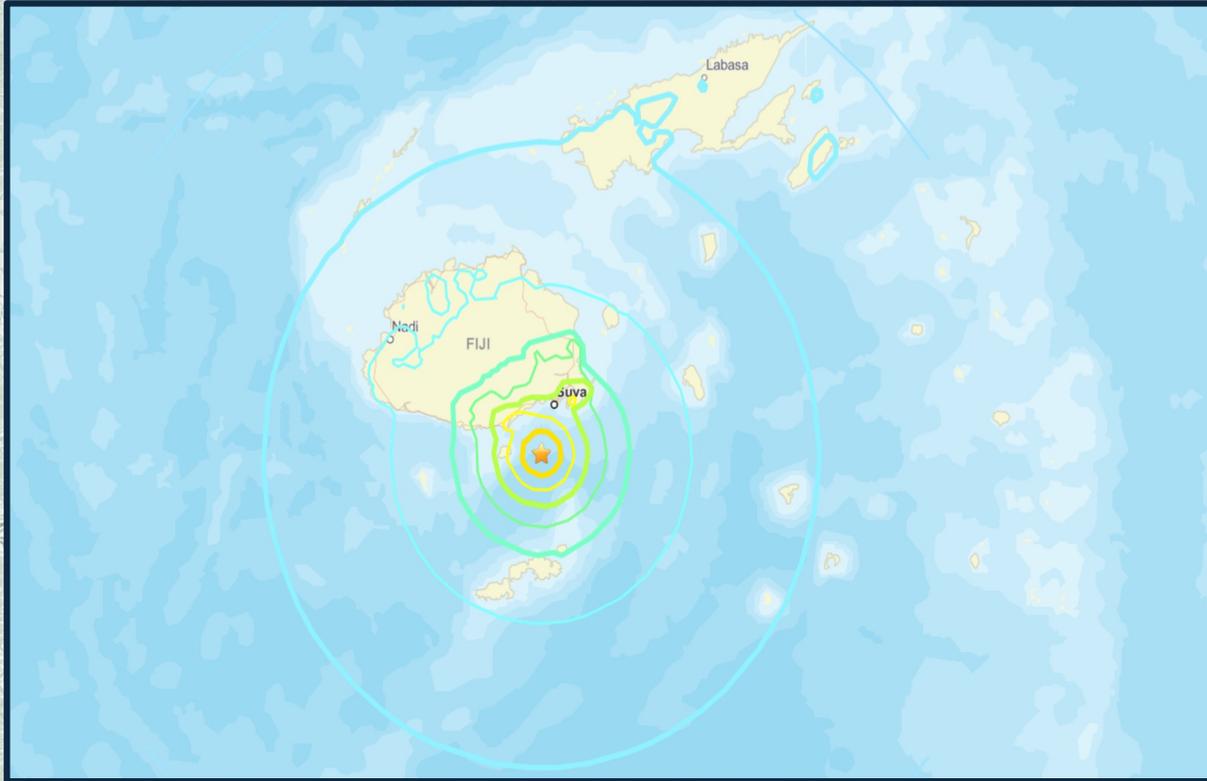


# FIJI TSUNAMI MITIGATION EFFORTS, TSUNAMI STANDARD OPERATING PROCEDURES AND PLANS FOR TSUNAMI READY

Presenter: Filimone Rokoiri (Technical Assistant)

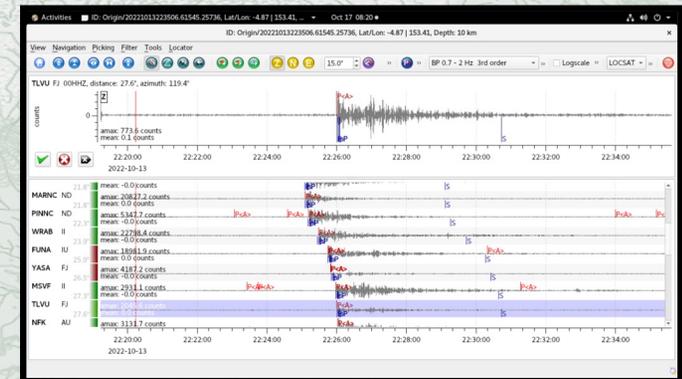




- **1953: A 6.7M earthquake occurred near Suva, off the southeast coast of Viti Levu, Fiji's largest island. causing a tsunami along its coastlines.**

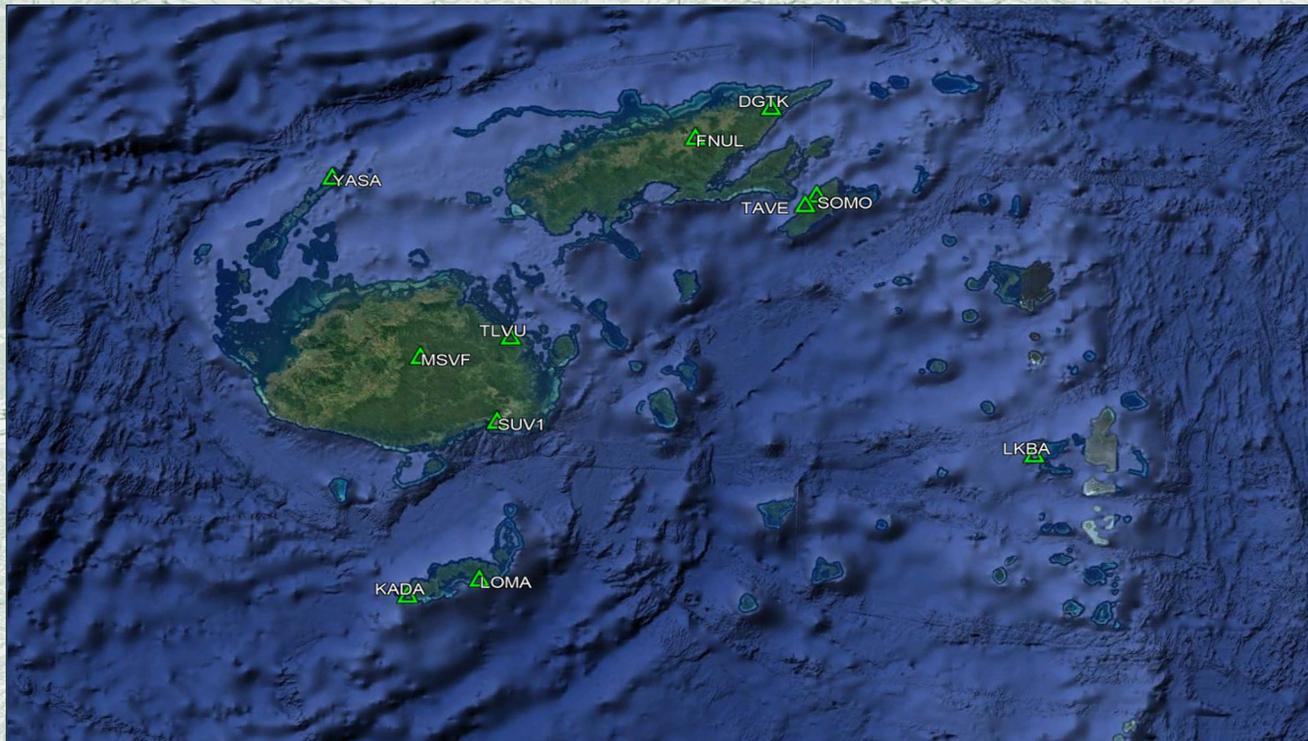
## SEISMOLOGY SECTION

- 24/7 monitoring of earthquakes and tsunamis
- Currently 9 VSAT seismic stations transmitting real time data to our Suva hub.
- Waveforms are analyzed in software's such as Seiscomp and Swarms
- The Fiji Network shares data with other SW Pacific countries through the Oceania Regional Seismic Network (ORSNET) which also contributes to our monitoring capabilities.



# EARLY WARNING SYSTEMS

## FIJI SEISMOLOGY NETWORK



### Location:

1. Lakeba (LKBA)
2. Taveuni (TAVE)
3. Dogotuki (DGTI)
4. Kadavu (KADA)
5. Yasawa (YASA)
6. Tailevu (TLVU)
7. Monasavu (MSVF)
8. Labasa (FNUL)
9. Suva (SUV1)

## EARLY WARNING SYSTEMS

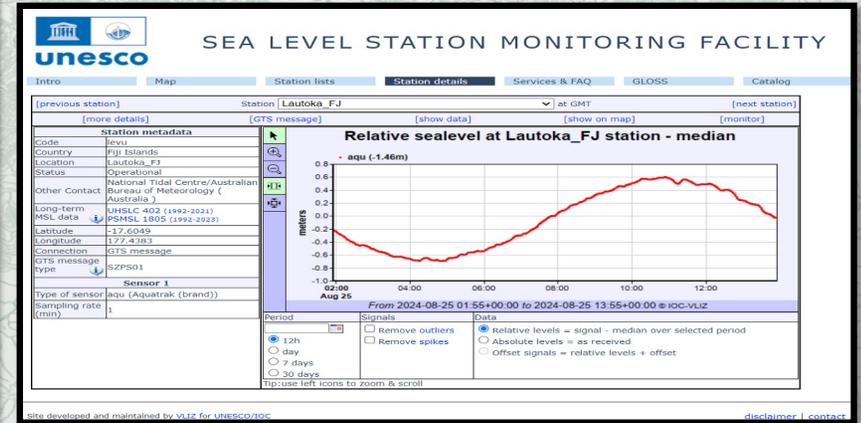
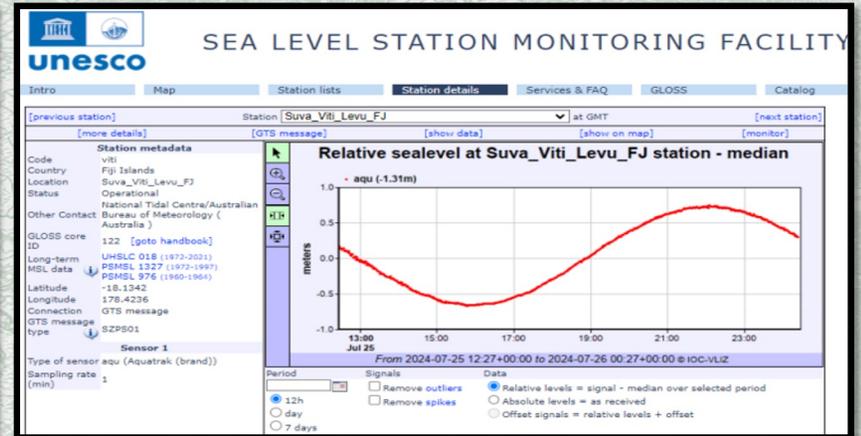
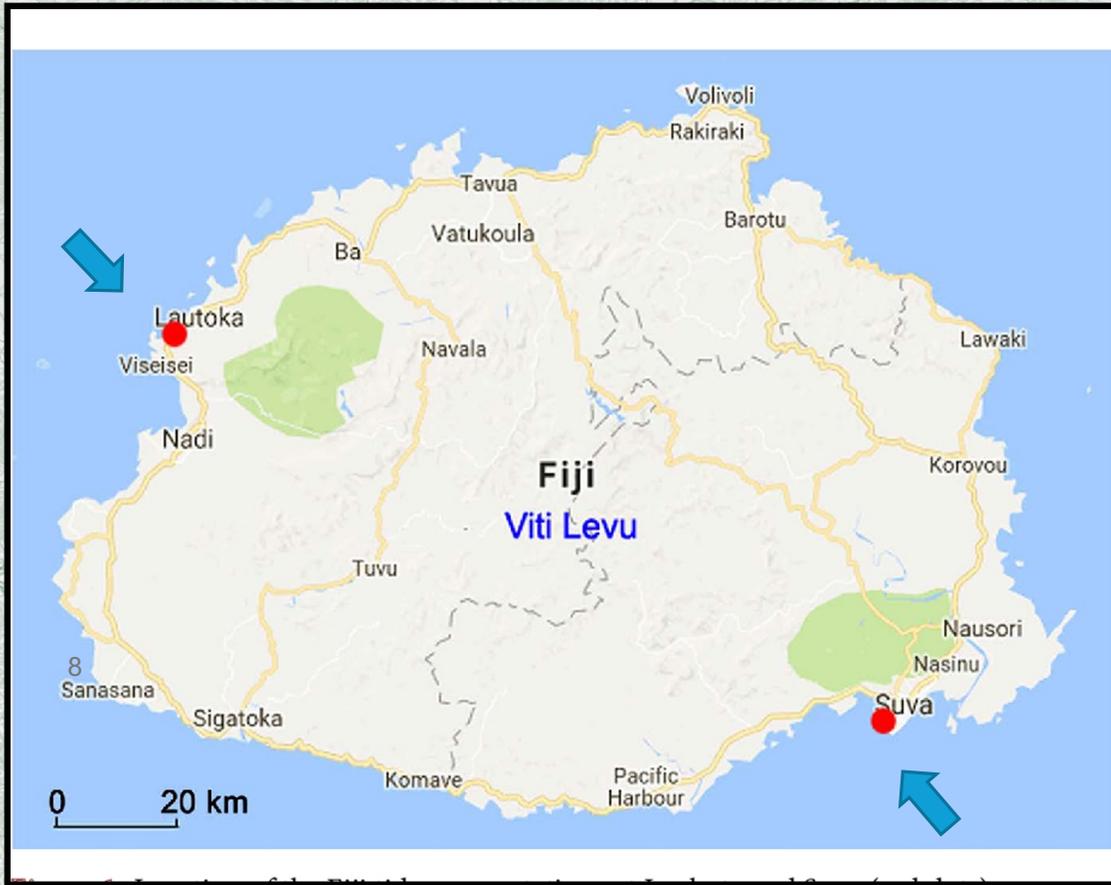


### Under the USGS Volcano Disaster Assistance Programme (VDAP) Stations

1. Lomati, Kadavu (LOMA)
2. Somosomo, Taveuni (SOMO)



# FIJI TIDE GAUGE NETWORK



# SEA LEVEL MONITORING

**PTWC Bulletin via email**

The screenshot shows an email from NOAA regarding a PTWC (Pacific Tsunami Warning Center) tsunami information statement. The email text includes: "PTWC TSUNAMI INFORMATION STATEMENT...", "THIS STATEMENT IS ISSUED FOR INFORMATION ONLY IN SUPPORT OF THE UNESCO OCEAN PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEM AND IS NEARLY FOR NATIONAL AUTHORITIES IN EACH COUNTRY OF THAT SYSTEM...", and "PRELIMINARY EARTHQUAKE PARAMETERS: MAGNITUDE 7.6, TIME 05:17:00 UTC JUN 25 2024, COORDINATES 16.03 SOUTH 174.8 WEST, DEPTH 16.03 21 MILES, LOCATION NEAR THE COAST OF CENTRAL PERU".

**SEA LEVEL STATION MONITORING FACILITY**

Station: **Suva\_Viti\_Levu\_FJ** at GMT

**Station metadata:**  
 Code: VFI  
 Country: Fiji Islands  
 Location: Suva\_Viti\_Levu\_FJ  
 Status: Operational  
 Other Contact: National Tidal Centre/Australian Bureau of Meteorology (Australia)  
 GLOSS core ID: 122 [goto handbook]  
 Long-term ID: UHSLC 018 (1972-2021)  
 MSL data: PMSL 1327 (1972-1997), PMSL 976 (1960-1964)  
 Latitude: -18.1342  
 Longitude: 178.4226  
 Connection: GTS message  
 GTS message type: SZPS01  
 Sensor: Sensor 1 (Aquatrak (brand))  
 Sampling rate (min): 1

**Relative sealevel at Suva\_Viti\_Levu\_FJ station - median**  
 - agu (-1.31m)  
 From 2024-07-25 12:27+00:00 to 2024-07-26 00:27+00:00 @ IOC-VLIZ

The graph shows a tidal cycle with a peak around 21:00 and a trough around 15:00. The y-axis is labeled 'meters' and ranges from -1.0 to 1.0.

**Tsunami Tide Tool**

The interface shows a map of the Pacific Ocean with numerous colored markers (red, yellow, green, blue) representing tide gauges. At the bottom, there are controls for '24 Hours', 'No message for 24 hours', and coordinates: 'Lat: 172.836', 'Etl: 00.130', 'Lat: -62.763', 'Rd: 3.6'. Buttons for 'NO STATION', 'CLEAR IP', 'CLEAR TL', and 'EXIT' are visible.

**NATIONAL DATA BUOY CENTER**  
 NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION

Station ID Search: [ ] Go Station List

View the latest observations near East Pacific Tropical Storm Bud.

Recent Data | Historical Data | Show Labels

Program Filter:  NDBC Meteorological/Ocean,  International Partners,  IGOOS Partners

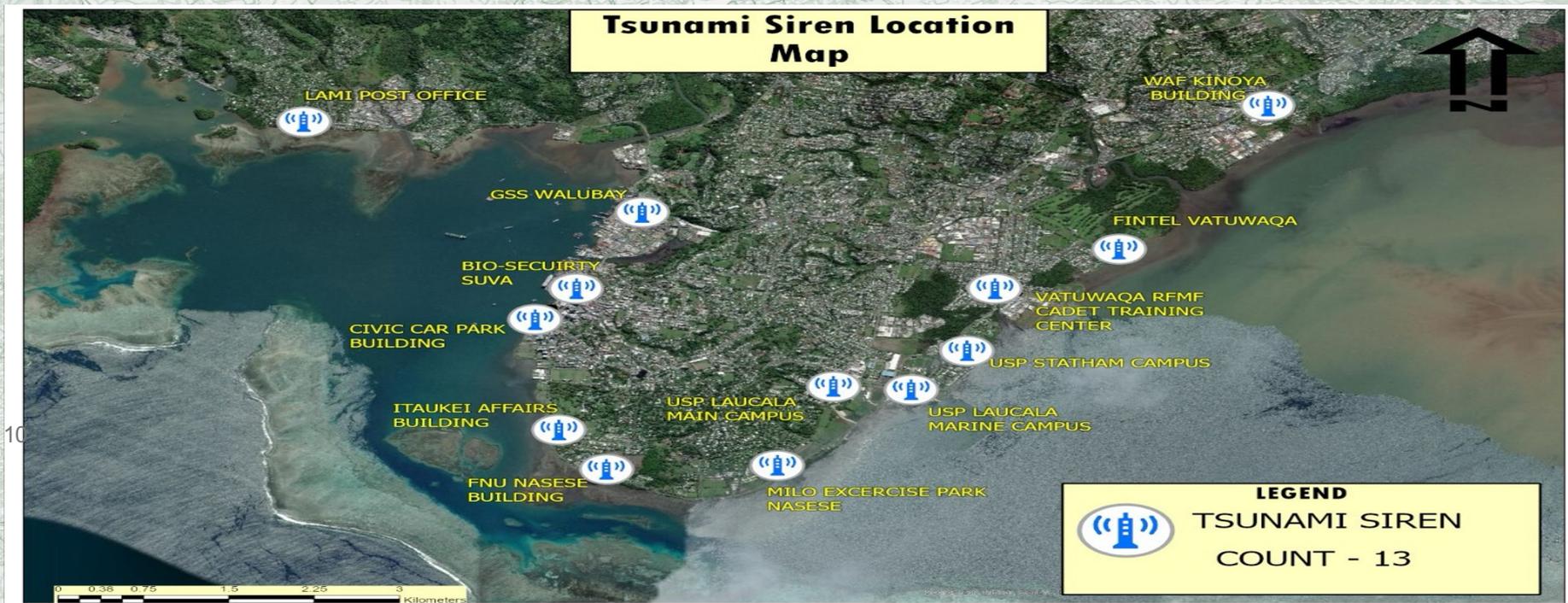
Owner Filter:  NDBC,  Australian Bureau of Meteorology,  Cooperative Effort DART 4G

Map showing stations with recent data (red diamonds) and historical data only (yellow diamonds). A graph for Station 5501006 shows 'Water Column Height at Station 5501006' from 07/22 00 GMT to 07/26 15 GMT.

74 stations deployed  
 56 have reported in the past 8 hours

# EARLY WARNING SYSTEMS

## FIJI TSUNAMI SIREN NETWORK

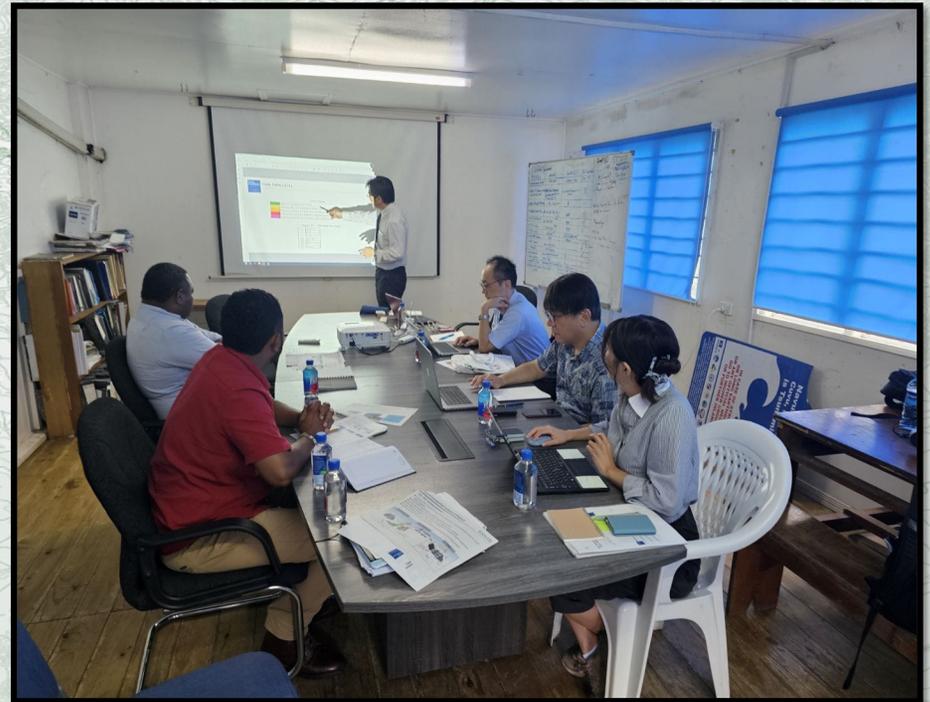




- **Tsunami Siren Test** conducted on the 5<sup>th</sup> of every month.(MRD and NDRMO)
- **Tsunami Siren maintenance (NDRMO)**

# EARLY WARNING SYSTEMS

Cooperation on Emergency Warning Satellite Service (EWSS)



## COMMUNITY AWARENESS AND EDUCATION



- Seismology section conducts awareness campaigns in schools and villages.
- Tsunami awareness messages and materials are posted on social media.
- Tsunami Drill and simulation exercise are conducted to help communities practice response action.

# COMMUNITY AWARENESS AND EDUCATION Cont'd

- ▶ Earthquake and Tsunami Awareness Outreach- Target areas (50) - coastal communities.
- ▶ World Tsunami Awareness Day (5<sup>th</sup> November):
  - Commemoration Program
  - Tsunami Evacuation Exercise Drill
- ▶ IOC-UNESCO Tsunami Ready Recognition Program [TRRP] (Educational Awareness, Training and Workshops, Exercise Drill, and Tsunami Signage Installation):
  - ▶ Recognized communities:
    - Sila, Cuvu, Nadroga.
    - Navuevu, Cuvu, Nadroga.



*Live Tsunami Drill for Korova settlement and the Nasese school cluster*

# LOCAL, REGIONAL & INTERNATIONAL COLLABORATION

## International

- ▶ JICA/ SATREPS PROJECT: Volcanic Hazards in Southwest Pacific Countries (Vanuatu-Fiji-Tonga)
- ▶ USGS : Additional Seismic Stations and Trainings.
- ▶ PTWS : Active Participation in ongoing risk assessments and early warning improvements.
- ▶ UNESCO-IOC – Tsunami Ready Recognition Program (TRRP)- Ongoing.
- ▶ CTBTO/IRIS/IDA- Technical Training and Maintenance of Auxiliary Station in Monasavu- Ongoing.

## Regional

- ▶ SPC (BSRP II) - Oceanic Regional Seismic Network (ORSNET), Spare Tool for Seismic Station Maintenance.



*JICA/SATREPS Collaboration on Volcanic Hazards in the Southwest Pacific Countries*



*SPC (BSRP II) collaboration on new Seismology equipment*

## Local, Regional & International Collaboration – Cont.'s

### Local (Relevant Stakeholders) :

- ▶ National Disaster Risk Management Office (NDRMO)- Ongoing coordination and support for national-level disaster preparedness.
- ▶ Live n Learn- Community-based awareness initiatives in partnership
- ▶ Plan International - Engaging communities for long-term risk reduction strategies.
- ▶ Partners in Community Development Fiji- Continuing grass root efforts for community-level disaster preparedness.



# FIJI TSUNAMI SOP

Ministry of Lands and Mineral Resources

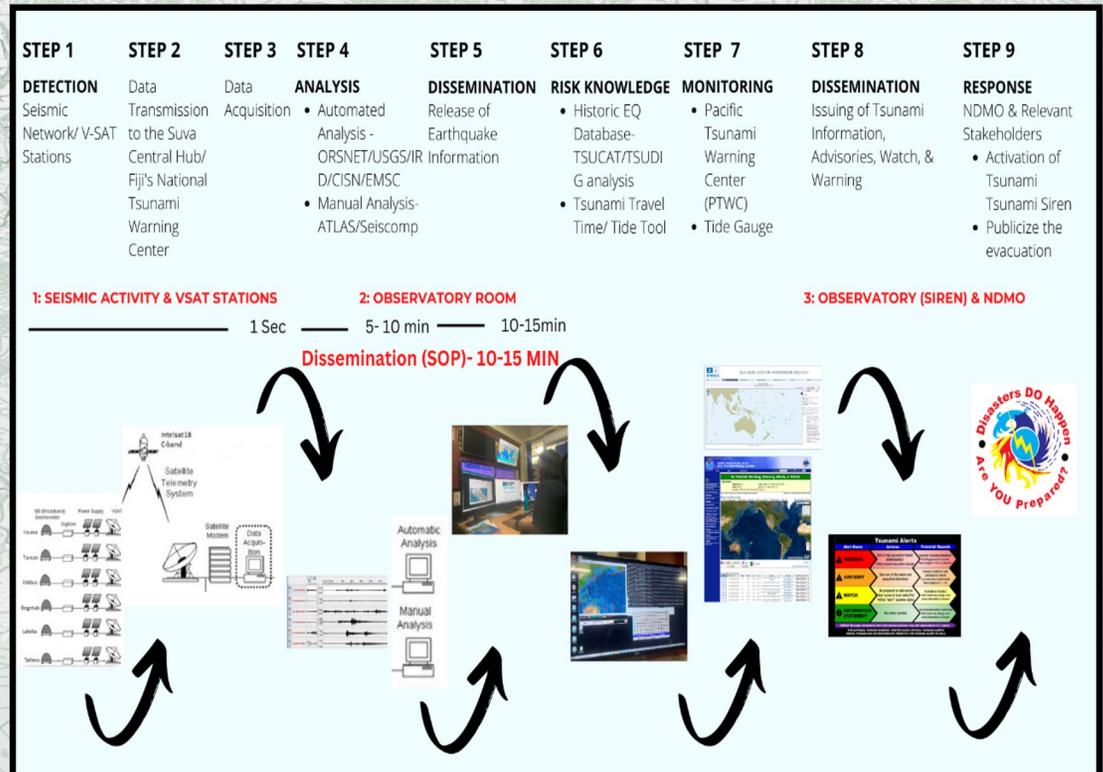
## Standard Operational Procedures for the Issuance of Tsunami Warning/Advisory in Fiji

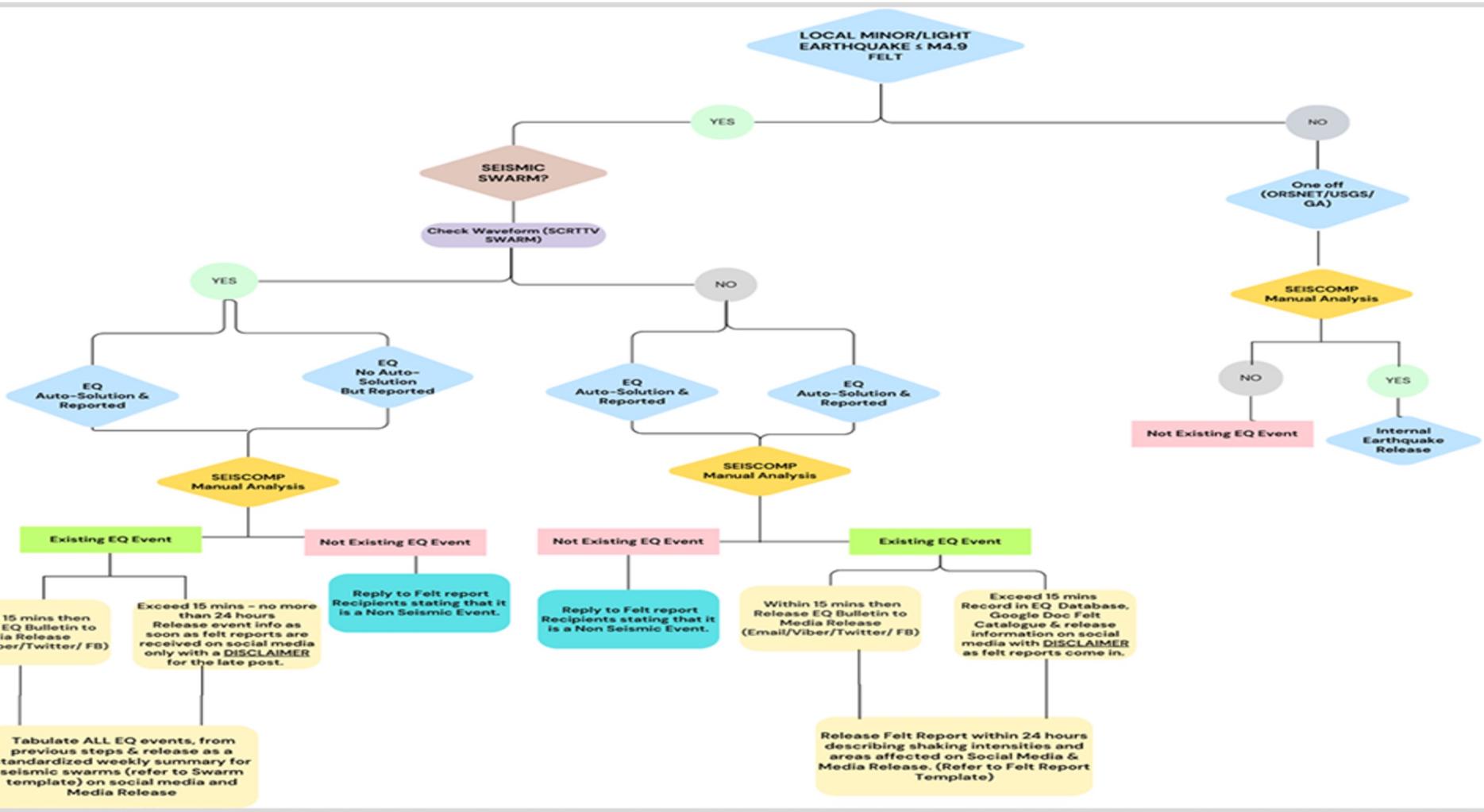
Fiji National Tsunami Warning Center

	Compiled by	Examined by	Approved by	Version
Name	Saula Mule	Raksha Rani	Ilaitia Dokonivalu	2024.003
Date	31/07/24	31/07/24	31/07/24	
Signature				

Copy of Tsunami SOP

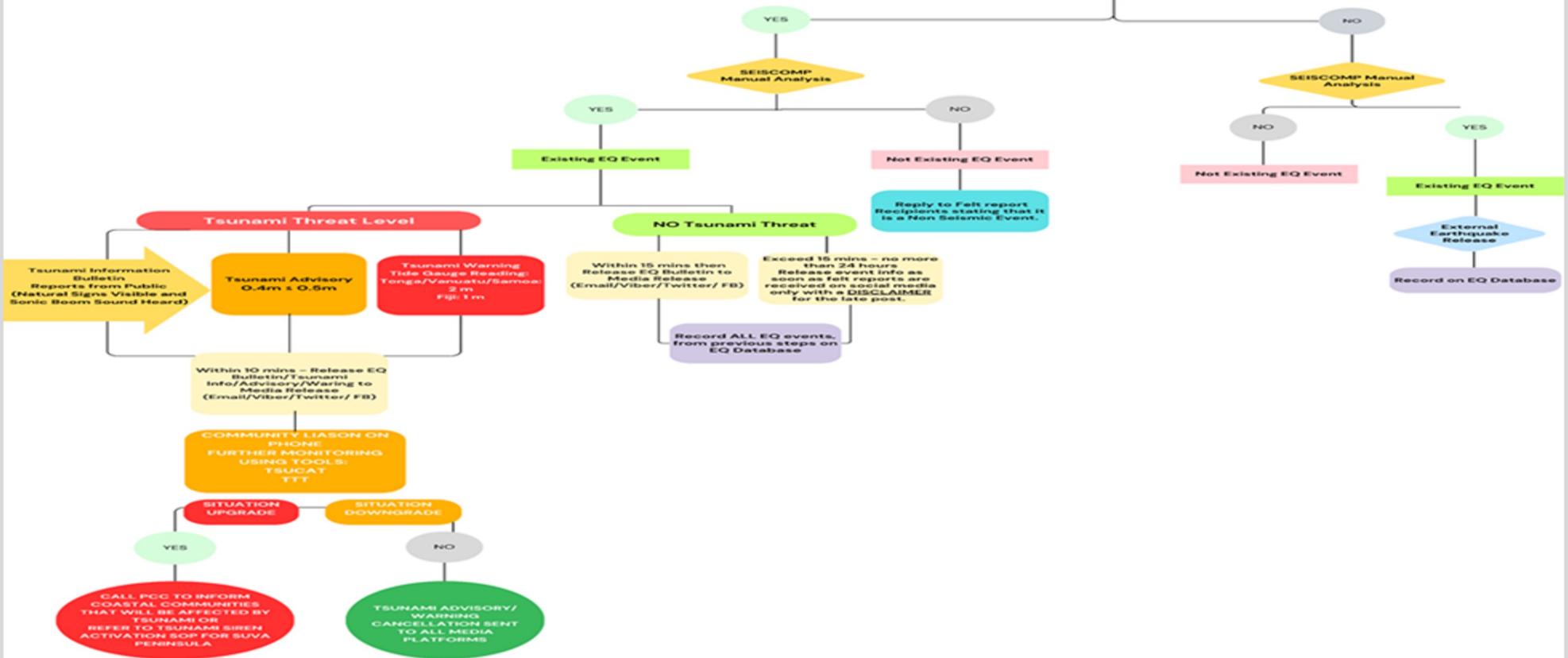
## Tsunami SOP for a major seismic event





# STRONG

**STRONG EARTHQUAKE  
M6.0-6.9  
FELT**



# Alert Criteria Table

REGIONAL AND DISTANT TSUNAMI THRESHOLD TABLE

FUJI REGIONAL AND DISTANT THRESHOLD TABLE									
TSP Product PTWC Threat messages	EQ Parameters (Seismic Monitoring Programs/Networks) Clarify Felt/Not Felt	Wave Amplitude/ Height Refer to Residual wave height on BOM Real Time Data Display & IOC Sea level Monitoring Facility// Tide Tool	Tide Level (Alm anac Tide Table )	Wave ETA (PTWC & Tide Tool)	Possible Tsunami Threat (Review of Tsunami Source and Wave Paramet ers)	NTWC Action / PTWC Information	Tsunami Threat Level	Template to Use	Response Action (NDMO)
No Product	$ML \leq 5.0$	No activity on the tide gauge network			No	Issue of Earthquake Information	No immediate tsunami threat expected	EARTHQUAKE INFORMATION Viber, FB, Twitter & SMS Messages, only insert EQ Parameters	No response action Internal COMM T
Tsunami Information Statement	$5.0 \leq Mw/ML \leq 6.0$ $0 \leq \text{Depth} \leq 100\text{km}$	$\leq 0.3\text{m}$ Local Zone (Port Villa, Nuku'alofa, Leava, Suva, Lautoka) $\geq 0.3\text{m}$ (North) Nauru, Betio, Kanton, Fongafale, Mata-Utu $\geq 0.3\text{m}$ (South) Raoul, Norfolk, North Cape $\geq 0.3\text{m}$ (East) Apia, Pagopago, Alofi, Raratonga, Huahine island, Papeete, Vairao, Tubuai, $\geq 0.3\text{m}$ (West) Tarekukure, Honiara, Lata, Luganville, Litzlitz, Loyalty Islands, Lifou, Thio, Ouinne, Hienghene,	Low/ High		No	<ul style="list-style-type: none"> <li>Confirmation from PTWC messages</li> <li>Analysis and assessment of wave amplitude and wave travel time information (TTT, <del>TsuDig</del>, <del>TsuCat</del>, Tide Gauges)</li> <li>Earthquake magnitude Evaluation.</li> </ul>	No immediate tsunami threat expected  Alert level may change once more information is known	EARTHQUAKE & TSUNAMI INFORMATION Viber, FB, Twitter & SMS Messages, only insert Eq Parameters	No Action Needed

REGIONAL AND DISTANT TSUNAMI THRESHOLD TABLE

Tsunami threat message (Only North, South, East & West H $\geq 0.3m$ )	$\leq 0.4$ Local Zone (Port Villa, Nuku'alofa, Leava, Suva, Lautoka)	Confirmation from PTWC messages Analysis and assessment of update information (TTT, <u>TsuDig</u> , <u>TsuCat</u> , Tide Gauges)	Expected Tsunami threat is low  Alert level may change once more information is known	TSUNAMI WATCH, Viber, FB, Twitter & SMS Messages, only insert <u>Eg</u> Parameters	Be Prepared to take Stay tuned to local  Internal Comms TE
	$\geq 0.3m - 1m$ (North) Nauru, Betio, Kanton, Fongafale, Mata-Utu				
	$\geq 0.3m - 1m$ (South) Raoul, Norfolk, North Cape				
	$\geq 0.3m - 1m$ (East) Apia, Pagopago, Alofi, Raratonga, Huahine island, Papeete, Vairao, Tubuai,				
	$\geq 0.3m - 1m$ (West) Tarekukure, Honiara, Lata, Luganville, Litzlitz, Loyalty Islands, Lifou, Thio, Ouinne, Hienghene				

REGIONAL AND DISTANT TSUNAMI THRESHOLD TABLE

<p>Tsunami threat message ; North H <math>\geq 0.3m</math> South H <math>\geq 1m</math> East H <math>\geq 1m</math> West H <math>\geq 1m</math></p>		<p>Local Zone <math>&gt;0.4m &lt;0.5m</math> (Suva, Lautoka) <math>\geq 1m \leq 1.5m</math> (Port Villa, Nuku'alofa, Leava) <math>\geq 0.3m</math> (North) Nauru, Betio, Kanton, Fongafale, Mata-Utu <math>\geq 1m</math> (South) Raoul, Norfolk, North Cape <math>\geq 1m</math> (East) Apia, Pagopago, Alofi, Raratonga, Huahine island, Papeete, Vairoa, Tubuai, <math>\geq 1m</math> (West) Tarekukure, Honiara, Lata, Luganville, Litzlitz, Loyalty Islands, Lifou, Thio, Ouinne, Hienghene</p>				<p>Issue of Tsunami Advisory/Tsunami Marine Warning</p>	<p><b>Expected Tsunami Threat level is Low/medium/High</b></p> <p>Be on standby and alert for the next available updates and stay tune to local media channel for further updates.</p>	<p><b>TSUNAMI ADVISORY/ TSUNAMI MARINE WARNING</b></p>	<p>All residents of coastal areas to the water and the shore due currents and waves.</p>
<p>Tsunami information statement</p>	<p><math>6.1 \leq Mw/ML \leq 6.9</math> <math>0 \leq \text{Depth} \leq 100km</math></p>	<p><math>\leq 0.3m</math> Local Zone (Port Villa, Nuku'alofa, Leava, Suva, Lautoka) <math>\geq 0.3m</math> (North) Nauru, Betio, Kanton, Fongafale, Mata-Utu</p>			<p>No</p>	<p>Confirmation from PTWC messages</p>	<p><b>Expected tsunami threat is Low.</b></p> <p>Alert level may change once more information is known</p>	<p><b>EARTHQUAKE &amp; TSUNAMI INFORMATION</b> Viber, FB, Twitter &amp; SMS Messages, only insert <b>Eq</b> Parameters</p>	<p>No Action Needed</p>

# FIJI TSUNAMI ALERT LEVEL TABLE

Warning Products	Alert Level	Public Action	Potential Hazard
Tsunami Information	Information Statement	No action required suggested at this time.	No threat or very distant event for which hazard had not been determined.
Tsunami Watch	Watch	Be prepared to take action. Stay tuned to local radio/TV	Tsunami Possible Alert Level may change once more information is known.
Tsunami Advisory	Advisory	Stay out of the water and away from the shore.	Strong currents and waves dangerous to those in or very near coastal waters.
Tsunami Warning	Warning	Move to high ground or inland immediately.	Dangerous coastal flooding and powerful currents.

## Tsunami Watch

**MINERAL RESOURCES DEPARTMENT  
SEISMOLOGY SECTION**

To : All Media Outlets Date: 17/10/2023  
From : Seismology Section Time: 09:45 AM  
Subject : Tsunami Watch Message 1  
Alert Level: Tsunami Watch

**FOR EXERCISE PURPOSES ONLY**

THIS STATEMENT IS ISSUED FOR A TSUNAMI WATCH ONLY AND CURRENTLY APPLIES TO ALL COASTAL LOW LYING AREAS OF FIJI ESPECIALLY FOR NAWA, SERUA AND THE WESTERN DIVISION.

WE ADVISE THE PUBLIC AND PARTICULARLY ALL RESIDENTS ON LOW LYING COASTAL AREAS TO TAKE NECESSARY PRECAUTION AND BE ON STANDBY FOR ANY FURTHER AVAILABLE UPDATES.

WE ALSO ADVISE THE PUBLIC TO STAY TUNE TO LOCAL MEDIA CHANNEL FOR FURTHER UPDATES.

THE SEISMOLOGY SECTION OF MRD WILL CONTINUE TO MONITOR THE SITUATION DURING THIS TIME UNTIL THE THREAT IS OVER.

A GREAT EARTHQUAKE HAS OCCURRED WITH VERIFIED PARAMETERS:

Description	
Time/Date: 17/10/23 09:41 AM	Time Depth: 10 km
Magnitude: 8.1 Mw	Longitude: 173.89°W
Depth: 10 km	Latitude: 19.22°S

**Tsunami Information**

- Tsunami Watch Period for Nawa, Serua and the Western Division

SEISMOLOGY SECTION  
MINERAL RESOURCES DEPARTMENT, FIJI  
PHONE: 3381611, 3389053, 3389053, 3389053, 3389053  
FAX: 3370039, 3383910

## Tsunami Advisory

**MINERAL RESOURCES DEPARTMENT  
SEISMOLOGY SECTION**

To : All Media Outlets Date: 17/10/2023  
From : Seismology Section Time: 09:45 AM  
Subject : Tsunami Advisory Message 1  
Alert Level: Tsunami Advisory

**FOR EXERCISE PURPOSES ONLY**

--- FIJI TSUNAMI ADVISORY STATEMENT ---

THIS STATEMENT IS ISSUED FOR A TSUNAMI ADVISORY AND CURRENTLY APPLIES TO ALL COASTAL LOW LYING AREAS OF FIJI ESPECIALLY THE LAO GROUP, SOUTHERN VANUALEU, NIKA BAY AND SANGANO.

WE ADVISE THE PUBLIC AND PARTICULARLY ALL RESIDENTS ON LOW LYING COASTAL AREAS TO STAY OUT OF THE WATER AND AWAY FROM THE SHORE DUE TO STRONG CURRENTS AND DANGEROUS WAVES.

WE OR STANDBY AND ALERT FOR THE BEST AVAILABLE UPDATES AND STAY TUNE TO LOCAL MEDIA CHANNEL FOR FURTHER UPDATES.

THE SEISMOLOGY SECTION OF MRD WILL CONTINUE TO MONITOR THE SITUATION DURING THIS TIME UNTIL THE THREAT IS OVER.

A GREAT EARTHQUAKE HAS OCCURRED WITH VERIFIED PARAMETERS:

Description		Location	
Time/Date: 17/10/23 10:00 AM	Magnitude: 8.1 Mw	Longitude: 173.89°W	Latitude: 19.22°S
Depth: 10 km			

**Tsunami Information**

- Tsunami Advisory Period for the Fiji Group.

SEISMOLOGY SECTION  
MINERAL RESOURCES DEPARTMENT, FIJI  
PHONE: 3381611, 3389053, 3389053, 3389053, 3389053  
FAX: 3370039, 3383910

## Tsunami Warning

**MINERAL RESOURCES DEPARTMENT  
SEISMOLOGY SECTION**

To : All Media Outlets Date: 17/09/2023  
From : Seismology Section Time: 9:46 AM  
Subject : Tsunami Warning 1

**FOR EXERCISE PURPOSES ONLY**

A TSUNAMI WARNING IS IN PLACE FOR THE LAO GROUP, NIKA BAY AND SANGANO.

**VERIFIED EARTHQUAKE PARAMETERS**

A Tsunami has occurred with the following verified parameters:

Description	Location
Time/Date: 17/10/23 09:41 AM	Longitude: 173.89°W
Magnitude: 8.1 Mw	Latitude: 19.22°S
Depth: 10 km	

**EVALUATION**

Tsunami waves up to 3 meters above tide level may hit certain coastal areas.

**RECOMMENDED ACTIONS**

- Members of the public are advised to remain calm and follow safety tsunami procedures (Personal Prepared Plan).
- Those already on high grounds will remain where they are until advised otherwise.
- Stay tuned to radio broadcasts or other forms of media BROADCAST AND AUDIO VISUAL INFORMATION.
- The next message will be issued within an hour or sooner if the situation warrants.
- The Tsunami Warning will remain in effect until further notice.

SEISMOLOGY SECTION  
MINERAL RESOURCES DEPARTMENT, FIJI  
PHONE: 3381611, 3389053, 3389053, 3389053, 3389053  
FAX: 3370039, 3383910

## Tsunami Cancellation

**MINERAL RESOURCES DEPARTMENT  
SEISMOLOGY SECTION**

To : All Media Outlets Date: 17/10/2023  
From : Seismology Section

**Subject: TSUNAMI CANCELLATION MESSAGE**

THE MINERAL RESOURCES DEPARTMENT - SEISMOLOGY OBSERVATORY HAS CONFIRMED ISSUING CANCELLATION AT 11:32 AM 17/10/2023.

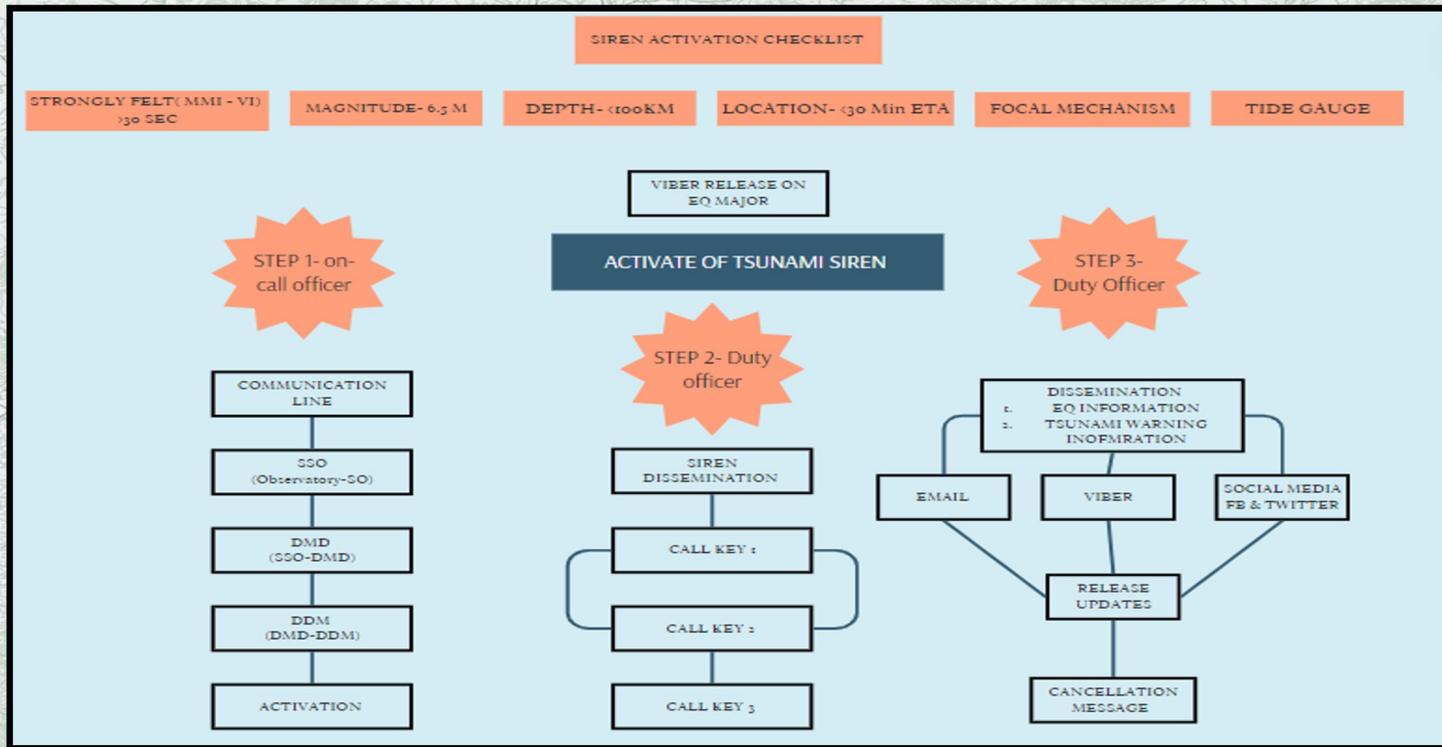
THIS BULLETIN IS FINAL AND IS ISSUED TO INFORM THE PUBLIC IN GENERAL ESPECIALLY COASTAL COMMUNITIES OF FIJI THAT THE TSUNAMI WARNING/ADVISORY/WATCH INFORMATION IS OVER AND IS NOW CANCELLED.

THE SEISMOLOGY OBSERVATORY (MRD) UPON ITS ASSESSMENTS HAS NOW VERIFIED AND CONFIRMED THE CANCELLATION OF THE WARNING/ADVISORY/WATCH INFORMATION ISSUED TO THE WHOLE FIJI GROUP.

THE PUBLIC IS NOW ADVISED TO AWAIT INSTRUCTIONS FROM MRD FOR ALL CLEAR INFORMATION BEFORE RETURNING TO LOW OR COASTAL AREAS. PUBLIC IS ALSO ADVISED TO REMAIN VIGILANT AS AFTERSHOCKS ARE EXPECTED TO OCCUR ALONG THE EARTHQUAKE SOURCE ZONES.

SEISMOLOGY SECTION  
MINERAL RESOURCES DEPARTMENT, FIJI  
PHONE: 3381611, 3389053, 3389053, 3389053, 3389053  
FAX: 3370039, 3383910

# SIREN ACTIVATION SOP



# FIJI TSUNAMI READY PROGRAMME





**MINISTRY OF LANDS AND MINERAL RESOURCES  
DEPARTMENT  
241 MEAD ROAD NABUA  
SUVA  
PHONE: 3381611**

*THANK YOU / VINAKA VAKALEVU*