National Reports will be posted to the ICG/PTWS-XXXI website without TWFP contact details

NATIONAL REPORT

Submitted by Ecuador

BASIC INFORMATION

(FILL IN SECTIONS 1-3 ONLY IF THERE IS A NEED TO COMMUNICATE OFFICIAL UPDATES.)

1. ICG/PTWS Tsunami National Contact (TNC)

Name: Nelson Andrés Pazmiño Manrique
Title: Chief Executive Officer
Organization: Instituto Oceanográfico y Antártico de la Armada
Postal Address: ---
E-mail Address: direccion@inocar.mil.ec
[redacted]

2. ICG/PTWS Tsunami Warning Focal Point (TWFP)

TWFP Agency name: Instituto Oceanográfico y Antártico de la Armada
(if different from NTWC agency)
TWFP Agency Contact or Officer in Charge *(if different from NTWC Agency):*
Name:
Position:
Telephone Number:
Email Address:
Postal Address:

TWFP 24x7 point of contact (office, operational unit or position**, not a person**):

Name of office, operational unit or position:
E-mail Address:
Telephone Number:
Cellular phone number:
Fax:

National Tsunami Warning Centre (if different from the above)

NTWC Agency Name: Instituto Oceanográfico y Antártico de la Armada
NTWC Agency Contact or Officer in Charge (person):
Name: Leonardo Alberto Alvarado García
Position: CNAT Director
[redacted]
Email address: leonardo.alvarado@inocar.mil.ec
Postal Address: ---

3. Tsunami Advisor(s), if applicable

Not Applicable

4. Tsunami Standard Operating Procedures for a Local Tsunami (when a local tsunami hazard exists)

INOCAR, as Ecuador's focal point for the Pacific Tsunami Warning and Mitigation System - PTWS - and National Tsunami Warning Center – CNAT in spanish - for the monitoring and diagnosis of tsunamis affecting the Ecuadorian continental and insular coasts, receives information from the Pacific Tsunami Warning Center - PTWC, the regional centers (Colombia, Perú, and Chile) and from Geophysical Institute of the National Polytechnic School (IGEPN in spanish) for the threat analysis and response. Figure 1.

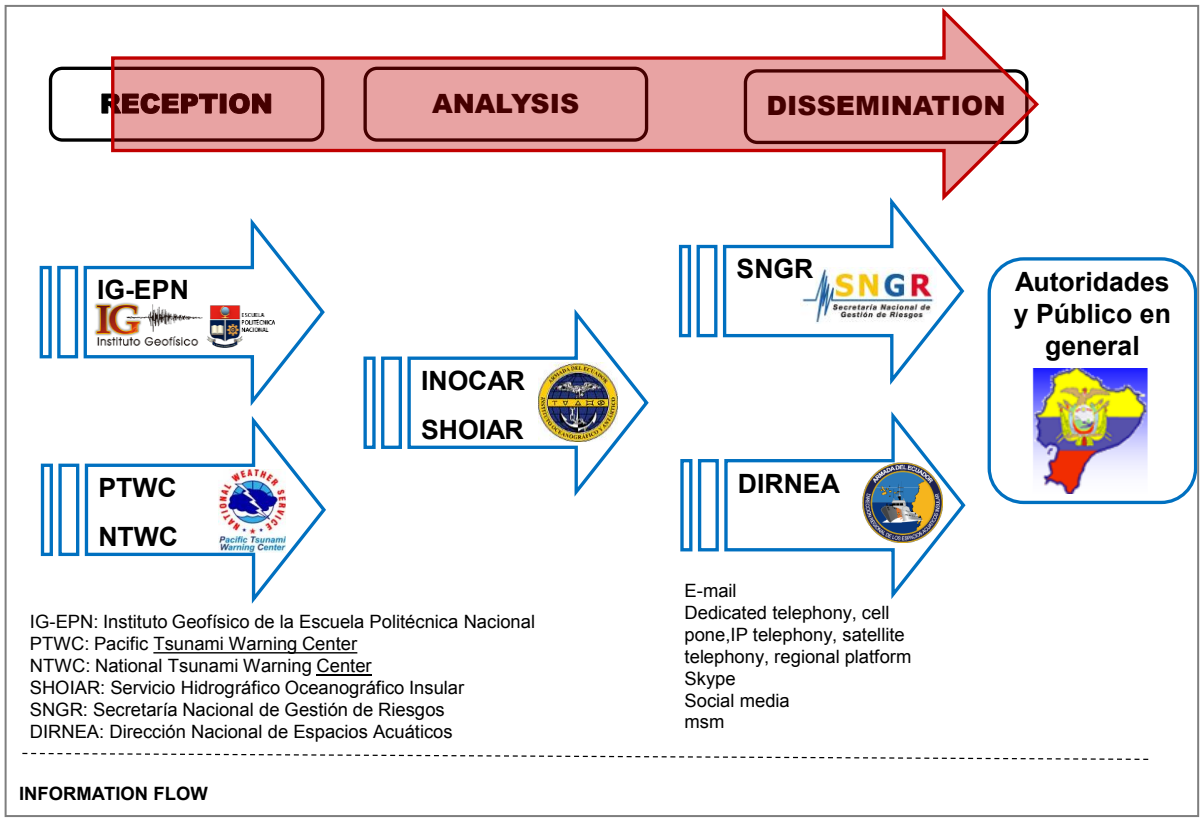


Figure 1. Schematic showing the flow of information for tsunami hazard analysis in Ecuador. **Source:** Inocar, 2025.

The technical protocol for evaluation and definition of tsunami warning (Version 3.0) has determined three domains for seismic monitoring, based on the level of competence to execute the tsunami warning evaluation originated by local earthquakes and based on the national level Ecuadorian monitoring capacity.

Domain 1- ECC-1 includes continental zone, Latitude : 4°N to 5.3° S and Longitude : 83° W to 73°W.

Domain 2 - ECG-1 corresponds to the island zone, Latitude : 4°N to 5.3°S and Longitude : 93°W to 89°W.

Domain 3 - ECF-1 includes oceanic area from 83°W - 89°W where the National Seismograph Network do not coverage the monitoring, it is poor. In this case, the information sources are USGS and PTWC.

Ecuador's CNAT does not have the capacity to monitor local seismic events ; however, it manages the national sea level network consisting of coastal tide gauges and ocean sensors, and receives information from IGEPN, the United States Geological Survey - USGS and the Pacific Tsunami Warning Center - PTWC. Figure 2.

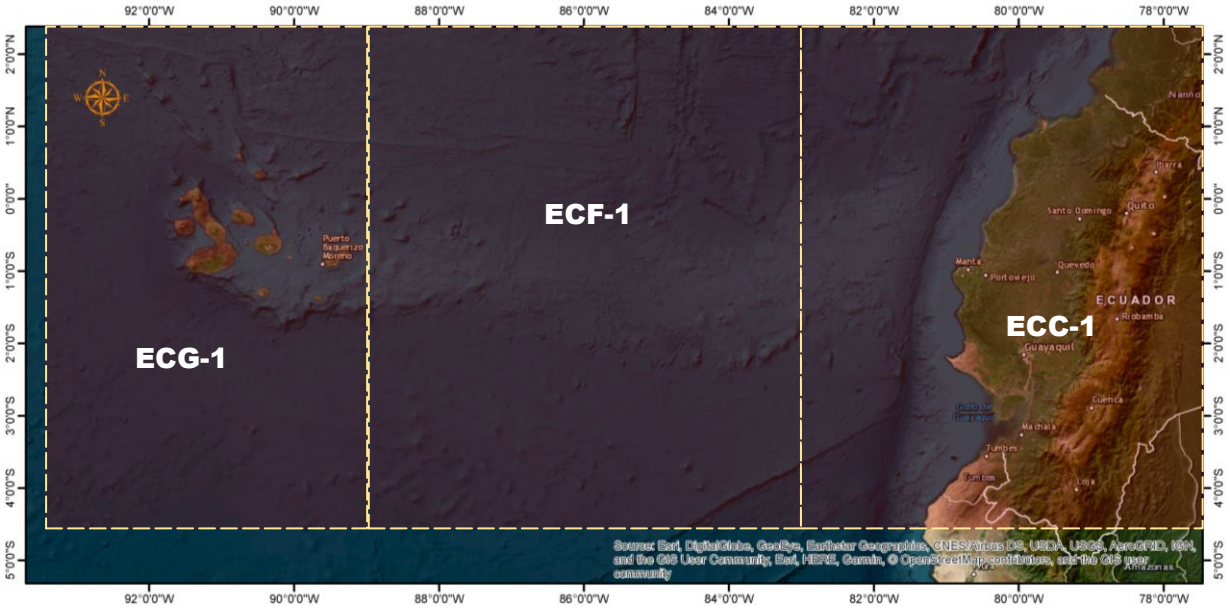


Figure 2. National Tsunami Warning Center responsibility Area. The subdivision area is in accordance with the monitoring capacity to the National Tsunami Warning System institutions have. **Source :** Inocar, 2025.

Information provided by the IG-EPN (local seismic net), USGS and PTWC is analyzed and related with sea level data of national network to evaluate the tsunami threat for the coasts of Ecuador. At the national level, first, INOCAR receives preliminary seismic parameters (automatic), and then it receives evaluated data by a seismologist on duty, finally INOCAR receives the magnitude moment Mw calculation (of the event). Local events are considered even those generated in the Colombian-Ecuadorian and Peruvian-Ecuadorian coastal boundary. Figure 3.

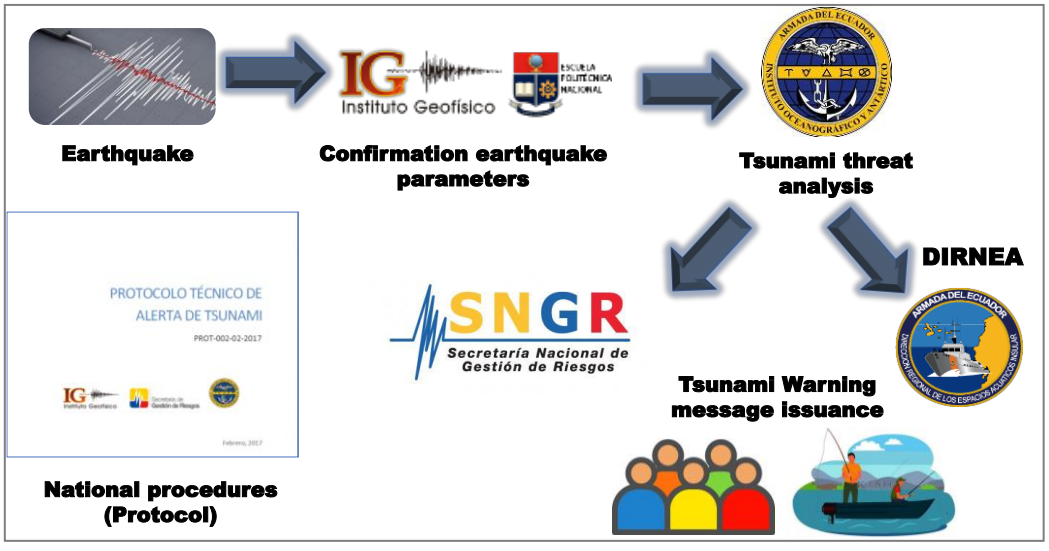


Figure 3. Ecuadorian coasts tsunami hazard monitoring and assessment capacity for the local sources providing information for information analysis. **Source :** INOCAR, 2025.

5. Tsunami Standard Operating Procedures for a Distant Tsunami (when a distant tsunami hazard exists)

For each situation, INOCAR identifies and characterizes tsunamigenic events.

The threshold or criteria for declaring a potential tsunami emergency is considered acording to PTWC SOP.

Bulletin type	Wave amplitude	Warning level	ETA
Warning	H ≥ 1m	Warning	ETA < 3 h
Advisory	0.3m ≤ H < 1m	Advisory	ETA < 3 h
Watching	H ≥ 0.3m	Watching	3 h ≤ ETA< 6 h
Information	H ≥ 0.3m	Information	ETA ≥ 6 h
Information	H < 0.3m	Information	---
Information	H ≥ 1m	Information	ETA > 3 h

The National Risk Management Secretary – Secretaría Nacional de Gestión de Riesgos (SGR in spanish) and the National Directorate of Aquatic Areas act on the information provided by INOCAR for characterizing the potential tsunami threat, but the National Risk Management Secretary disseminate the information within the country because it is the responsible agency for disaster public safety action.

The situation is considered over when INOCAR cancels the Tsunami Warning. (3 hours after the tsunami waves have arrived to the last point in the coast).

For regional and distant events, CNAT will evaluate the graphical and textual products provided by PTWC. Most model and its graphical interface results are added to this analysis. Figure 4.

For distant events, the response time is also six minutes from the moment information is received from the PTWC or USGS. Updates are made based on PTWC information updates and when results are obtained using the models and software available to CNAT, including Tsunami Travel Time (TTT), COMMIT/MOST, and TsuCAT.
For Distant Tsunami Procedures the information provided by PTWC, NWPTAC, and/or SCSTAC is analyzed and compared with that obtained from the application of specific software to determine wave height and arrival time, but the procedure is the same.

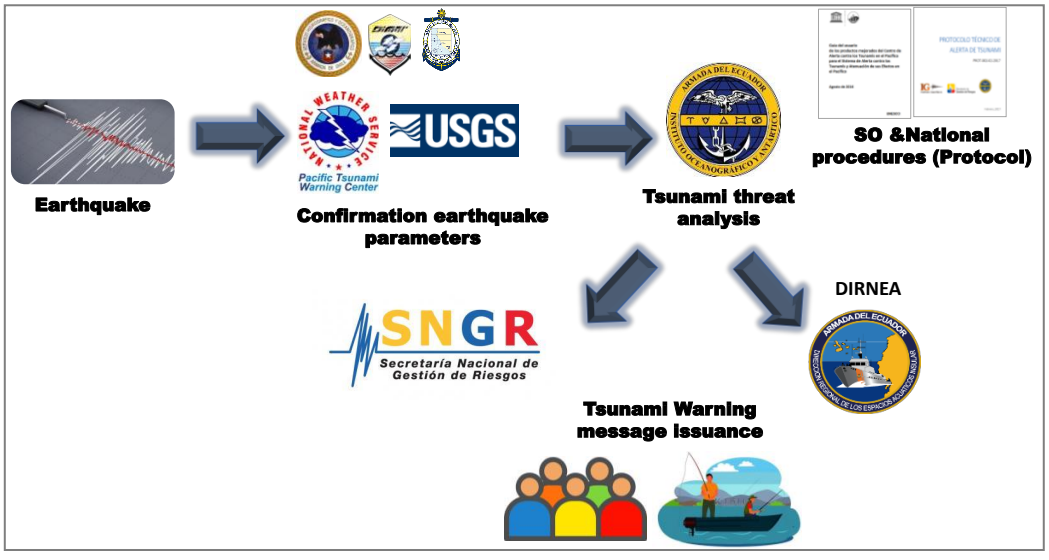
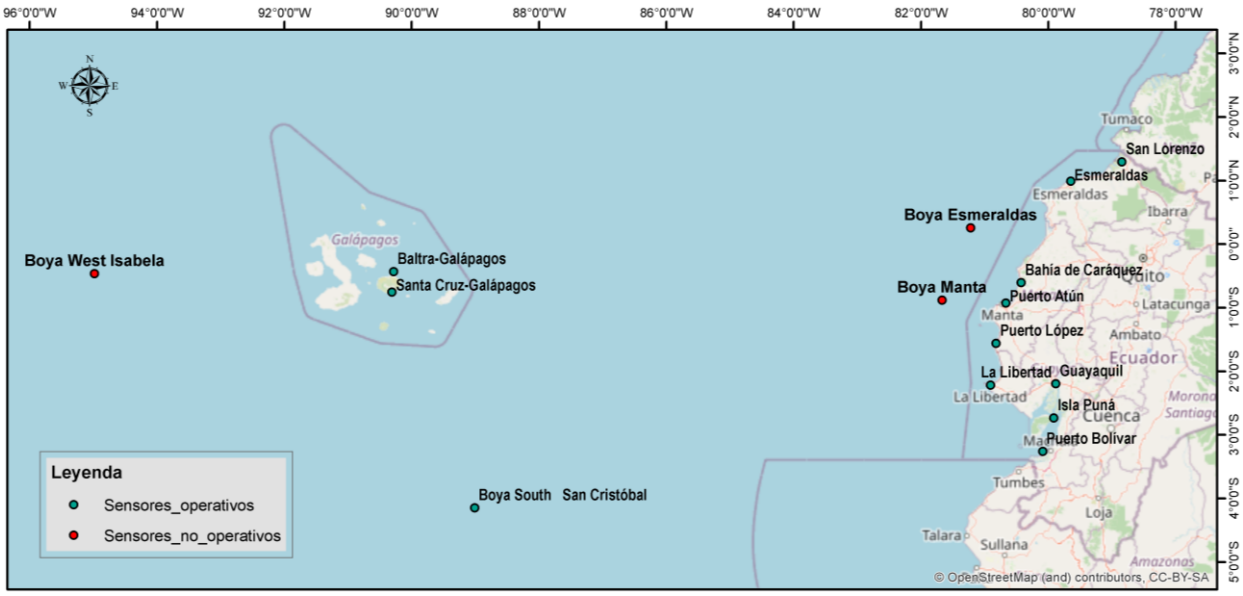


Figure 4. Ecuadorian coasts tsunami hazard monitoring and assessment capacity for distant tsunami soureces providing information for analysing. **Source :** INOCAR, 2025.

6. National Sea Level Network

Stations characteristics detail of the national Tide gauge network.

Station	Latitude	Longitude	Sensor type	Recording interval (minutes)	Transmission interval (minutes)	Remarks Operability
San Lorenzo	1.2956	-78.8421	Pressure, Radar, temperature	10	1	Station Ecuador-Colombia coastline
Esmeraldas	0.9909	-79.6466	Radar 1, Radar 2, temperature	10	1	In Operation
Bahía de Caráquez	-0.6064	-80.4229	Pressure, Radar, temperature	10	1	In Operation
Puerto Atún	-0.9257	-80.6659	Radar	10	1	In Operation
Puerto López	-1.5609	-80.8170	Radar 1, Radar 2	10	1	In Operation
Isla Puná	-2.7346	-79.9119	Pressure, Radar, temperature	10	1	In Operation
Puerto Bolívar	-3.2612	-80.0860	Pressure, Radar, temperature	10	1	Station Ecuador-Peru coastline
Guayaquil	-2.1953	-79.8798	Pressure, Radar, Temperature	10	1	In Operation
La Libertad	-2.2177	-80.9064	Pressure, Radar 1, Radar 2	1, 1, 5	5	In Operation
Baltra –Galápagos	-0.4330	-90.2830	Pressure, Radar 1, Radar 2	1, 1, 5	5	In Operation
Santa Cruz – Galápagos	-0.7520	-90.3070	Pressure, Radar 1, Radar 2	1, 1, 5	5	In Operation
Manta	-0.8810	-81.6640	EBM-24TS	15	180	Out of Operation
Esmeraldas	0.2560	-81.2160	EBM-24TS	15	180	Out of Operation
West Isabela	0.4620	-94.9800	EBM-24TS	15	180	Out of Operation
South San Cristóbal	-4.1480	-89.0080	EBM-24TS	15	180	In Operation



7. Information on Tsunami occurrences

Not Applicable

8. Web sites (URLs) of national tsunami-related web sites

https://www.inocar.mil.ec/web/index.php/tsunamis

9. Summary plans of future tsunami warning and mitigation system improvements.

NATIONAL PROGRAMMES AND ACTIVITIES INFORMATION

Ecuador, through INOCAR has planned to develop the following future activities:

1. Strengthen its tide gauge network by acquiring new tide gauge stations to increase the density of the national network. This initiative is supported by a joint project with the Risk Management Secretariat, scheduled for execution in 2025.
2. Certify continental coastal localities as Tsunami Ready cities.
3. Develop a database of pre-computed scenarios for distant tsunami events affecting the Ecuadorian coast.
4. Enhance the pre-computed scenario database with local models to assess tsunami impacts on Ecuadorian coastal areas.
5. Increase the number of inundation maps for Ecuadorian coastal regions.
6. Strengthen the infrastructure of the primary and alternate tsunami warning centers (Guayaquil and Galápagos).
7. Improve the technical capacity of personnel in tsunami inundation mapping to enhance the quality of products generated by INOCAR, with support from other institutions.

10. EXECUTIVE SUMMARY

INOCAR, as the Focal Point and National Contact for the Pacific Tsunami Warning System, has enhanced its tsunami monitoring capabilities. It has focused on three specific areas: Tsunami monitoring, where it has installed a tsunami detection buoy southeast of the Galápagos Archipelago; improving its response capacity by upgrading its system, which enables the preparation and issuance of bulletins during a tsunami emergency or event within a maximum of 6 minutes; and contributing to tsunami risk management by providing coastal areas with tsunami inundation maps using numerical methods.

These maps allow coastal cities to develop their contingency, emergency, and evacuation plans, establishing procedures that minimize the tsunami threat along Ecuador's coastal zones. Tsunami inundation maps are annually developed for coastal cities along the Ecuadorian continental margin.

INOCAR has also contributed to the certification of Puerto Baquerizo Moreno as the first Tsunami Ready city in Ecuador and South America, and continues this process for the certification of two other cities in the Galápagos province. Finally, it is important to highlight that INOCAR, in collaboration with other institutions within the Tsunami Warning System, continuously works on coordinating drills and exercises that help update national action protocols.

11. NARRATIVE

Since 2016, the first version of the technical protocol for evaluating tsunami threats in Ecuador was signed. In 2022, the 4th version of this document was issued, incorporating procedures for unusual

events, such as the January 15 eruption of the Hunga volcano, which generated a tsunami without any established procedures.

To disseminate the messages received from the PTWC or the bulletins evaluated from the National Geophysical Institute, INOCAR developed a semi-automatic bulletin issuance system that allows the quick creation of messages. This system integrates software like Tsunami Tide Tool, with tabular data available in three of the five bulletins generated through the system. These bulletins include: Alert, Warning, Observation, Information, and Cancellation.

In 2019, it acquired two tsunami detection buoys which were installed off the coasts of Manta and Pedernales. These buoys are listed in the NDBC with codes 32068 and 32069 and were replaced for maintenance in January 2023.

In 2022, a database of 11,000 pre-computed local scenarios was implemented. This project used the national historical seismic data as its base. As a result, wave amplitudes are obtained, and based on these amplitudes, a chart was created to assess the threat according to these amplitudes and the distance of the event from Ecuador's coasts.

Another ongoing action as a tsunami warning center is the creation of tsunami inundation maps, which aim to provide coastal communities with tools to assess the threat for coastal cities. This tool helps them develop evacuation, emergency, or contingency plans to enhance their capacity to respond to tsunamis.

Puerto Baquerizo Moreno became the first city in Ecuador and South America to receive Tsunami Ready certification in October 2024. Currently, all indicators have been met for two new Ecuadorian cities. This strengthens the response capacities of Ecuador's coastal communities and populations.

Finally, it is important to mention that INOCAR contributes to tsunami risk reduction in Ecuador through its technical studies, threat assessment, ongoing sea level monitoring, and, most importantly, the transfer of knowledge to students from schools, high schools, and universities who visit the institution to learn how tsunami information is managed in Ecuador.

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Date: February 5th 2025

Name: TNNV-SU Leonardo Alvarado Garcia.