ITP-TEWS Hawaii
Presented by:

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ITIC-CAR, HAWAII, HONOLULU

HONDURAS
GOBIERNO DE LA REPÚBLICA

COPECO HONDURAS

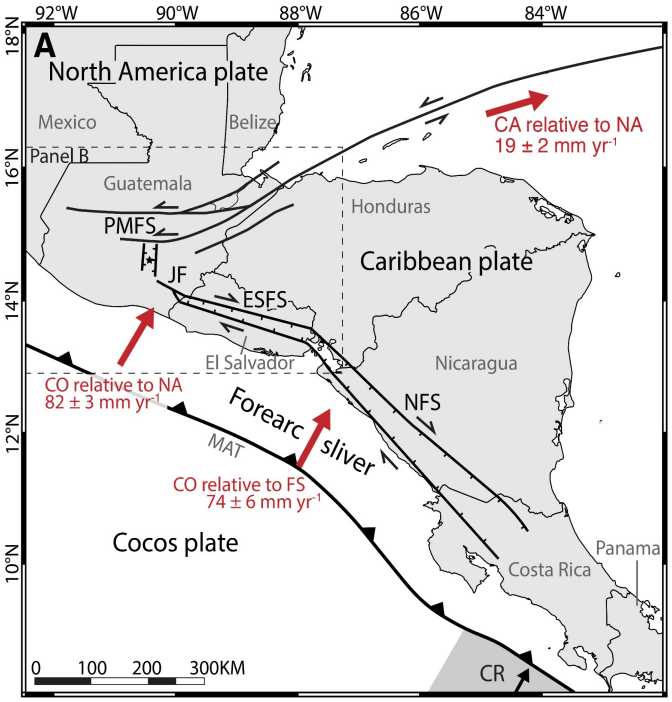
CENAOS

IHCIT
Instituto Hondureño de Ciencias de la Tierra

Tsunami Early Warning System

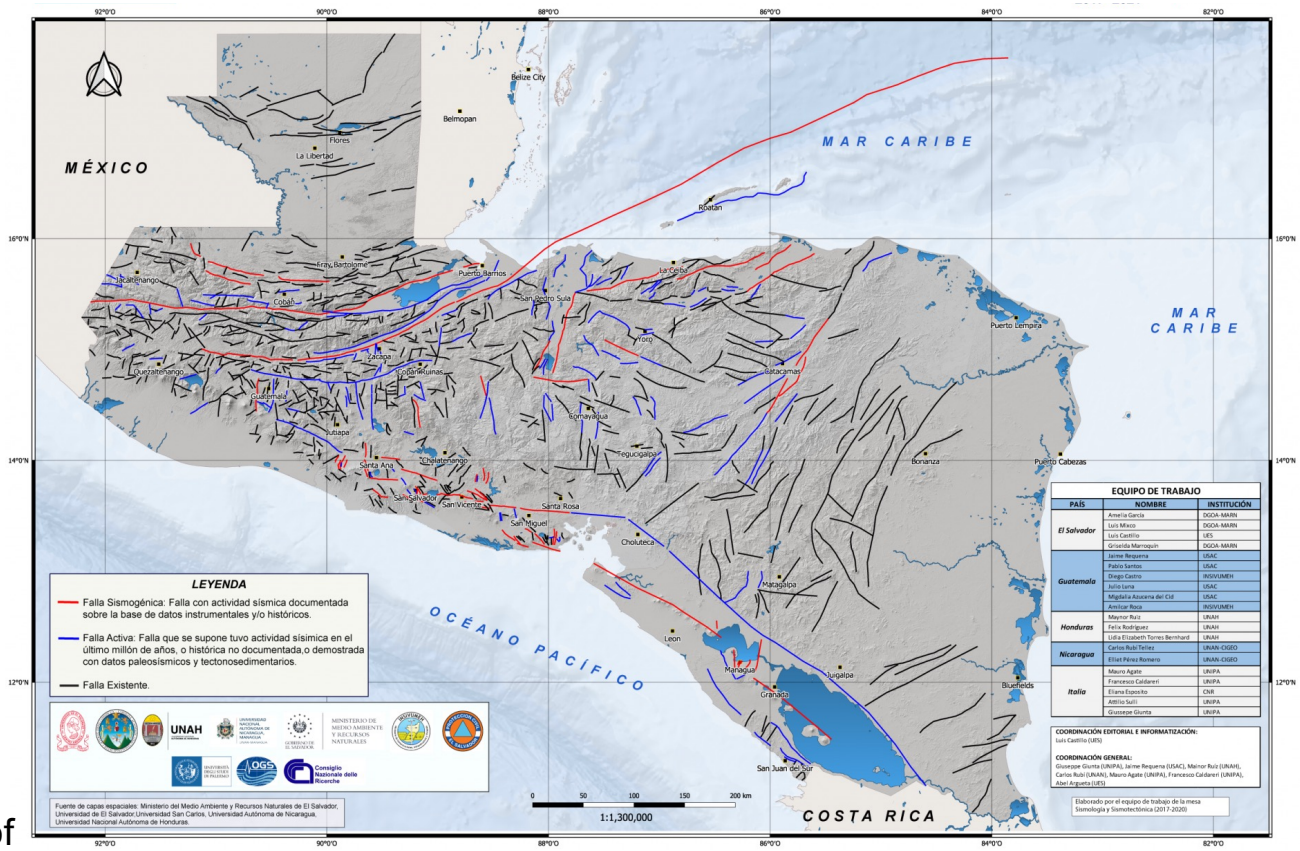
Comisión Permanente de Contingencias COPECO
Permanent Contingency Committee

Honduras Seimotectonic Context (Risk Knowledge Component)



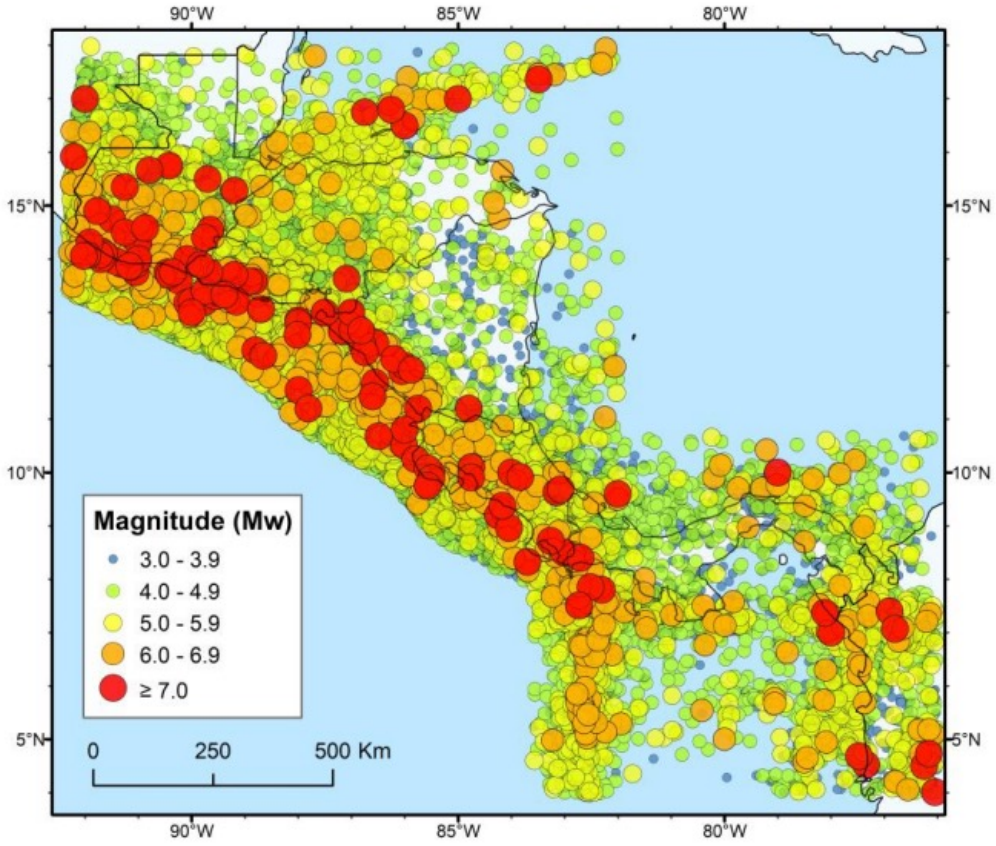
Garnier et. Al. 2020

Honduras is located in a seismotectonic enviroment dominated by the interaction of 3 tectotic plates: Coco, Caribbean y North American plate.



Regional Fault Map (RIESCA Project)

Seismic Catalog CA (Risk Knowledge Component)

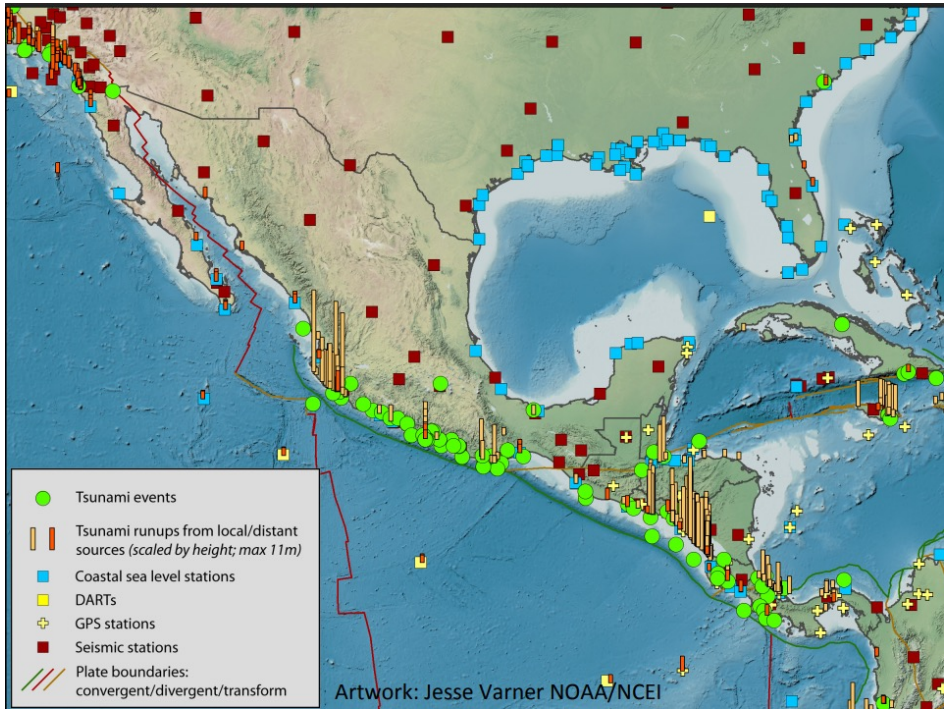


Country	Number of events	Percentage
Guatemala	27 909	10.71%
Honduras	4117	1.58%
El Salvador	74 715	28.68%
Nicaragua	47 322	18.16%
Costa Rica	76 030	29.18%
Panama	30 455	11.69%

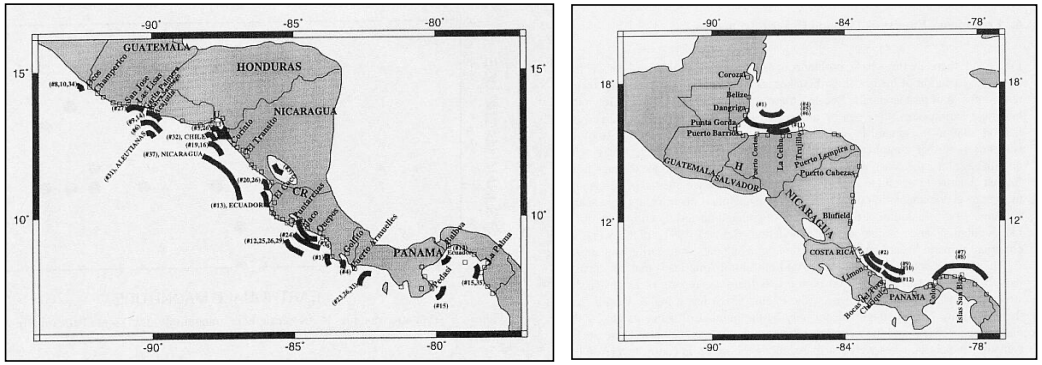
Honduras reports the lowest percentange of earthquakes during this period. This may be because our Seismic Network is quit recent.

Fuente: "Seismicity in Central America (1520–2020) and Earthquake catalog compilation for seismic hazard assessments“ , Gamboa, C. et al 2024

Tsunami Catalog CA (Risk Knowledge Component)



Fuente: https://x.com/CEPREDENAC/status/1589661619763613696?lang=ar-x-fm



Potential tsunami generating sources. Fuente: Fernández, M, 2002

	Datos del Temblor					Datos del tsunami		
#	Fecha	Lat. N	Long. W	Mag.	Fuente	Localización	Alt.(m)	Mag.
1	1539-1124					Golfo Hond.		
2	1798-0222	10,2	82,9		CV	Matina, CR		-1
3	1822-0507	09,5	83,0	7,6	CV	Matina, CR		-1
4	1825-02..			5-5,5		Golfo Hond.		
5	1855-0925			6-6,5		Golfo Hond.		
6	1856-0804			7-8,0		Golfo Hond.	5	2
7	1873-1014	10,2	80,0		CV	Colón, Pan.		
8	1882-0907	10,0	79,0	7,9	CV	San Blas, Pan.	3	1
9	1904-1220	09,2	82,8	7,3	AA	Bocas Toro		
10	1916-0426	09,2	83,1	6,9	AA	Bocas Toro	1,3	0
11	1976-0204	15,2	89,2	7,5	AA	Golfo Honduras	0,45	-0,5
12	1991-0422	09,6	83,2	7,6	AA	Bocas Toro	3	1

Fuente: Camacho & Víquez (1993), AA: Ambraseys & Adams (1996)

Background

The earthquakes that have caused tsunamis on the Caribbean coast of Central America originated from both the Polochic-Motagua fault system and the Northern Deformed Belt of Panama.

In the research conducted on **DAMAGE, EFFECTS, AND THREATS OF TSUNAMIS IN CENTRAL AMERICA** by Mario Fernández A., it was found that 12 tsunamis have struck Caribbean coastal towns from 1539 to 2000.

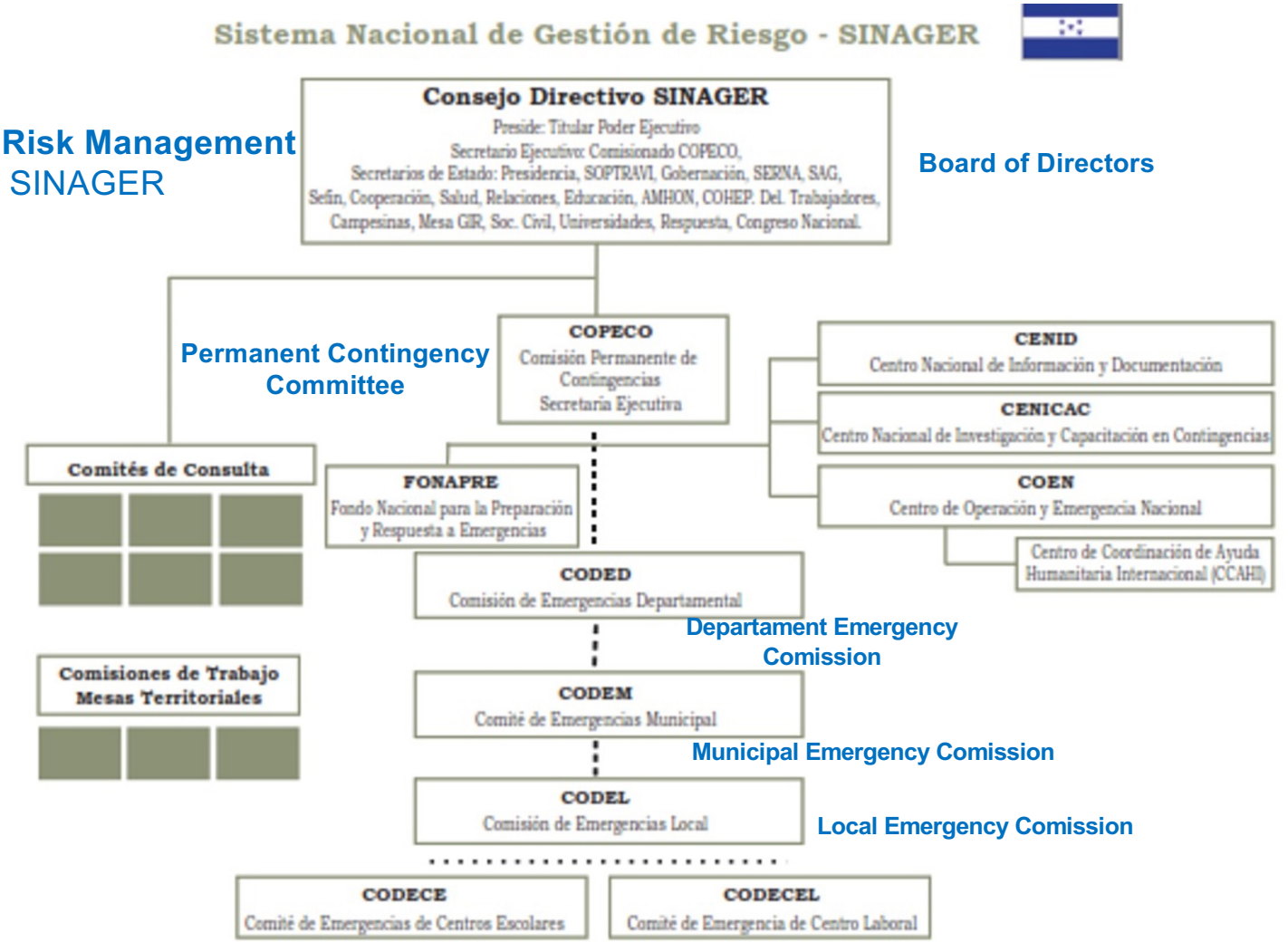
We have no information about tsunamis that have strongly affected the south region of the country, but the waves did rise with the Nicaraguan tsunami in 1992.

Seismic Catalog CA (Risk Knowledge Component)

Tsunami Early Warning System

Comisión Permanente de Contingencias COPECO
Permanent Contingency Committee

National Risk Management System - SINAGER



13 Reformas a la Ley del SINAGER deberán ser tenidas en cuenta en la implementación y actualización de la Politica.

What is COPECO?

A government agency responsible for coordinating disaster risk management in Honduras within the framework of SINAGER, coordinating prevention, preparedness, response, and recovery at the national, departmental, and municipal levels.

Mission

To coordinate and strengthen the National Risk Management System through shared public and private management focused on risk prevention and reduction, emergency response, recovery, and adaptation to climate change in order to protect the nation's lives, material assets, and environment.

Vission

A consolidated institution for the effective coordination of the National Risk Management System, contributing to the equitable and sustainable development of the country.

TNC,TWFP, NTWC

National (institutional) designations

TNC : Eng. Iván Montalvo — National Contact for the IOC/UNESCO.

ivan.montalvo@copeco.gob.hn

TWFP : COPECO/CENAOS — Operations Room — Tsunami Alert Focal Point; receives messages from the TSP and activates SOP.

twfp.ptws@copeco.gob.hn

Head of Seismology Unit – Mario Martínez Valdes

NTWC : CENAOS/COPECO – National Tsunami Warning Center — Monitoring and issuance of national bulletins.

ntwc.copecohn@copeco.gob.hn

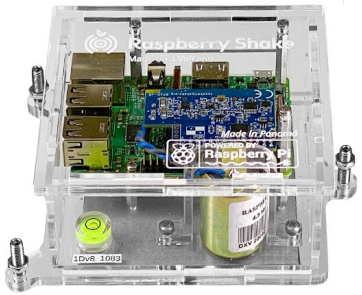
Head of Meteorology Unit

Current Seismic Network of Honduras… Monitoring Component

It is composed of the UNAH Experimental Seismic Network and the COPECO Seismic Network.

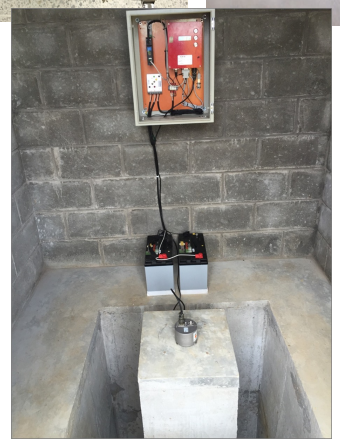
The **UNAH** Experimental Seismic Network consists of 25 short-period stations, made up of Raspberry Shake sensors:

12 - 1D stations
11 - 3D stations
2 - 4D stations



COPECO has a seismic network of 17 short-period stations, consisting of:

LENNARTZ 3dlite sensors
SARA SL-06 digitizers



Current Seismic Network of Honduras… Monitoring Component

There is also a broadband station installed in Tegucigalpa, set up by the United States Geological Survey (**USGS**) and locally managed by UNAH and COPECO, which has:

Streckeisen STS-2 Standard-gain broadband sensor

Kinemetrics FBA ES-T EpiSensor accelerometer

Current Seismic Network of Honduras… Monitoring Component

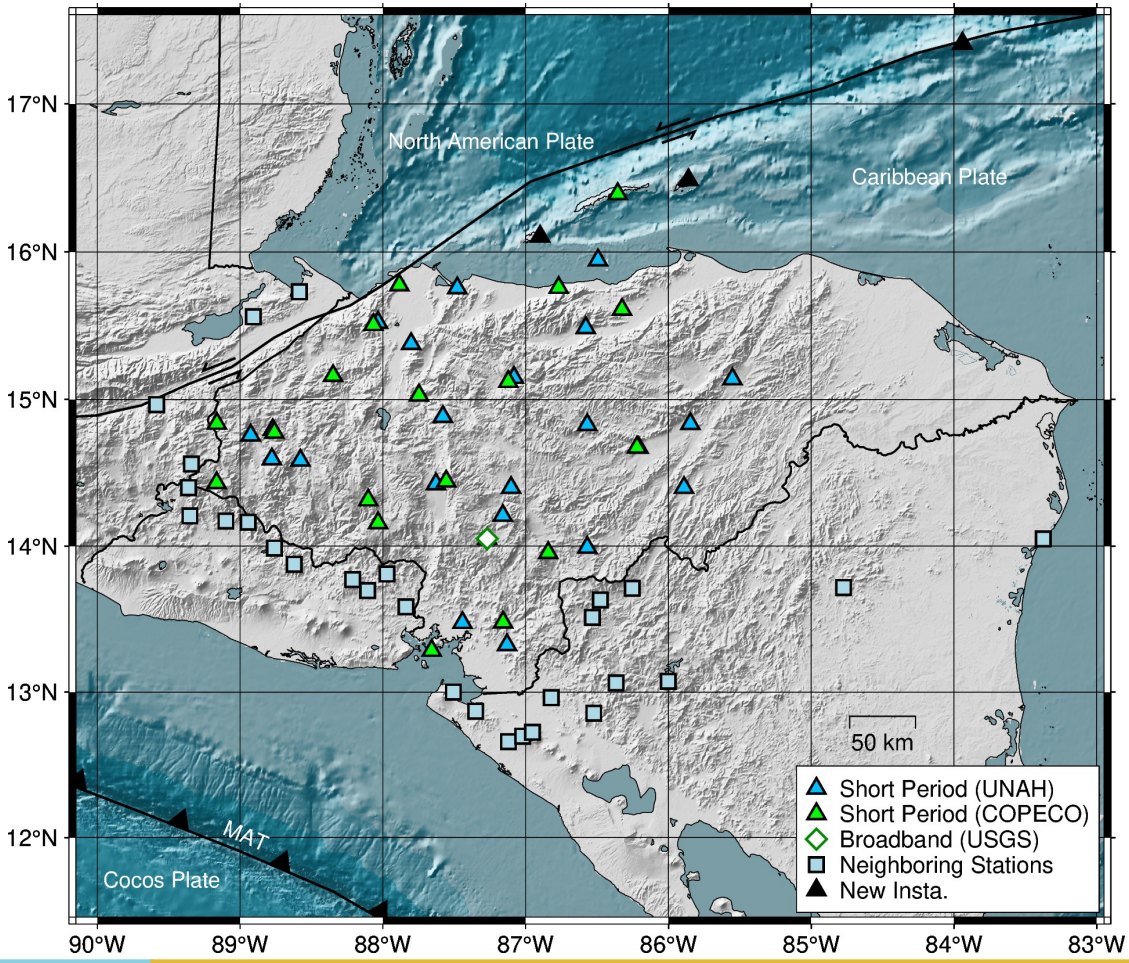
The Honduran Seismic Network (**RSH**) consists of seismographic stations belonging to the National Autonomous University of Honduras (UNAH) and the Secretariat of State for Risk and Contingency Management (COPECO).

The network of (**active**) stations used for monitoring consists of:

32 Short Period
1 Broadband

RSH is complemented by more than 25 stations belonging to neighboring countries (GT, SV, and NI).

In some cases for detection of events off the northern coast of Honduras, some stations in Mexico, Cuba, the Cayman Islands, and Jamaica are usually included to reduce the azimuthal gap.



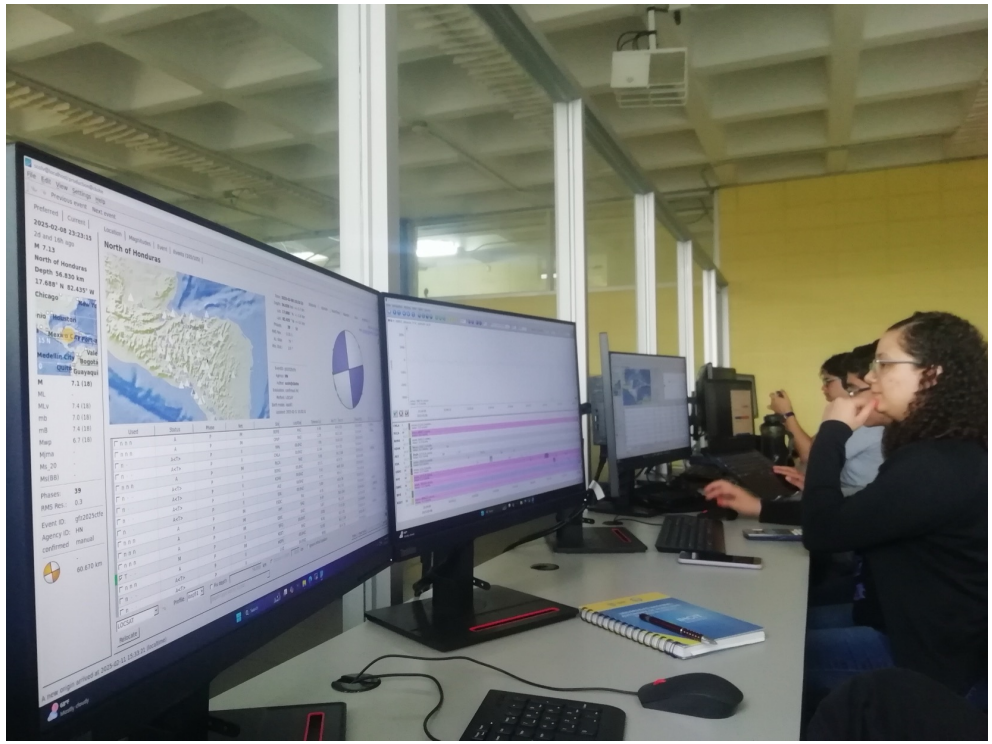
Current Seismic Network of Honduras… Monitoring Component

Honduras also has the ***CTBTO National Data Center (NDC***), which currently has 20 months of continuous seismic data - *February 2024-September 2025* -(+3 terabytes in waveforms), of which:

- The period February 2024-October 2024 has been partially analyzed.
- November 2024-January 2025 period completed
- January 2025-Sept 2025 period partially analyzed.

Use of workstations donated by the CTBTO for technical transfer on seismic data processing, analysis, and visualization.

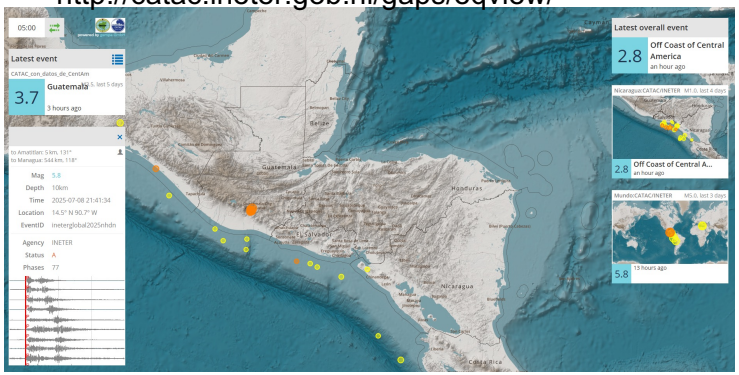
A SeisComP acquisition server has been set up at COPECO as an alternative for waveform recovery in the event of a main server failure.

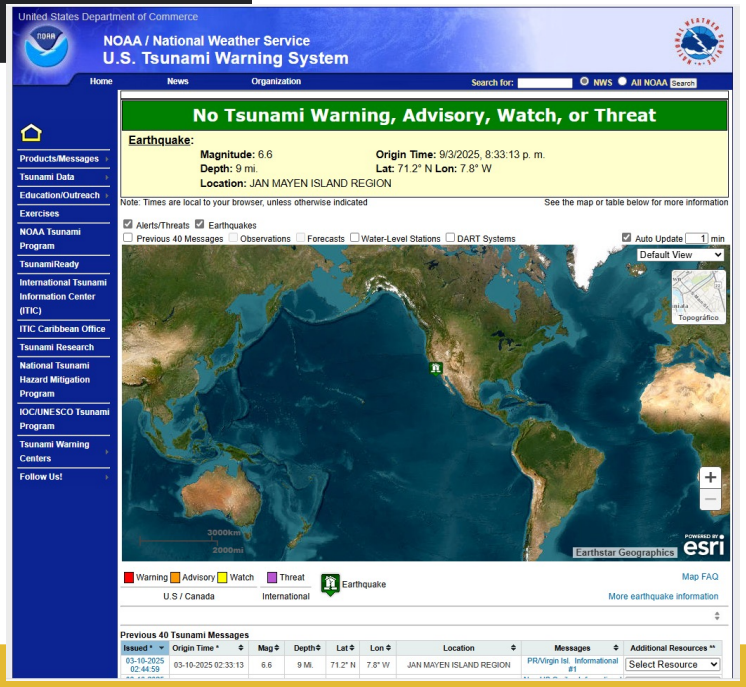


NDC Installed in Honduras by the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization

Current Tsunami Monitoring System

CATAC Earthquake viewer
http://catac.ineter.gob.ni/gaps/eqview/





EWS OPERATIONAL STAGES IN RESPONSE TO TSUNAMIS

Stage 1
Surveillance

The surveillance stage is implemented on a permanent basis, without the occurrence of an event or with the occurrence of earthquakes with magnitudes below 6.0 in the Pacific Ocean or Caribbean

Sea without any risk of tsunami impact on Honduras.

Stage 2
Issuance of the Alert

The Alert Stage is implemented if an event has occurred that exceeds the established thresholds:

i) Magnitude greater than or equal to 7.0 off the coast of Honduras or the countries of Central America;

ii) Magnitude greater than or equal to 7.0 at the regional level in the Pacific Ocean or Caribbean Sea, and

iii) Magnitude greater than or equal to 7.0 in the Pacific Ocean and Caribbean Sea basins, far from the coastal zone of Central America.

EWS OPERATIONAL STAGES IN RESPONSE TO TSUNAMIS

Stage 3 Alert Dissemination

Implemented when the onset of a specific event has been detected exceeding the established thresholds:

i) Magnitude greater than or equal to 7.0 off the coasts of Honduras or Central American countries;

ii) Magnitude greater than or equal to 7.0 at the regional level in the Pacific Ocean or Caribbean Sea and

iii) Magnitude greater than or equal to 7.0 in the Pacific Ocean and Caribbean Sea basins, far from the coastal zone of Central America.

Stage 4 Response Activation

This is implemented when the onset of a specific event has been detected, exceeding the established thresholds, and it is necessary to mobilize people from potentially affected areas to evacuation points.

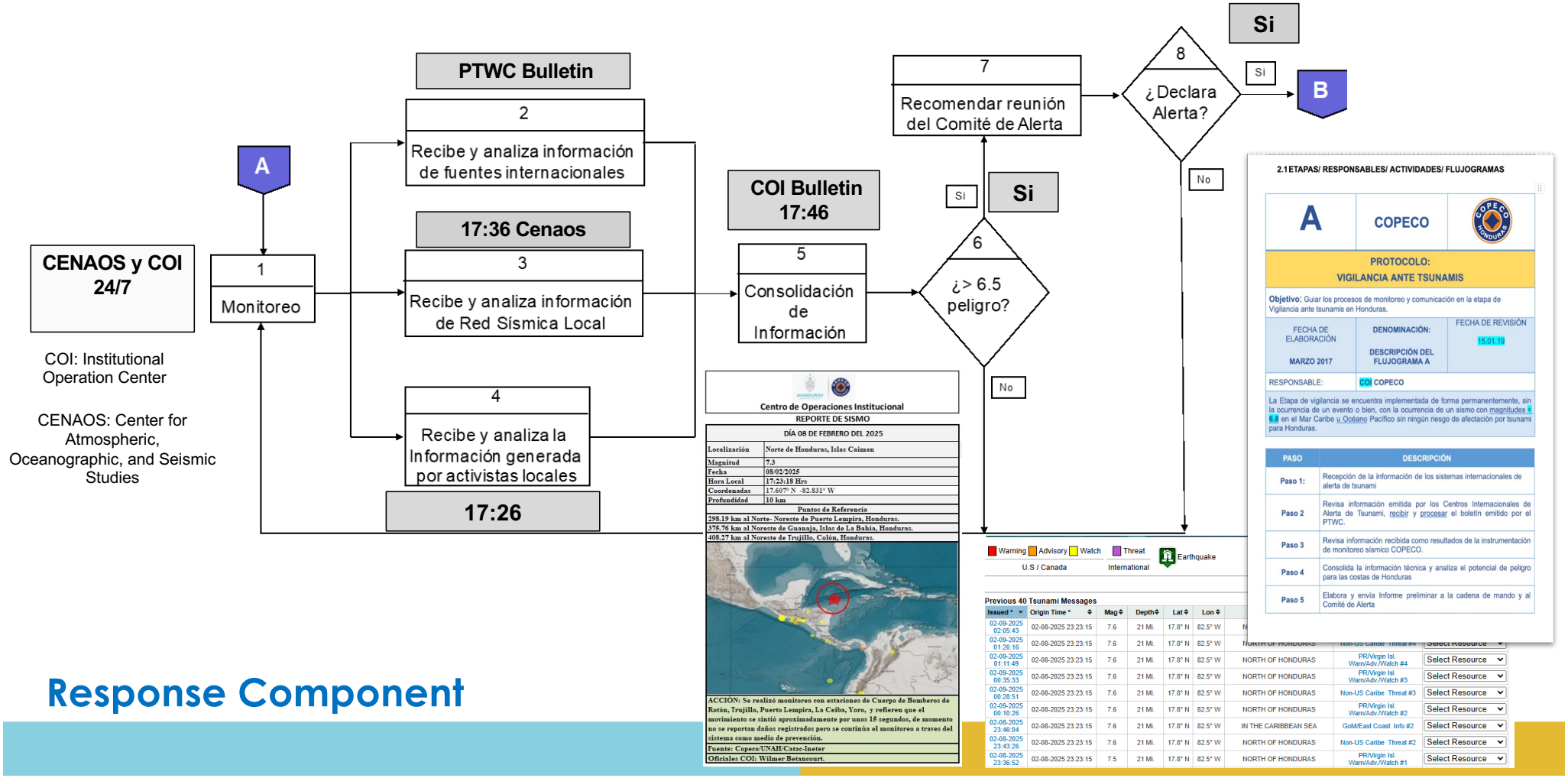
Stage 5 Cancellation

This stage will be implemented if:

- No tsunami has been generated or the tsunami generated has not affected the coast of Honduras, or

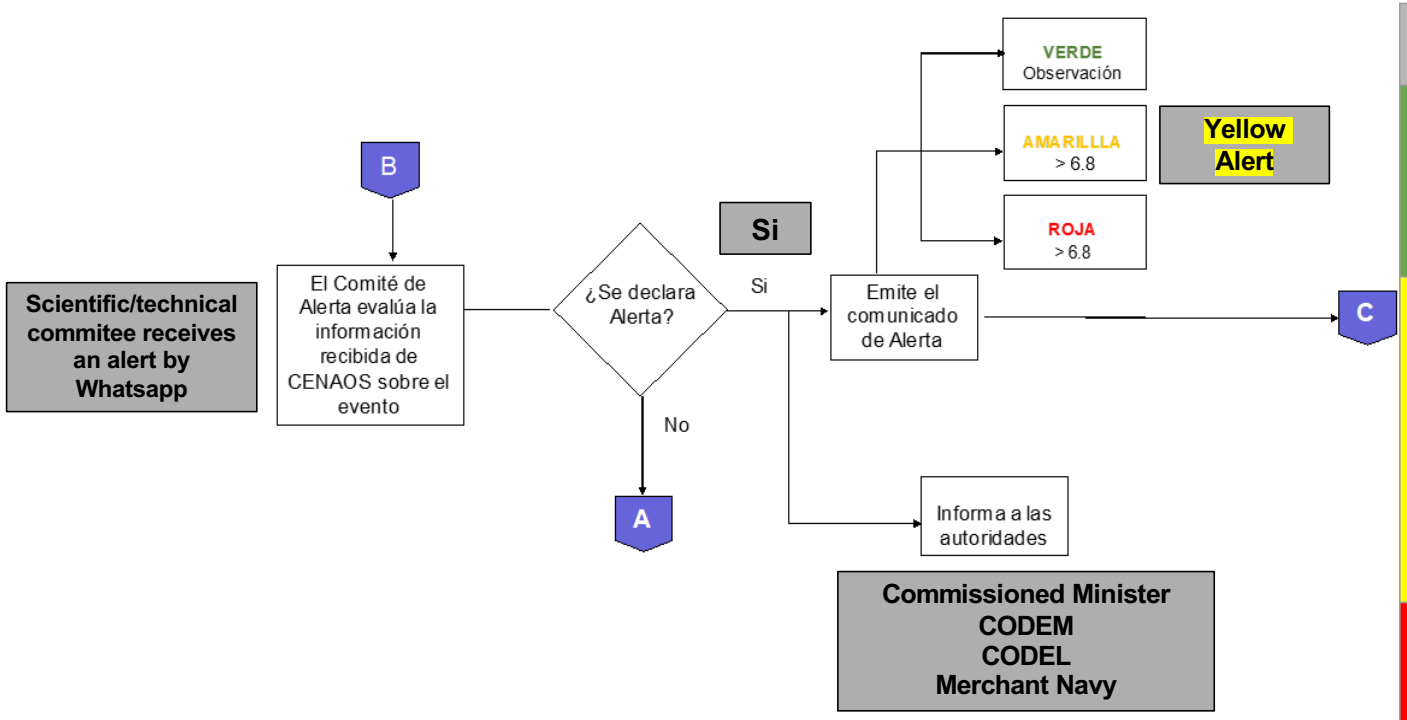
- It is considered that the effects of the tsunami that has impacted the coast of Honduras have passed.

EWS Protocol - Tsunami Surveillance Flowchart A (SOP's)



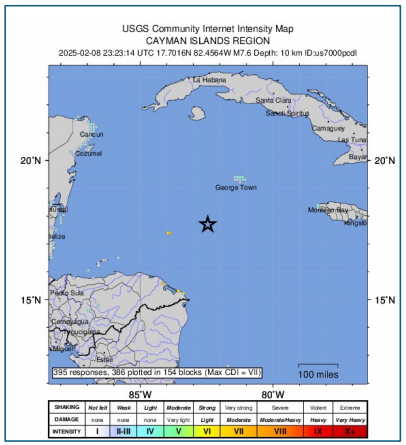
Response Component

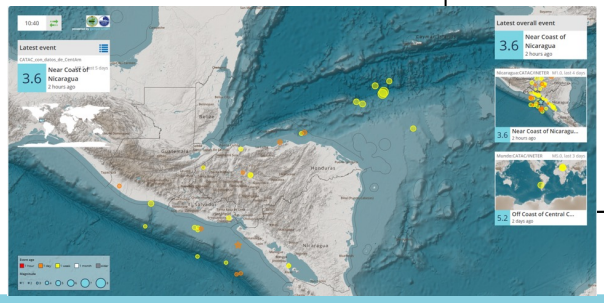
EWS Protocol - Tsunami Alert Flowchart B (SOP's)



Alert type	Technical criteria
Green	Occurrence of an earthquake with a magnitude greater than or equal to 6.0 in the basins of the Pacific Ocean and Caribbean Sea, far from the coastal zone of Central America. *Tsunami notice issued by the Pacific Tsunami Warning Center.*
Yellow	Arrival of tsunami waves in coastal areas of Central American countries, with wave heights likely between 30 cm to 1 m, generated by an earthquake from a distant source. Occurrence of a regional earthquake with a magnitude greater than 6.8 in the Pacific Ocean or Caribbean Sea. *Declaration of a potential tsunami by the Pacific Tsunami Warning Center regarding a regional earthquake in the Pacific Ocean or Caribbean Sea.*
Red	Arrival of tsunami waves in coastal areas of Central American countries, with wave heights likely to exceed 1 meter, generated by an earthquake of regional or distant origin. Occurrence of an earthquake in the subduction zone of El Salvador, Honduras, Nicaragua, and Costa Rica, with a magnitude greater than 7.0 and a depth of less than 60 km. (Pacific Ocean) Occurrence of an earthquake at the Caribbean Sea with a magnitude equal or greater than 7.0 near the Honduran coast. *Tsunami warning issued by the Pacific Tsunami Warning Center regarding an earthquake in the Pacific Ocean or Caribbean Sea, from a nearby source.*

EWS Protocol - Tsunami Response Activation Flowchart D (SOP's)





D

1
Activación de los Planes de Respuesta frente a Tsunami

2
Activación de mecanismos de Alerta a la población

3
Evacuación de la población

4
Gestión de Ayuda Humanitaria

5
Envío de información Sobre la evolución del evento

6
¿Se mantiene la Alerta?

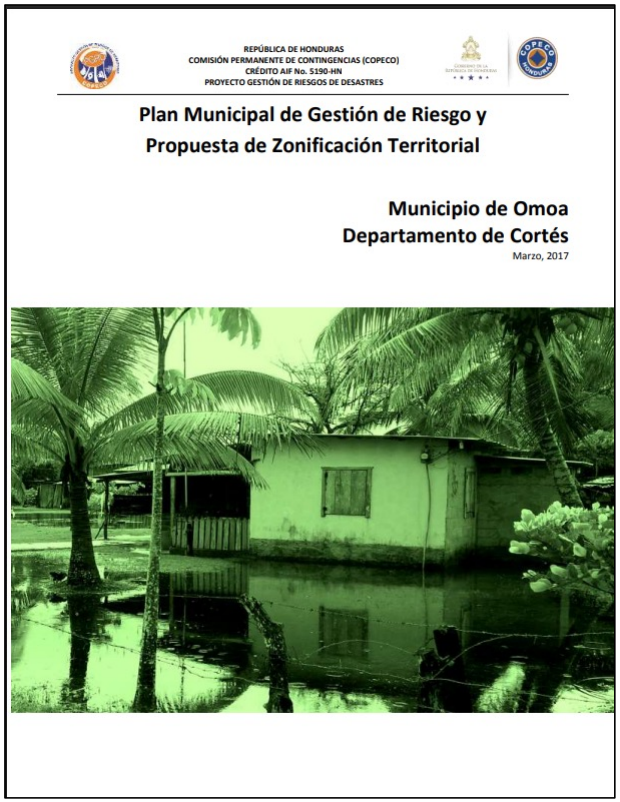
No

E

A statement is issued announcing the suspension of the alert

Si

Guidance documents: Emergency Plans and Standard Operating Procedures (SOPs)


REPÚBLICA DE HONDURAS
COMISIÓN PERMANENTE DE CONTINGENCIAS (COPECO)
CRÉDITO AIF No. 5190-HN
PROYECTO GESTIÓN DE RIESGOS DE DESASTRES

Plan Municipal de Gestión de Riesgo y
Propuesta de Zonificación Territorial

Municipio de Omoa
Departamento de Cortés
Marzo, 2017


PLAN DE RESPUESTA DE EMERGENCIA PARA
TSUNAMIS DEL MUNICIPIO DE OMOA

MUNICIPALIDAD DE OMOA
Turismo y Desarrollo Municipal
CORTES, HONDURAS

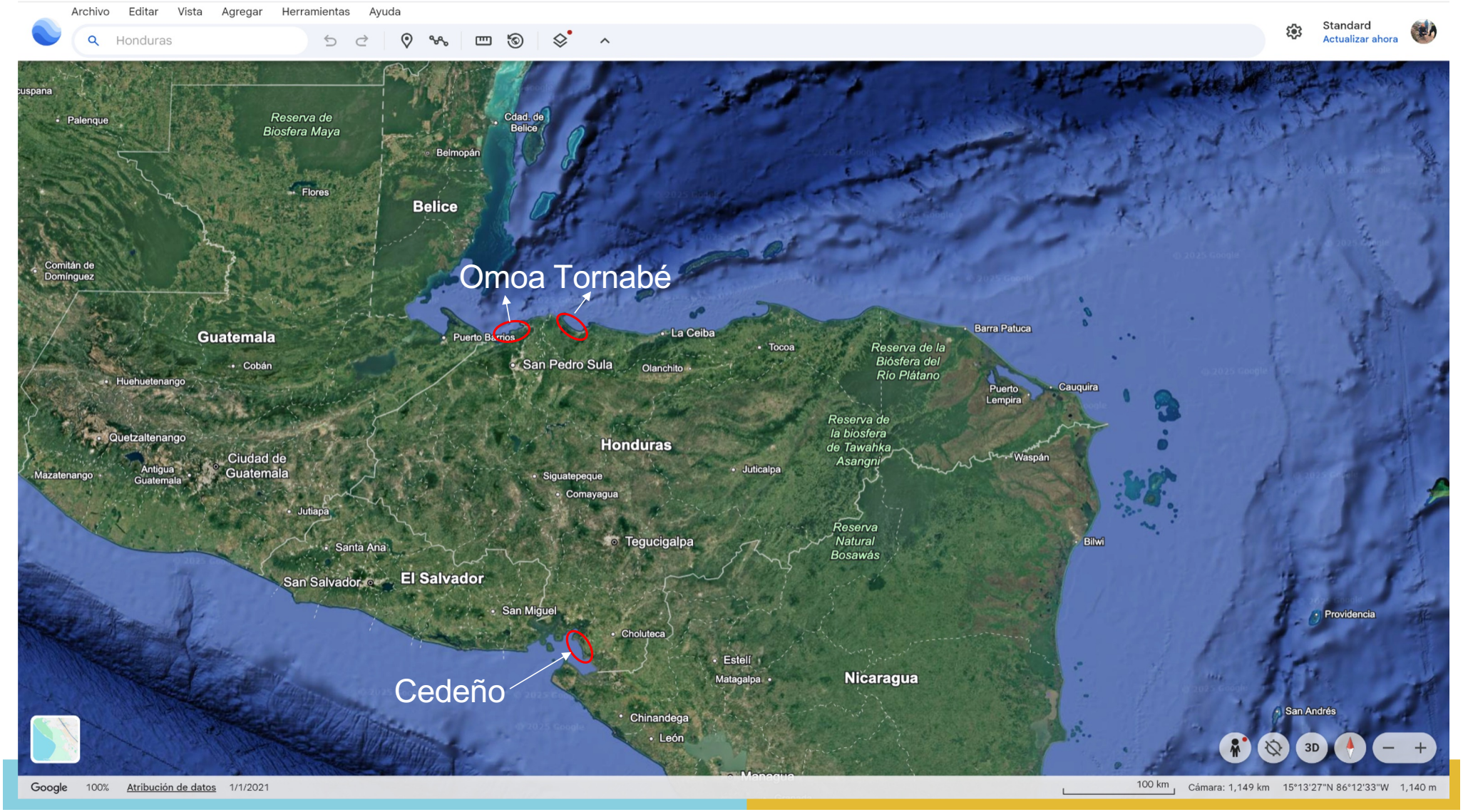
AGOSTO 2017

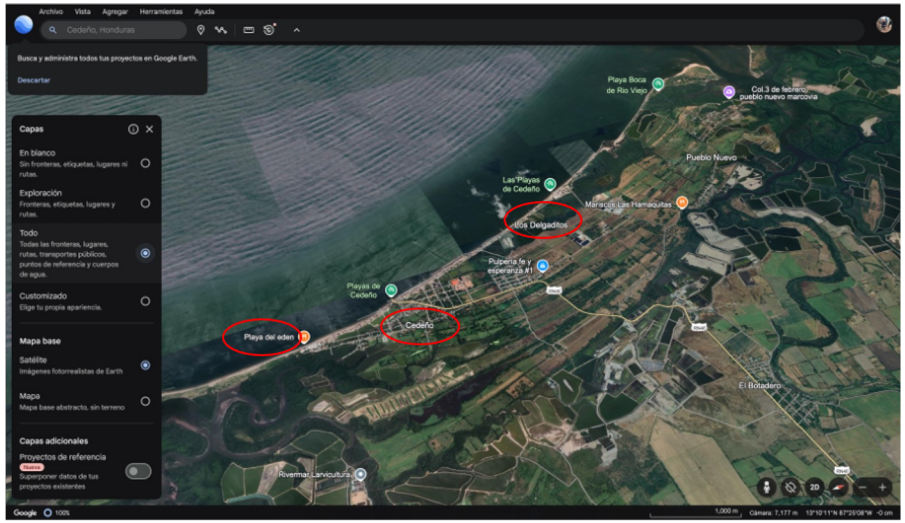

PROCEDIMIENTOS OPERATIVOS ESTÁNDAR
SOPs

MUNICIPIO DE OMOA
DEPARTAMENTO DE CORTÉS
HONDURAS

NOVIEMBRE DE 2017

Tsunami Ready Status in Honduras


Archivo Editar Vista Agregar Herramientas Ayuda
Honduras
Standard
Actualizar ahora
Omoa Tornabé
Cedeño
Belice
Guatemala
Honduras
El Salvador
Nicaragua
Reserva de Biosfera Maya
Reserva de la Biósfera del Río Plátano
Reserva de la biosfera de Tawahka Asangni
Reserva Natural Bosawás
Palenque
Cdad. de Belice
Belmopán
Flores
Comitán de Domínguez
Puerto Barrios
La Ceiba
Tocoa
Barra Patuca
San Pedro Sula
Olanchito
Cobán
Huehuetenango
Puerto Lempira
Cauquira
Quetzaltenango
Ciudad de Guatemala
Antigua Guatemala
Mazatenango
Siguatepeque
Juticalpa
Waspán
Comayagua
Jutiapa
Santa Ana
Tegucigalpa
Bilwi
San Salvador
San Miguel
Choluteca
Estelí
Matagalpa
Providencia
Chinandega
León
San Andrés
Managua
3D
Google 100% Atribución de datos 1/1/2021
100 km
Cámara: 1,149 km 15°13'27"N 86°12'33"W 1,140 m



Location of the main beaches in Cedeño. (Google Earth, 2024)

The community of Cedeño is one of the 21 communities or villages that make up the municipality of Marcovia, in southern Honduras.

According to data from the National Institute of Statistics of Honduras (INE), Cedeño had a population of approximately 47,510 people in 2018.

Cedeño, as one of the coastal communities of the municipality of Marcovia, suffers from major threats of natural origin, but also from complex socioeconomic conditions, which aggravates the situation in times of crisis.

Being a **Low Cost Tourist territory with easy access to the population, it is a very popular place due to its proximity to the capital of Honduras, Tegucigalpa.**

One of the main problems in Cedeño is the constant loss of coastline, it is estimated that **in the last ten years** a total of five blocks of houses and main infrastructure such as school and health center, are now under the sea; each block estimated at 50 square meters.

Sunset in Cedeño, 2024

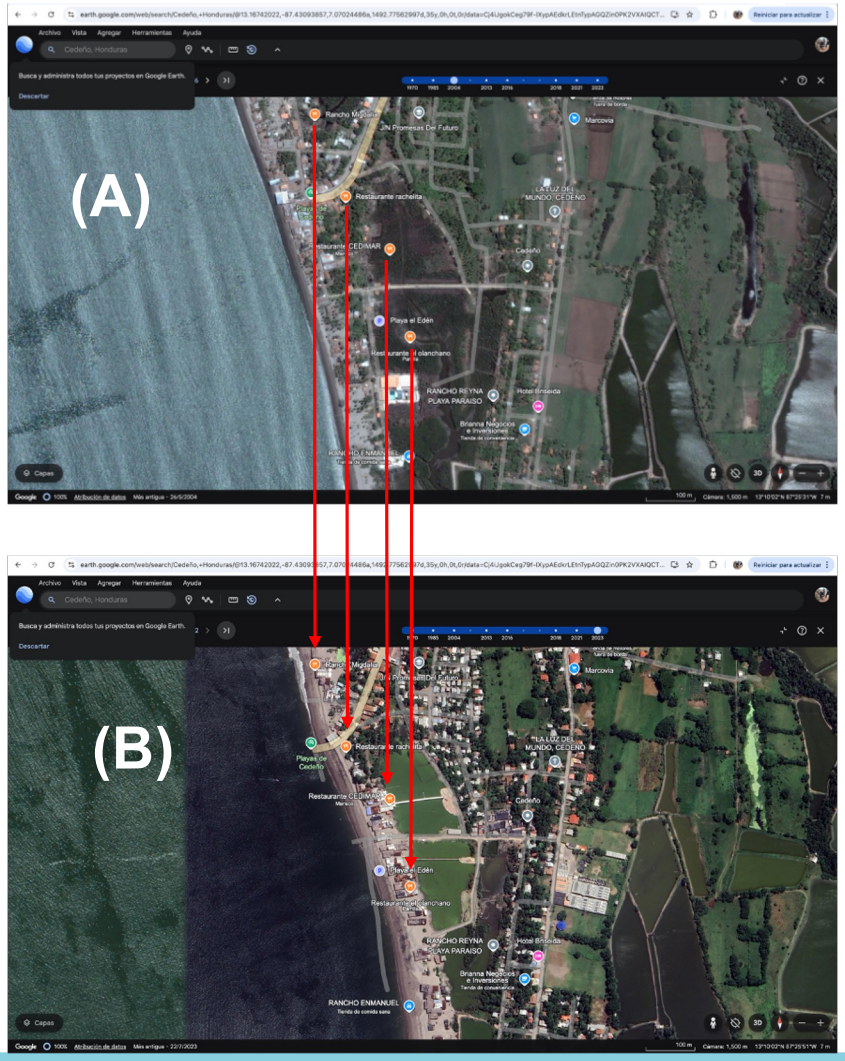
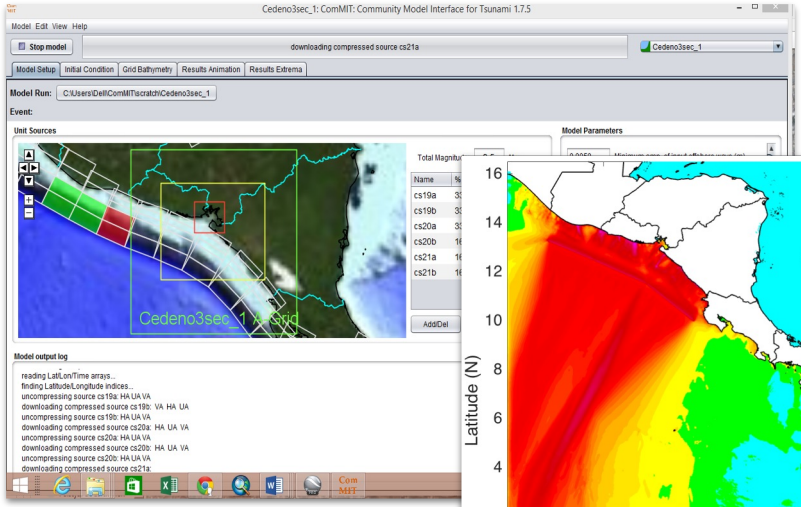


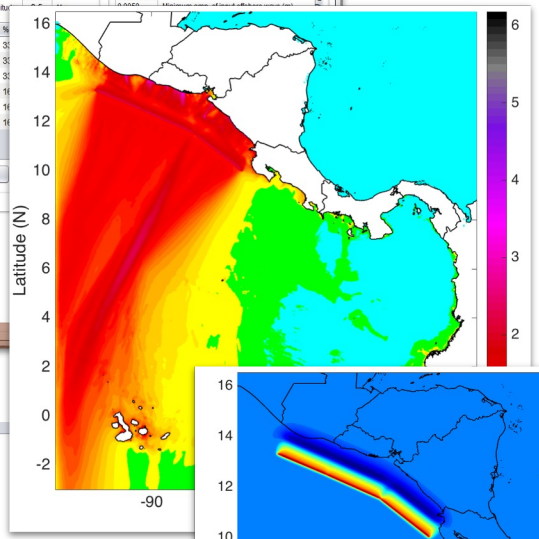
Fig.: Evidence of shoreline change for Cedeño beaches
(A) Image from 2004, (B) Image from 2023. (Google Earth)

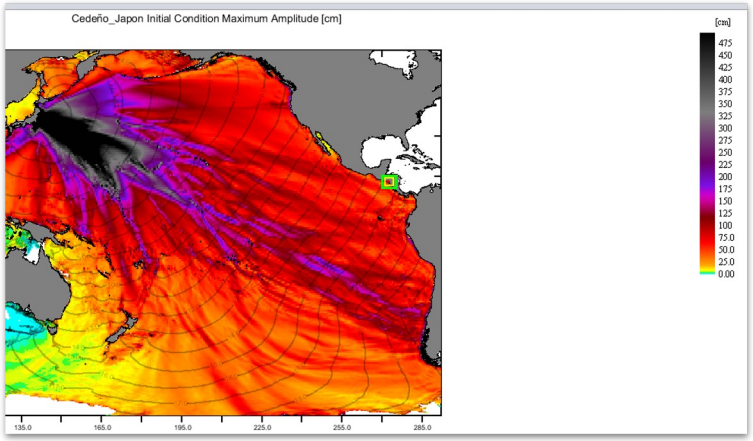
Tsunami Ready Status for Cedeño

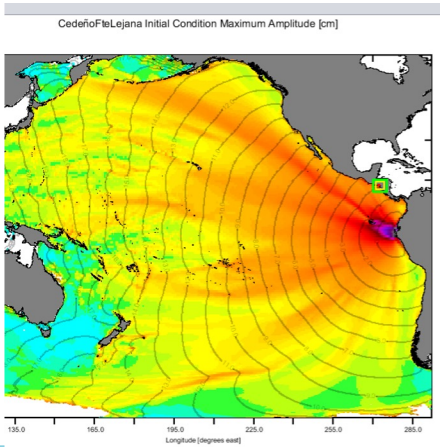
Cedeño was recognize as a Tsunami Ready Community in February of 2017, today its recognition is outdated.

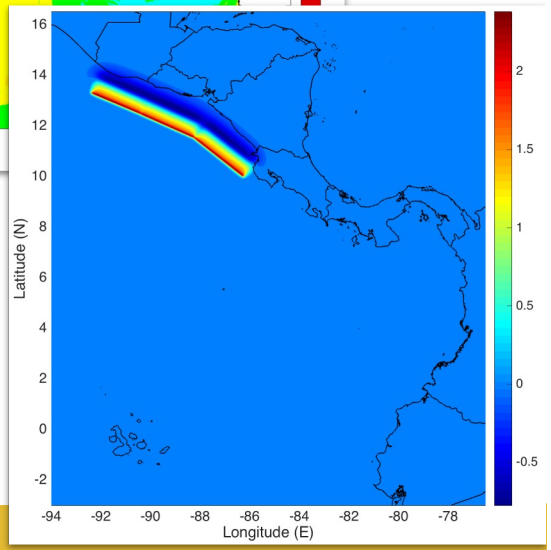
Ubicación de Fuente	Magnitud	Área Inundada (Km²)	Altura Amplitud (cm)	Dirección de la Energía	Resolución Utilizada	Time Step	Fuente Que deja mayor Inundación
Campo Cercan0 1 (Costas Golfo)	8.5	14.78	560.00	S-W	Malla A: 60 Malla B: 30 Malla C:3	3.63	1
Campo Cercano 2 (Costa México)	8.8	9.29	256.6	S-W			3
Campo Lejano 1 (Perú-Ecuador)	9.1	11.46	201.7	N-W			2
Campo Lejano 2 (Japón)	9.5	9.09	241.0	S-E			
Campo Lejano 3 (Oceania)	9.0	3.23	137.7	E	Malla A: 120 Malla B: 30 Malla C: 3	3.61	

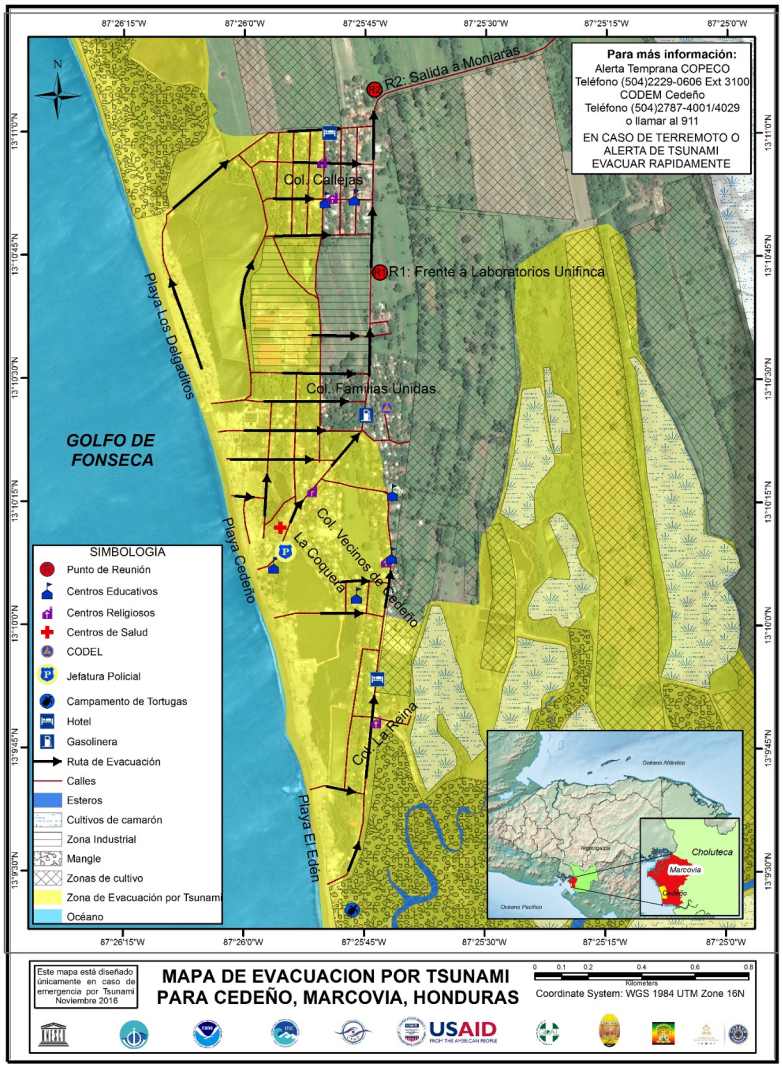




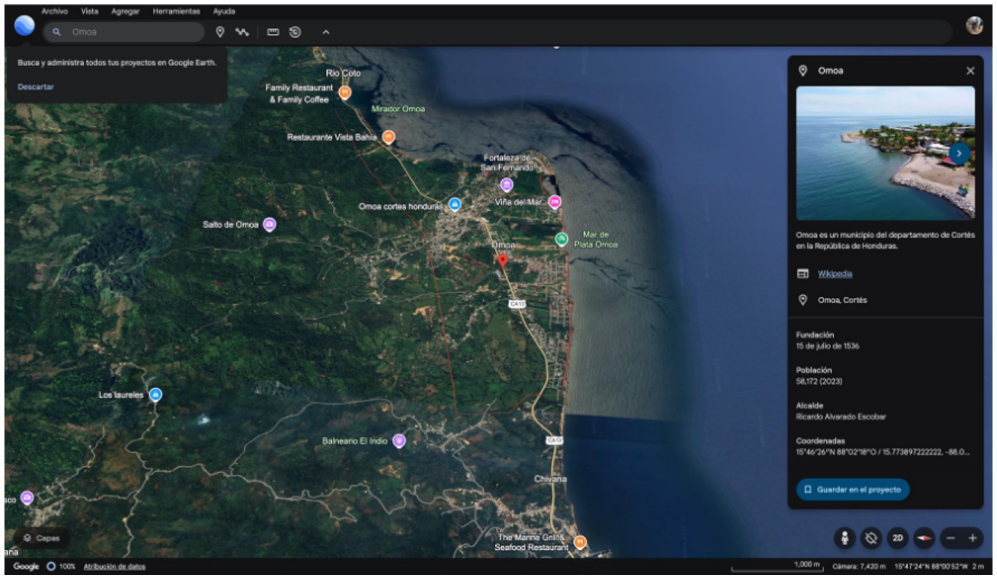








Materials and supplies found and useful for the renewal of recognition	Identified needs for the renewal of recognition
Tsunami flood and and Tsunami evacuation map 2017	Generate new modeling for Tsunami flood mapping.
Flyers prepared in spanish to promote the dissemination of the simulation	Generate new evacuation map
Municipal Risk Management Plan at the municipality level. (Not includes tsunami issues)	All signage for Tsunami
Report of the evaluation of the response capacity at the municipal level (2022).	Training for CODEM and CODEL members.
Training material used during the first community recognition.	Revision and update of the Emergency Plan 2025 to include earthquake and tsunami hazards.
Honduras Guide for PACWAVE 2017 Drill for Cedeño	Equipped with loudspeakers, sirens, radio communication.
Facilitator's Guide for PACWAVE 2017 Marcovia	Community training and new estimation of people in risk
Official contact information for the community in 2017.	Drill support
Evidence of PREP 1, 2, 3 and 4 indicators for 2017 and also evidence of the drill exercise in 2017.	Produce SOPs for this community



Location of the Omoa border line (Google Earth, 2024)

The municipality of Omoa, Cortés is comprised of 28 villages according to the Population and Housing Census of the National Institute of Statistics (2013).

The population of Omoa, in the department of Cortés, Honduras, is 51,046 (25,307 men and 25,739 women), according to 2018 data. Of this total population, 24,770 inhabitants live in urban areas and 26,276 in rural areas.

According to conversations with local authorities, no significant changes in the coastline have been reported in Omoa.

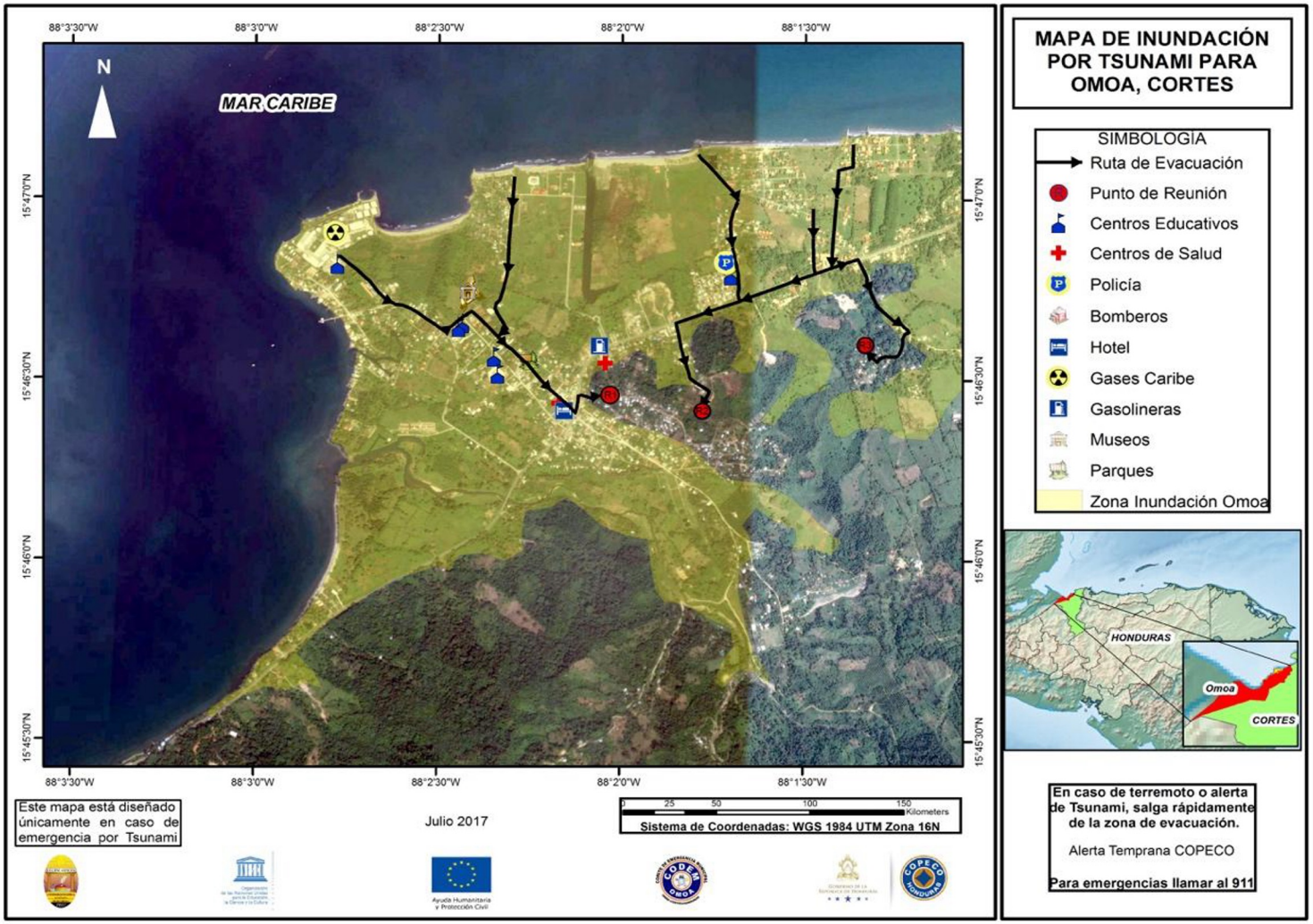
Tsunami Ready Status for Omoa

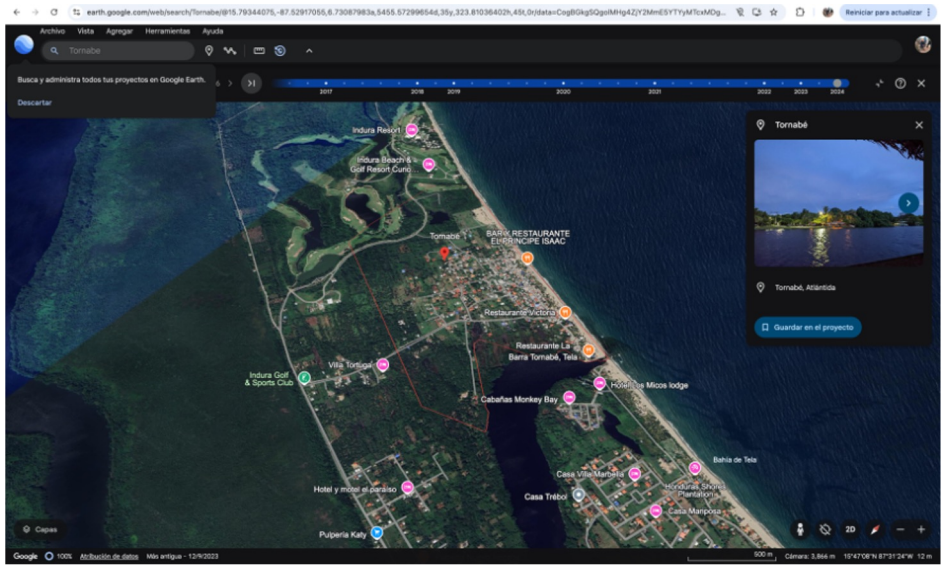
The community of Omoa, was recognized as Tsunami Ready in September 2019, to date its recognition has expired.

Gases del Caribe is a major Colombian company with more than 58 years of experience in providing public services through the distribution and marketing of natural gas. It is located in Omoa.

Omoa Municipality

Materials and supplies found and useful for the renewal of recognition	Identified needs for the renewal of recognition
Standard Operating Procedures, 2019	Review and validation if Tsunami flood and evacuation maps
Municipal Risk Management Plan and Territorial Zoning Proposal - Municipality of Omoa, Department of Cortés. March, 2017	Complete the installation of missing signs and place a large Tsunami warning zone signs on the beach
Tsunami emergency response plan for the municipality of Omoa, Cortes (2019).	Training CODEM and CODEL members
Natural and Biological Disaster Response Capacity Report for Omoa, Cortes. 2022	Revision and update Emergency Plan 2025 to include Earthquake and Tsunami hazards.
Official contact information for the community in 2019 and evidence of PREP 1, 2, 3 and 4 indicators for 2019.	Equipped with loudspeakers, sirens, radio communication.
Tsunami Flood and Tsunami Evacuation map 2019	Better signposting of evacuation routes or placing maps in strategic places. (may place some evacuation maps signals too)
Municipal emergency plan for 2023 (Tsunami hazard not included)	Community training and new estimation of people in risk
Municipal emergency plan for 2024 (Tsunami hazard not included)	Drill support


MAPA DE INUNDACIÓN POR TSUNAMI PARA OMOA, CORTES
SIMBOLOGÍA
Ruta de Evacuación
Punto de Reunión
Centros Educativos
Centros de Salud
Policía
Bomberos
Hotel
Gases Caribe
Gasolineras
Museos
Parques
Zona Inundación Omoa
MAR CARIBE
N
88°3'30"W
88°3'0"W
88°2'30"W
88°2'0"W
88°1'30"W
15°47'0"N
15°46'30"N
15°46'0"N
15°45'30"N
HONDURAS
Omoa
CORTES
Este mapa está diseñado únicamente en caso de emergencia por Tsunami
Julio 2017
0 25 50 100 150 Kilometers
Sistema de Coordenadas: WGS 1984 UTM Zona 16N
En caso de terremoto o alerta de Tsunami, salga rápidamente de la zona de evacuación.
Alerta Temprana COPECO
Para emergencias llamar al 911



Location of the Tornabé municipality border line (Google Earth, 2024)

Tornabe is a community located in the municipality of Tela, in the department of Atlántida, Honduras; located on the north coast of the country, surrounded by beaches and natural landscapes.

The Tornabe community is known for being one of the largest and most traditional **Garifuna** communities in Honduras, with an estimated population of around 5,000 inhabitants. **The Garifuna are an Afro-descendant** culture that settled on the north caribbean of Honduras, and have maintained their cultural traditions and music throughout the years.

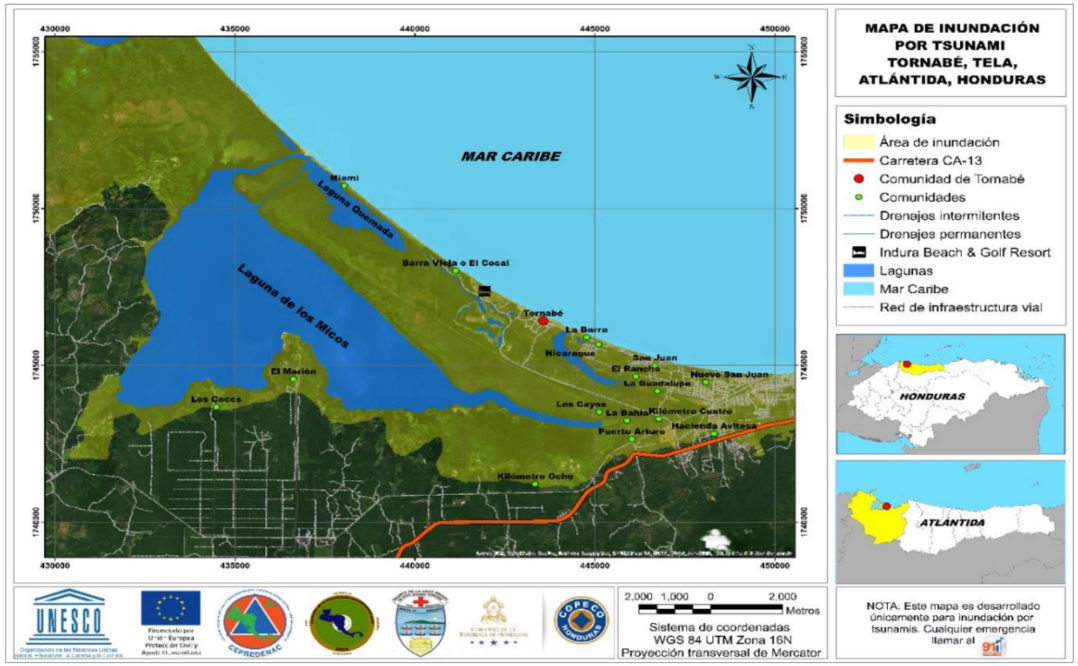
Tsunami Ready Status for Tornabé

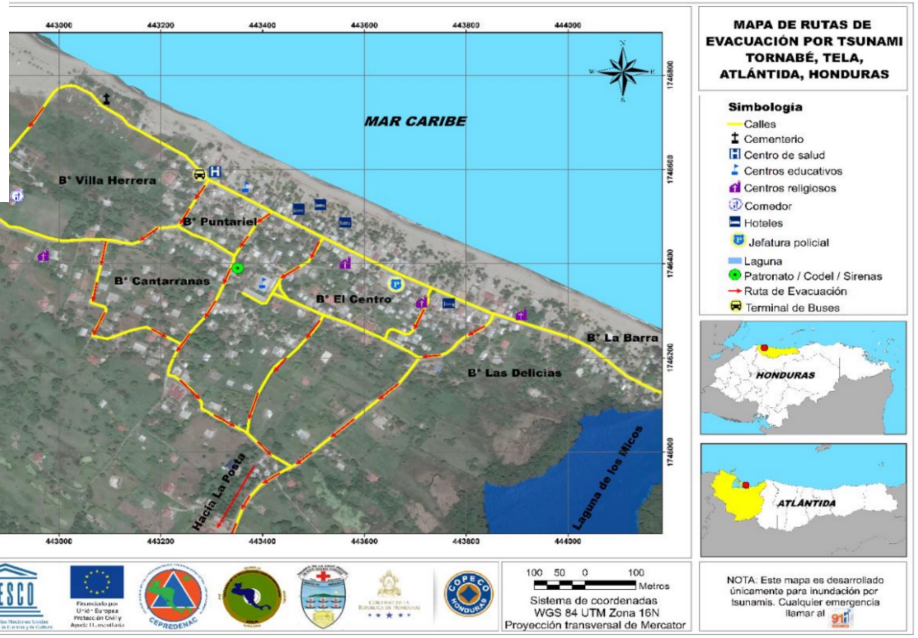
Tornabé was recognize as a Tsunami Ready Community in 2019, today its recognition is outdated.

According to discussions with locals and literature reviews, there have been no significant changes in the shoreline of the Tornabé community.

Tornabé Community

Materials and supplies found and useful for the renewal of recognition	Identified needs for the renewal of recognition
Standard Operating Procedures, 2019	Review and validation if Tsunami flood and evacuation maps
Municipal Risk Management Plan and Territorial Zoning Proposal - 2017 (Includes seismic hazard but not Tsunami)	Installation of missing signs and place (there's no signals from 2019 installed)
Tsunami Response plan for the municipality of Tela, Atlántida (2019).	Training CODEM and CODEL members
Natural and Biological Disaster Response Capacity Report for Tela, Atlántida. 2022	Revision and update Emergency Plan 2025 to include Earthquake and Tsunami hazards.
Municipal emergency plan for the municipality of Tela, 2024 (does not include seismic or tsunami hazards).	Equipped with loudspeakers, sirens, radio communication.
Letter of endorsement with authorization for the activation of the tsunami warning and authorization for the use of the maps generated in 2019.	Better signposting of evacuation routes or placing maps in strategic places. (may place some evacuation maps signals too)
	Community training and new estimation of people in risk
	Drill support and Strong outreach work with the neighborhood organization (Patronato) is needed.


MAPA DE INUNDACIÓN POR TSUNAMI TORNABÉ, TELA, ATLÁNTIDA, HONDURAS
MAR CARIBE
Laguna de los Micos
Miami
Laguna Quemada
Barra Vieja o El Cocal
Tornabé
La Barra
Nicaragua
San Juan
El Rancho
La Guadalupe
Nuevo San Juan
El Marión
Los Cocos
Los Cayas
La Bahía
Kilómetro Cuatro
Puerto Arturo
Hacienda Avitesa
Kilómetro Ocho
Simbología
Área de inundación
Carretera CA-13
Comunidad de Tornabé
Comunidades
Drenajes intermitentes
Drenajes permanentes
Indura Beach & Golf Resort
Lagunas
Mar Caribe
Red de infraestructura vial
HONDURAS
ATLÁNTIDA
2,000 1,000 0 2,000
Metros
Sistema de coordenadas
WGS 84 UTM Zona 16N
Proyección transversal de Mercator
NOTA: Este mapa es desarrollado únicamente para inundación por tsunamis. Cualquier emergencia llamar al 911


MAPA DE RUTAS DE EVACUACIÓN POR TSUNAMI TORNABÉ, TELA, ATLÁNTIDA, HONDURAS
MAR CARIBE
B° Villa Herrera
B° Puntariel
B° Cantarranas
B° El Centro
B° La Barra
B° Las Delicias
Hacia La Posita
Laguna de los Micos
Simbología
Calles
Cementerio
Centro de salud
Centros educativos
Centros religiosos
Comedor
Hoteles
Jefatura policial
Laguna
Patronato / Codel / Sirenas
Ruta de Evacuación
Terminal de Buses
HONDURAS
ATLÁNTIDA
100 50 0 100
Metros
Sistema de coordenadas
WGS 84 UTM Zona 16N
Proyección transversal de Mercator
NOTA: Este mapa es desarrollado únicamente para inundación por tsunamis. Cualquier emergencia llamar al 911

Thank you very much for your attention!!!