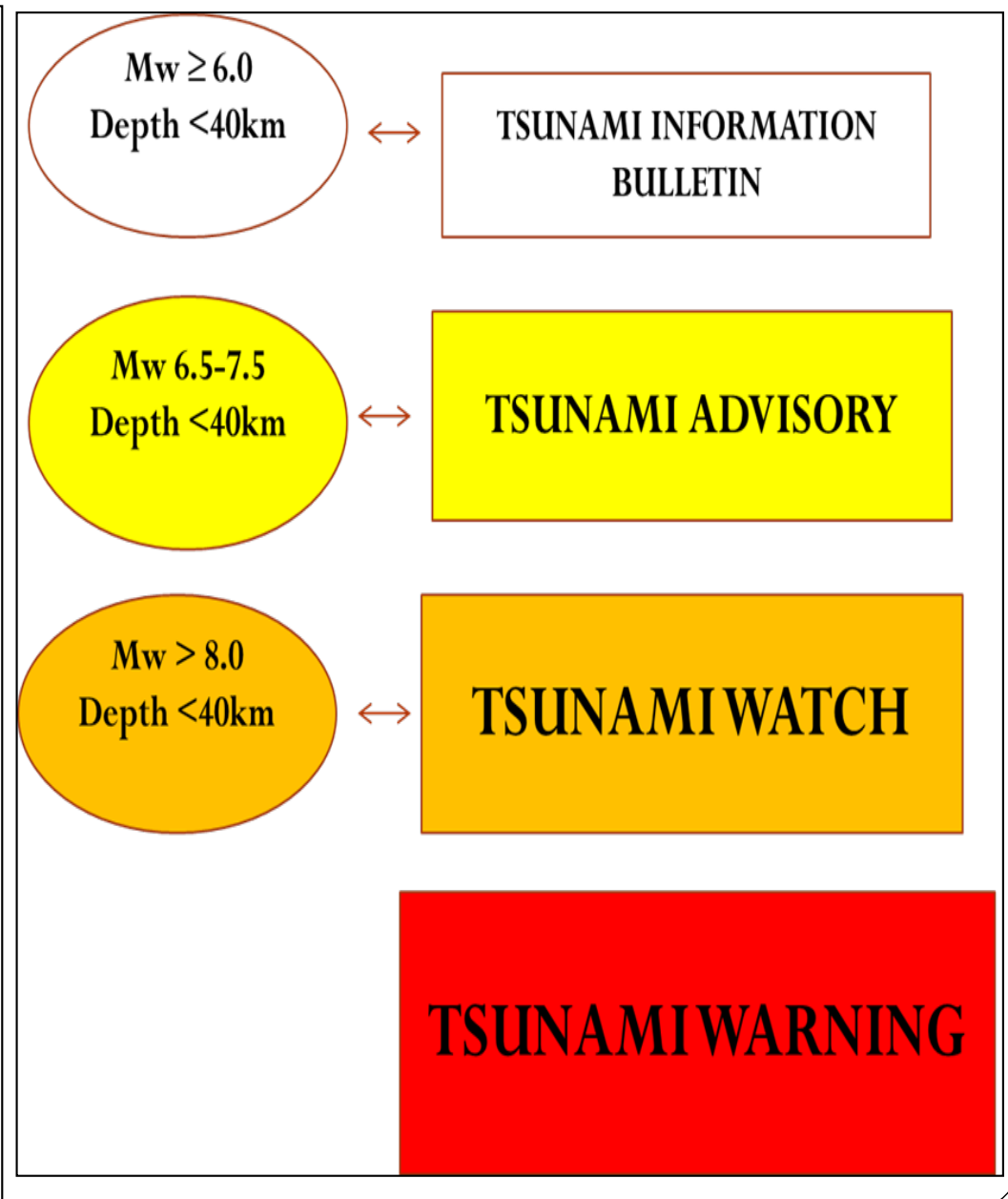
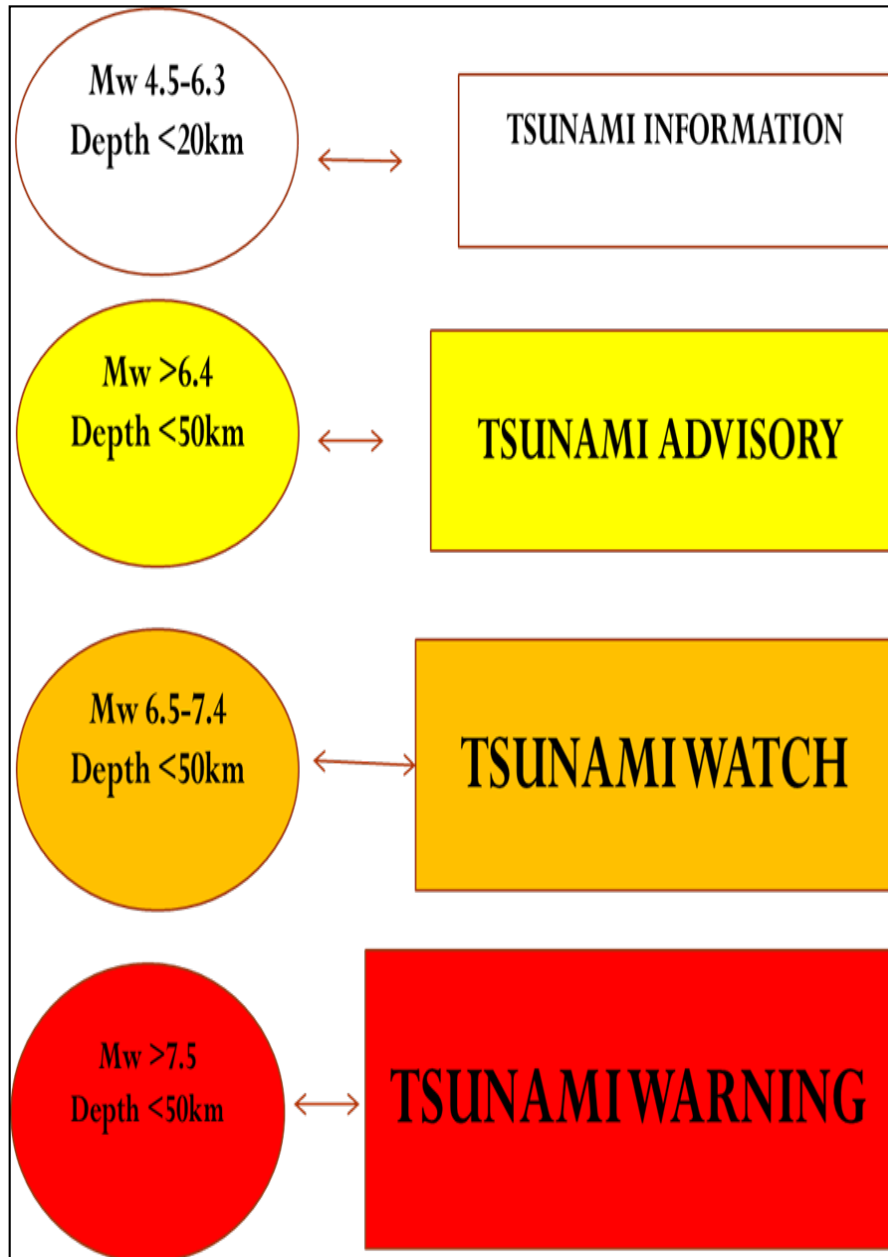
Region 4: >4000 km, Rest of the
Pacific region, Tsunami Travel
Time is more than 6 hours.

TSUNAMI ALERT LEVEL ACCORDING TO SOURCE



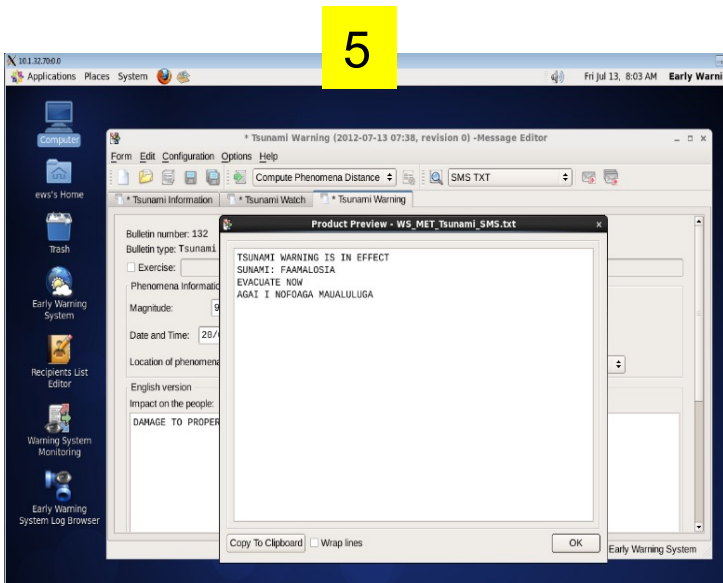
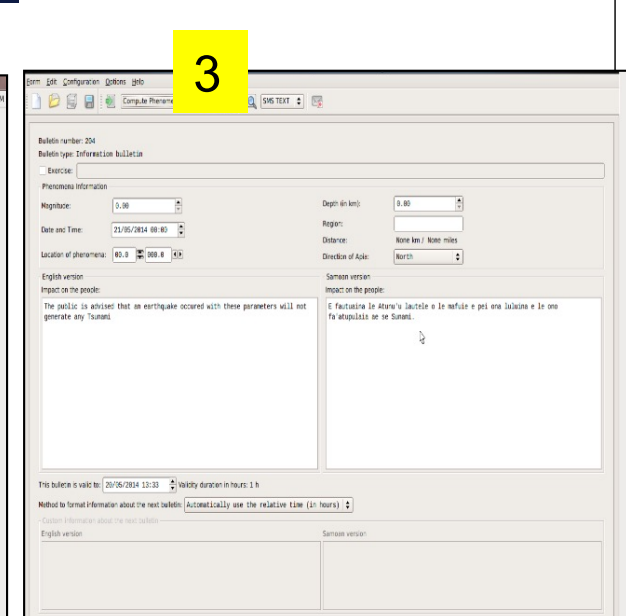
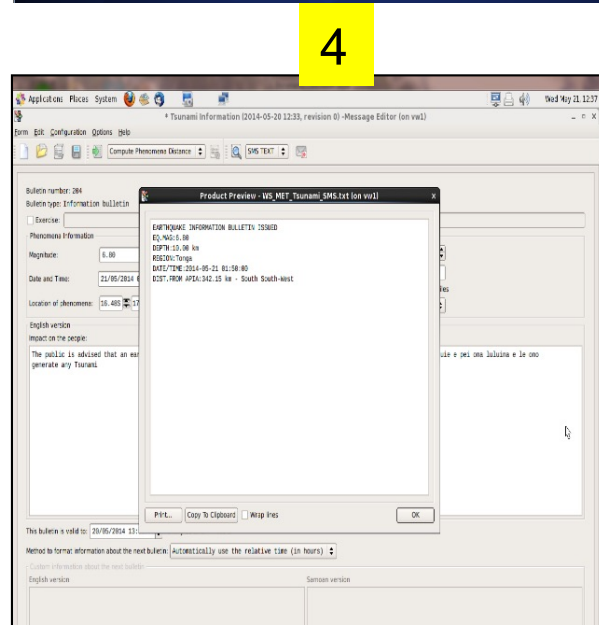
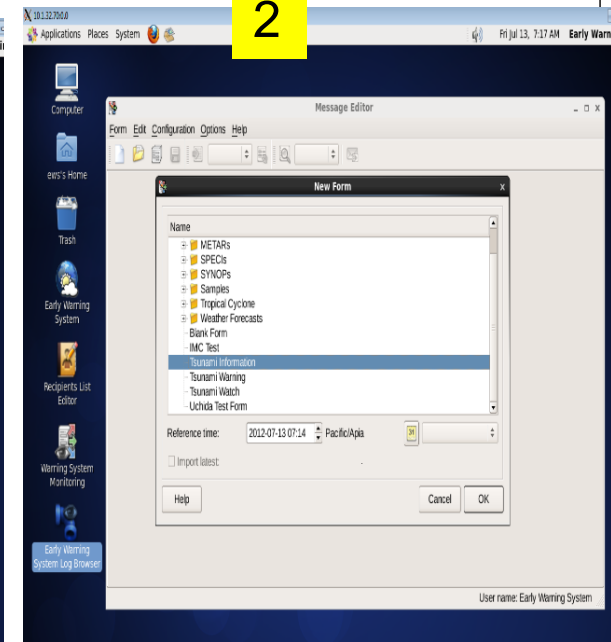
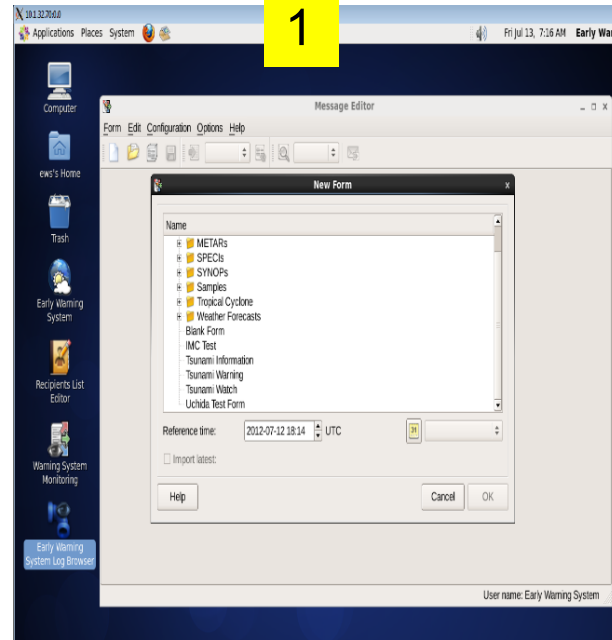
LOCAL EVENTS (0-300km)

REGIONAL EVENTS (0-300km)



Tsunami Monitoring System

GEOPHYSICS TEAM



Tsunami Information & Advisory Bulletins.

SAMOA METEOROLOGY
DIVISION

SPECIAL TSUNAMI BULLETIN

ISSUED AT _____ DATE:
_____ 2023

INFORMATION BULLETIN

An earthquake with magnitude _____
_____ occurred in the _____
islands region, approximately _____
_____ km
_____ of Apia.

**The public is advised that an
earthquake will not generate any
tsunami.**

SAMOA METEOROLOGY DIVISION

SPECIAL TSUNAMI BULLETIN _____

ISSUED AT _____

TSUNAMI ADVISORY

An earthquake with magnitude _____
occurred in the _____ islands region,
approximately _____ km of
Apia.

The public is hereby advised that the above
earthquake has generated
a(height) tsunami wave in
theIslands. This wave is expected
to weaken by the time it reaches the Samoa
Islands.

**Due to effect of high tide all people
living on the low-lying coastal areas are
advised to take extra precaution.**

The next Tsunami Bulletin will be issued
within the next 30 minutes, or sooner if
warranted.

Tsunami Watch & Warning Bulletins

SAMOA METEOROLOGY DIVISION

SPECIAL TSUNAMI BULLETIN _____

ISSUED AT _____ DATE: _____
_____ 2023

TSUNAMI WATCH

An earthquake with magnitude _____
occurred in the _____ islands
region, approximately _____
_____ km _____
_____ of Apia.

**The public is advised that a TSUNAMI
WATCH is in effect for all Samoan
low-lying coastal areas.**

**All people living on low-lying coastal
areas are advised to take precaution
and standby for further updates.**

The next Tsunami Bulletin will be issued within
the next hour, or sooner if warranted.

SAMOA METEOROLOGY DIVISION

SPECIAL TSUNAMI BULLETIN _____

ISSUED AT : _____ DATE: _____
_____ 2023

TSUNAMI WARNING

An earthquake with magnitude _____ occurred in
the _____ islands region, approximately _____
_____ km _____
of Apia.

PUBLIC SAFETY

**The public is advised that a TSUNAMI WARNING is in
effect for all Samoan low-lying coastal areas.**

**All people living on low-lying coastal areas and in the
lagoon area are advised to leave everything and
evacuate to higher designated grounds
IMMEDIATELY.**

**All mariners are advised to move further out into
deep waters**

**All are also advised to inform as many people as
possible of this warning.**

The next Tsunami Bulletin will be issued within the next hour,
or sooner if warranted.

Tsunami Watch/Warning Cancellation

SAMOA METEOROLOGY
DIVISION

SPECIAL TSUNAMI BULLETIN

ISSUED AT _____

DATE: _____ 2023

TSUNAMI WATCH/WARNING CANCELLATION

The public is hereby advised that the TSUNAMI WATCH/WARNING which was in effect for all Samoan low-lying coastal waters has now been CANCELLED.

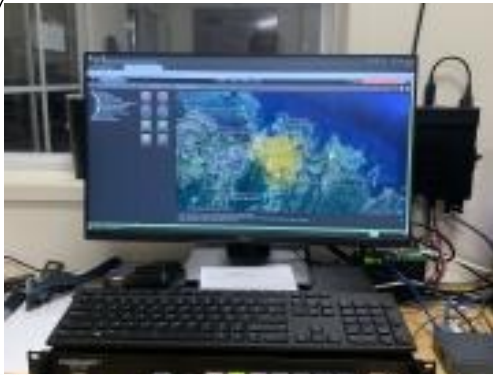
REPEAT: The Tsunami Watch/Warning which was in effect for all Samoan low-lying coastal waters has now been CANCELLED.

The public is advised that it is now safe to return to your homes as the threat is over.

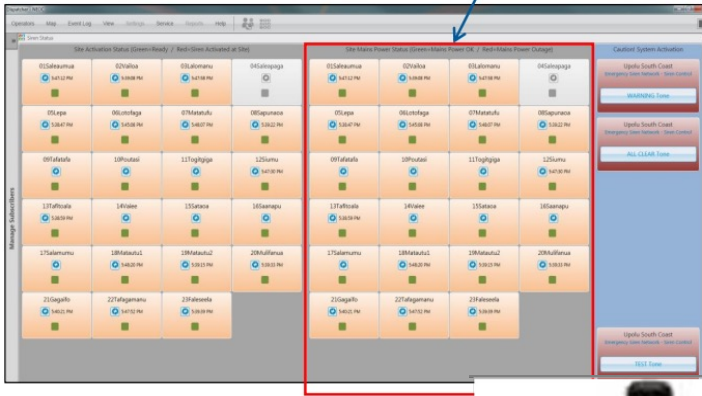


NDMO
Activate the
Emergency Siren
Network-
CANCELLATION
TONE!!!

Emergency Siren Network Installed



Site Mains Power Status panel

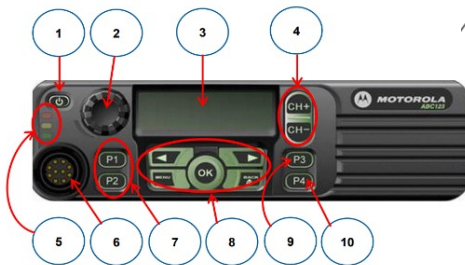


Each siren is represented by a single tile:



- A **green** light indicates that the mains power is okay.
- A **red** light indicates that there is a mains power failure.

Backup System



Emergency Siren Network



EPC Poles

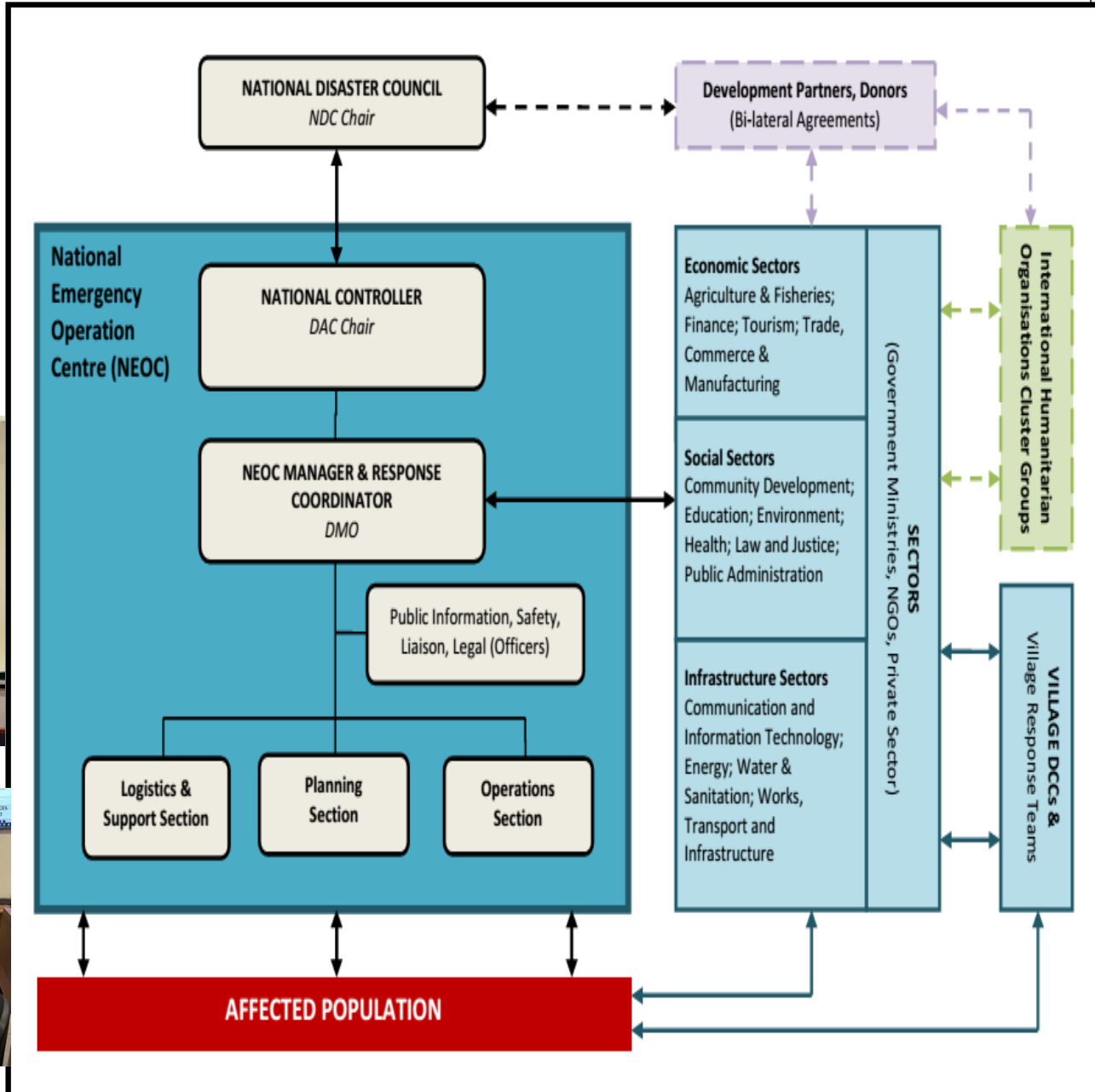
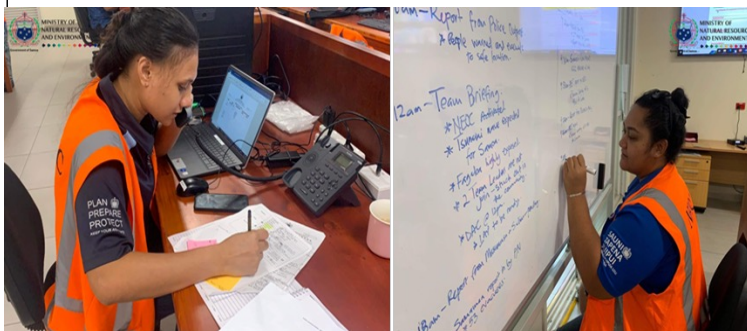


Steel- Tripods



Churches

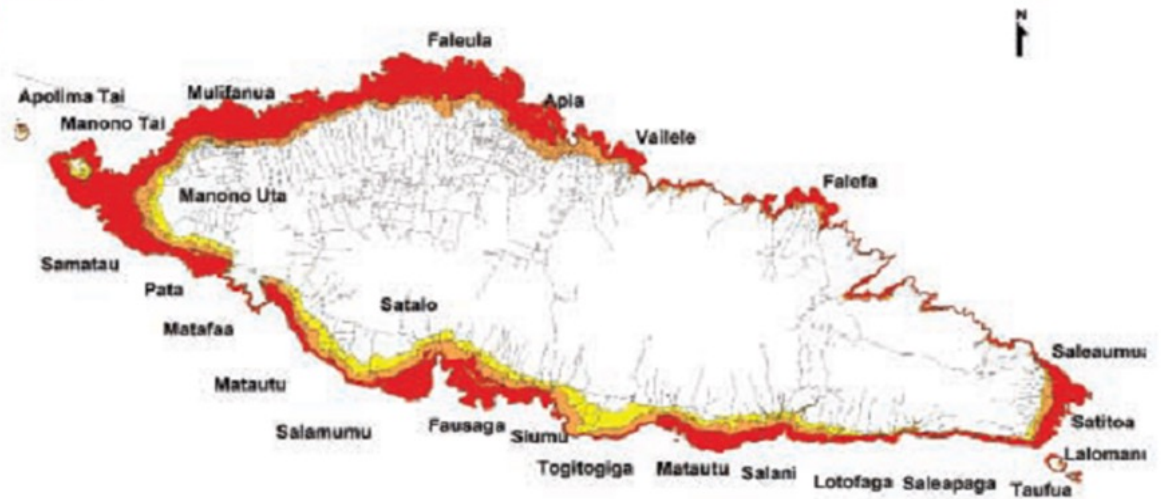
NEOC- Activation & Coordination of Response



National Preparedness- Hazard Mapping



SAMOA TSUNAMI HAZARD ZONES MAP



Red – highest level of threat, people within the red zone needs to evacuate as soon as warning is issued despite the tsunami source, that is whether it is generated from a local earthquake or distant source, like in Japan, Chile.

Orange - this zone is expected to be affected by either local source tsunami or tsunamis that are caused by local earthquakes i.e. Tongan Trench and also by some very big distant tsunamis similar to Japan.

Yellow - this is expected to be potentially affected or inundated due to a local tsunami based on modeling and mapping completed for whole coast of Samoa, establishing a yellow zone in the North part of Samoa is not necessary.

Safe Zone – zone outside of the Red, Orange and Yellow zones showed on the maps.

Tsunami Hazard Zones:

- Yellow
- Orange
- Red

CDCRM Program & School Drills



VILLAGE RESPONSE TEAM



- LEGEND**
- Tsunami Evacuation Zones Final
 - red zone
 - orange zone
 - yellow zone
 - Schools covered by CDCRM
 - SBS_Village
 - CDCRM completed
 - SBS Villages — SBS_Village

0 7.5 15 km

PACWAVE Simulations

2017- Operational Drill @Village
Agencies- Tabletop

2022- Operational Drill @ Village,
NEOC & MET- Tabletop



- 2008- Operational drill
- 2011- Tabletop Exercise
- 2014- Table top (Tonga, Fiji & Samoa)
- 2018- Operational drill.
- 2019- Ex- National Wave (operational @ Village, NEOC- Tabletop)

CHALLENGES

- **Geophysics**
 - Short staff
 - Spare parts not available in country for the reviving system
 - No proper or enough instruments to collect data and information on ongoing seismic activities locally.
- **NDMO**
 - Staff turn over
 - Specs of the Sirens are not suitable
 - All programs/activities are donor/project driven

WAY FORWARD

- National Disaster Management Plan currently under review.
- MET & DMO to review the National Tsunami Response Plan.
- Tsunami Day- SIMEX in November 2023.
- CDRM Program continues.
- Tsunami signage to be installed.
- ITIC refresher training.

For any other information please
google it.
Thank you in advance.