NATIOANAL PROGRESS REPORT

VIET NAM

Pham The Truyen
Earthquake Information and Tsunami Warning Center
Institute of Geophysics- VAST

BASIC INFORMATION

PTWS NATIONAL TSUNAMI WARNING CENTER (NTWC)

The Earthquake Information and Tsunami Warning Center under Institute of Geophysics was established by the Prime Minister's Decision No 1798/QD-KHCNVN, September 4, 2007.

BASIC INFORMATION

PTWS NATIONAL TSUNAMI WARNING CENTER (NTWC)

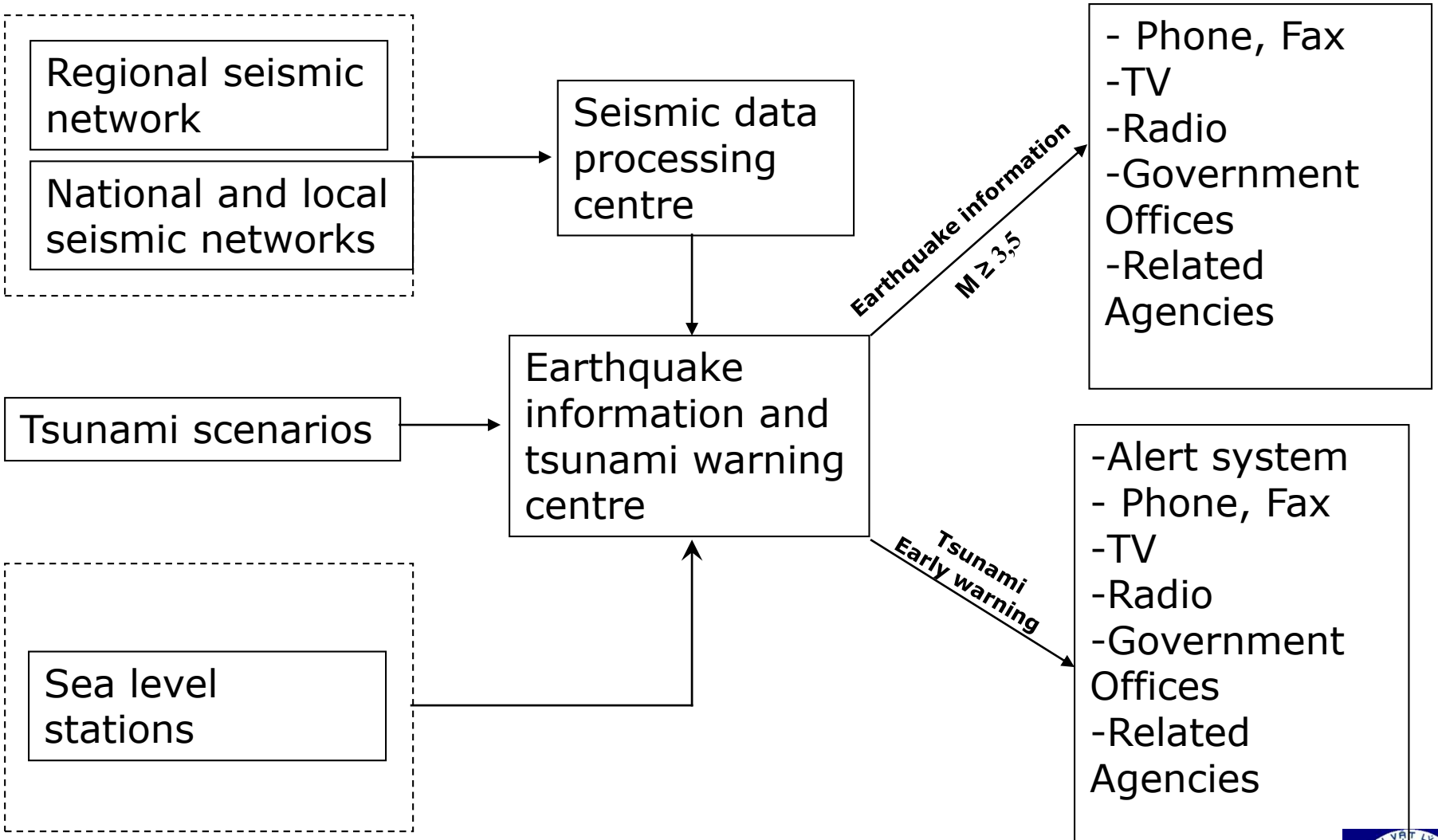
NTWC Agency Name:

Earthquake Information and Tsunami Warning Center,
Institute of Geophysics,
Vietnam Academy of Science and Technology

NTWC Agency Contact or Officer in Charge (person):

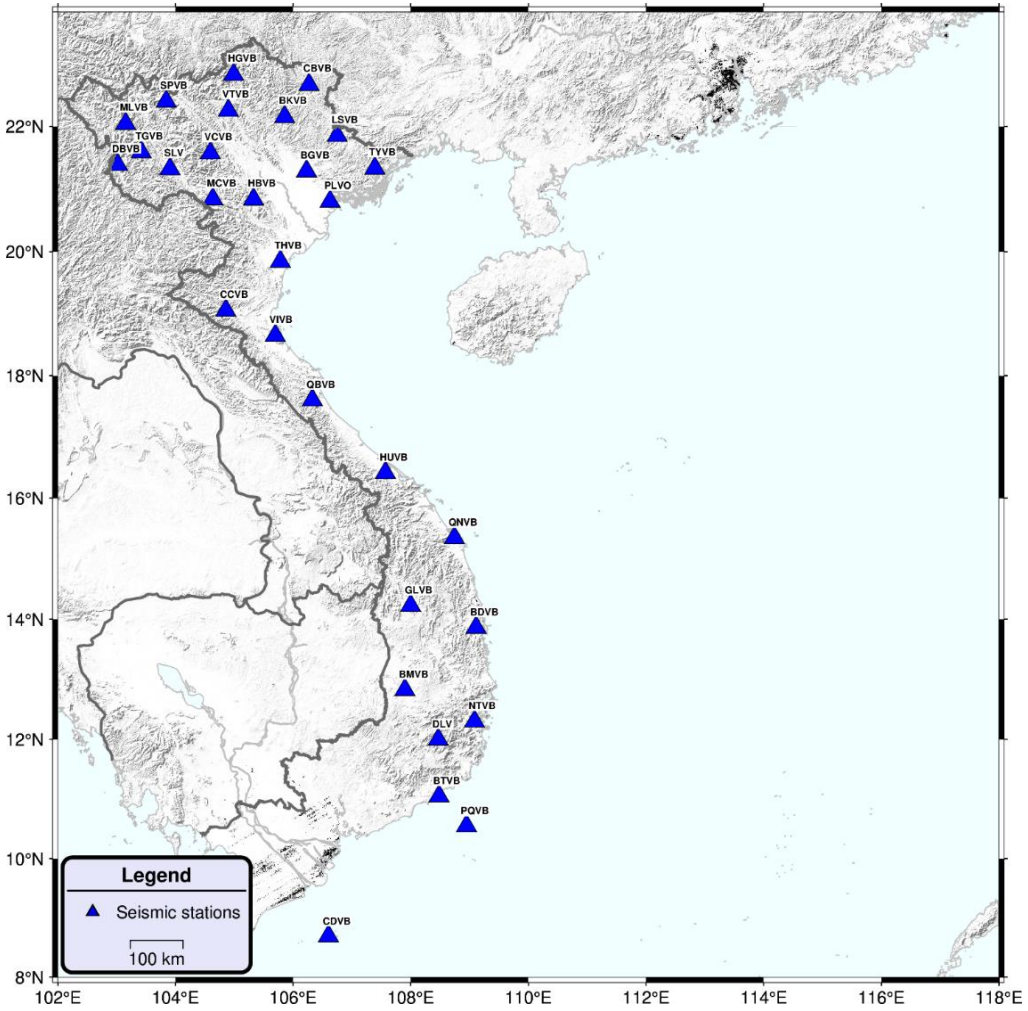
Name: Dr. Nguyen Xuan Anh
Position: Director
Telephone Number: (0084-4) 37564380
Email address: : anhnx@igp-vast.vn
Postal Address: A8-18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam

WARNING SYSTEM



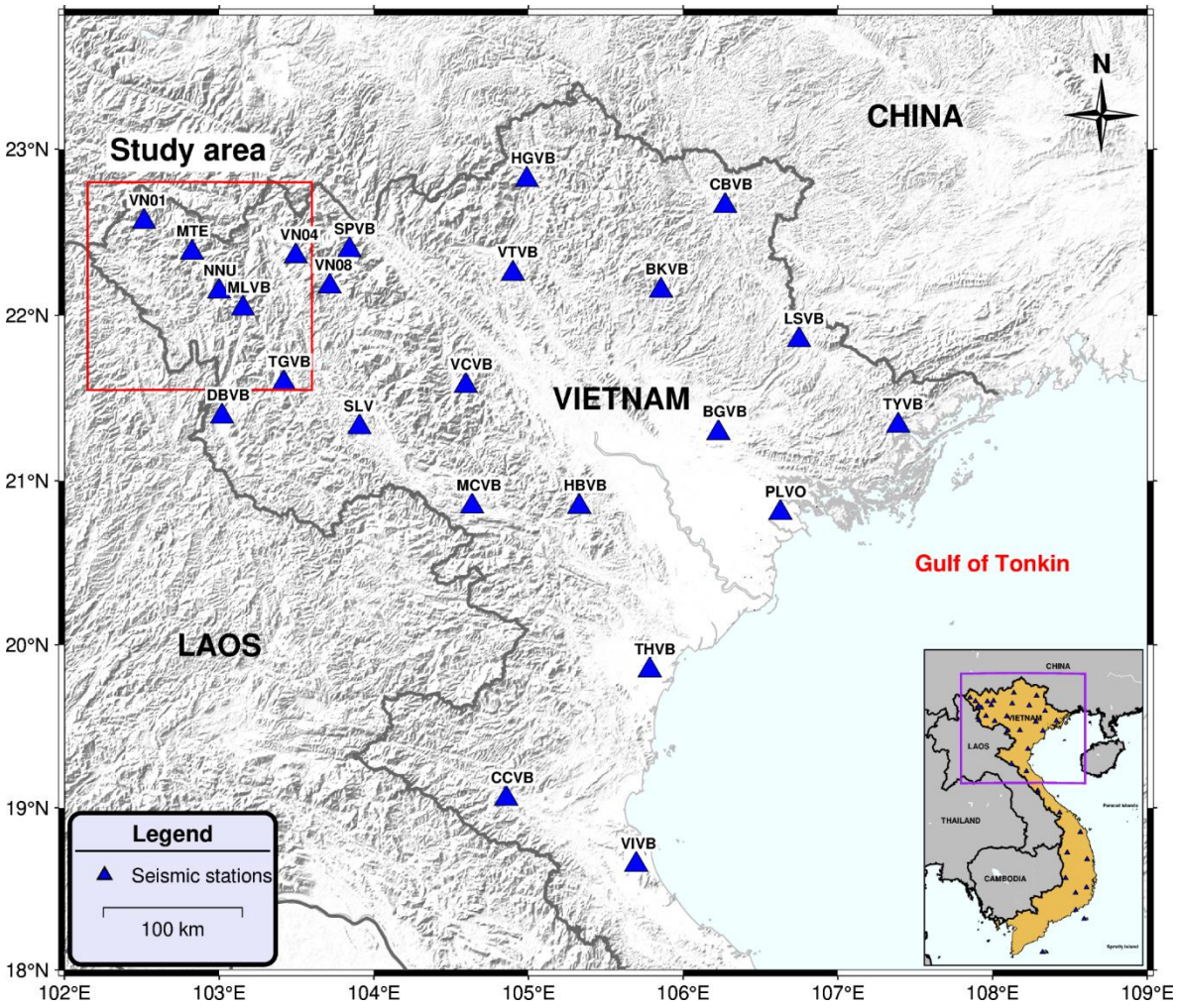
NATIONAL SEISMIC NETWORK

The IGP is currently operating a National Seismic Network, which consists of 31 broadband seismometers.



LOCAL SEISMIC NETWORK

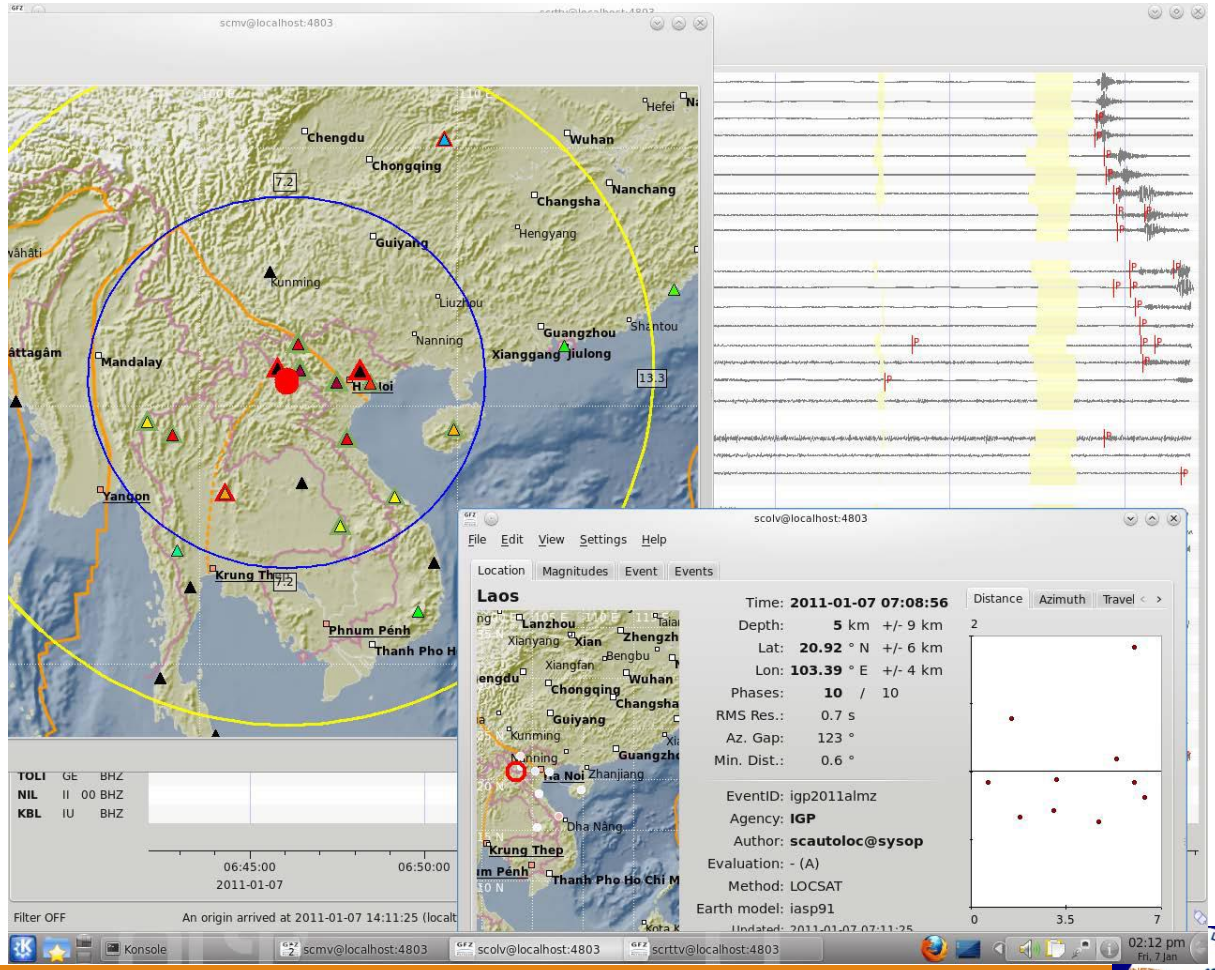
About 50 broadband seismic stations for monitoring induced earthquake activities



WARNING SYSTEM

DATA PROCESSING

- SeisComp
- Earthworm
- SeisAn

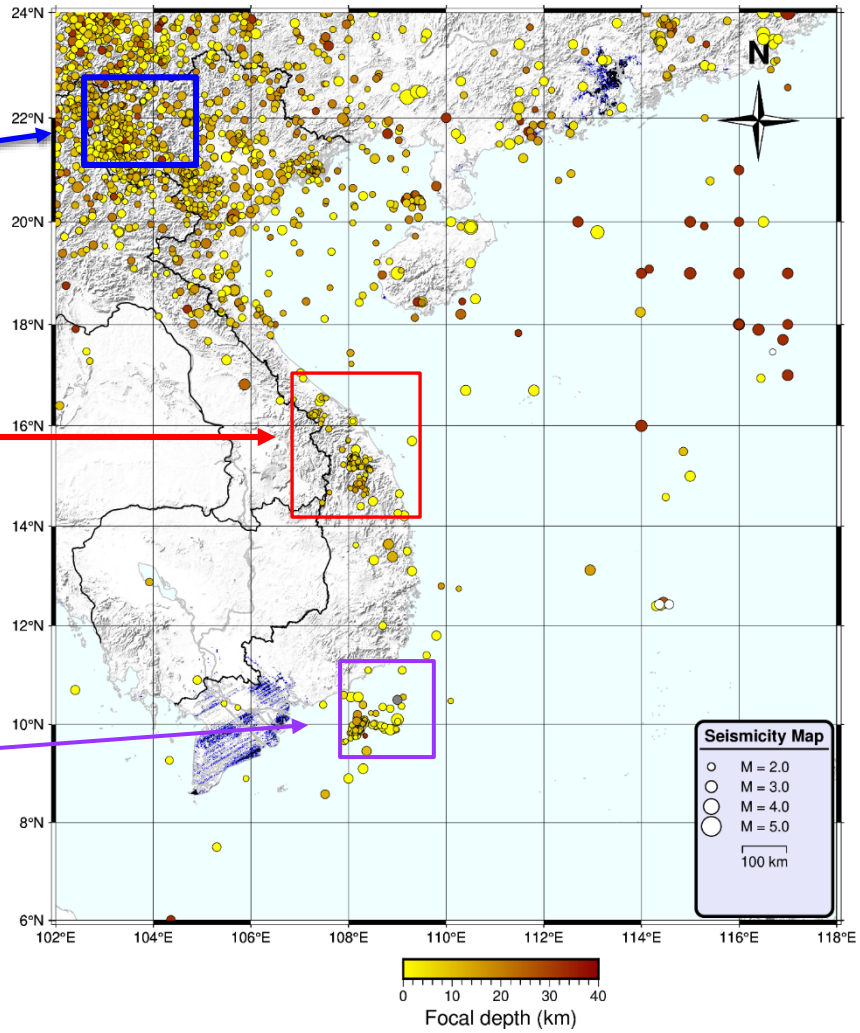


SEIMICITY IN VIETNAM

- Đien Bien 1935 (M=6.7)
- Tuan Giao 1983 (M=6.7)

•Induced earthquakes area

• Volcanic earthquake 1923 (M=6.1)



NATIONAL SEA LEVEL NETWORK

The National Hydro-Meteorological Service of Vietnam (NHMS), is operating a national hydro-meteorological network, which consists of 23 stations.

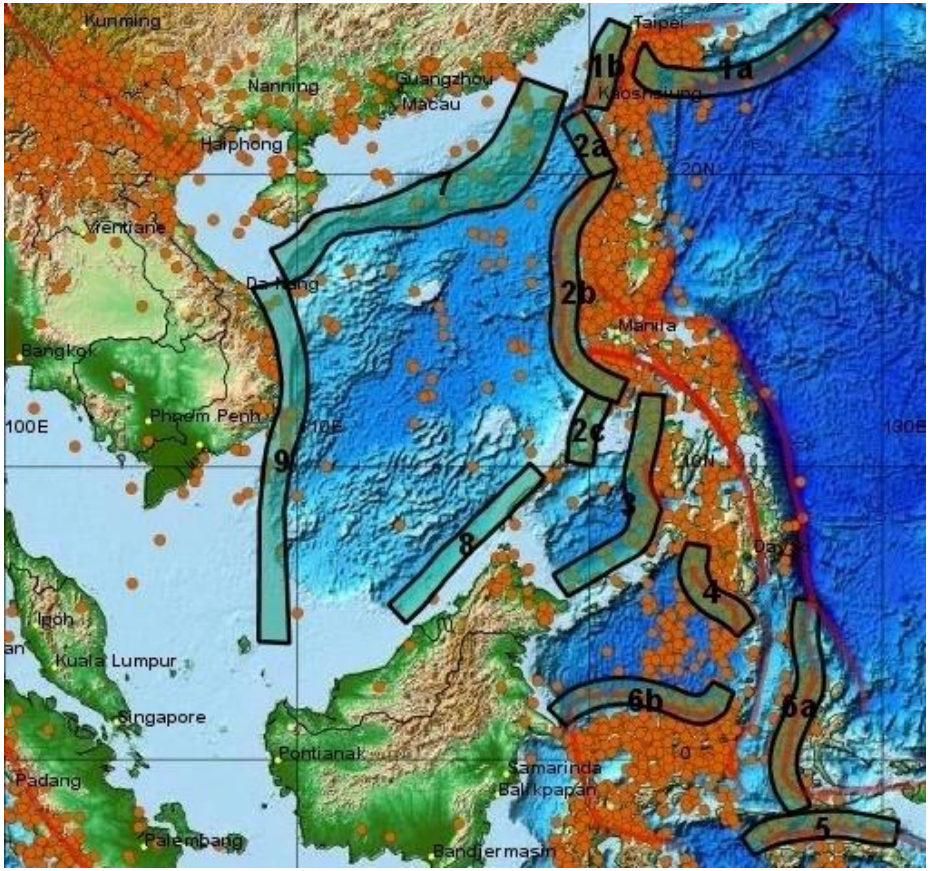
No	Station name	Location	Starting time	Station type
I. Northeastern Vietnam Meteorlogical Service				
1	Cua Ong	21°01' N - 107°21' E	26-10-1960	Coastal
2	Co To	20°59' N - 107°46' E	26-10-1958	Island
3	Bai Chay	20°57' N - 107°04' E	25-6-1960	Coastal
4	Hon Dau	20°40' N - 106°48' E	1-1956	Island
5	Bach Long Vi	20°08' N - 107°43' E	4-1958	Island
II. Northern Central Vietnam Meteorlogical Service				
6	Sam Son	19°45' N - 105°54' E	1-1-1998	Coastal
7	Hon Ngu	18°48' N - 105°46' E	5-1961	Island
8	Hoanh Son	17°57'N-106°27'E	2013	New station
III. Mid Central Vietnam Meteorlogical Service				
9	Con Co	17°10' N - 107°22' E	1-6-1974	Island
10	Son Tra	16°06' N - 108°13' E	7-1977	Coastal
11	Hoang Sa	16°33'N-111°37'E	1975	Mute station
12	Dung Quat		2012	Coastal
13	Ly Son	15°23'N-109°09'E	2014	New station
IV. Southern Central Vietnam Meteorlogical Service				
14	Qui Nhon	13°46' N - 109°15' E	1-4-1986	Coastal
15	Phu Qui	10°31' N - 108°56' E	1-4-1979	Island
16	Trường Sa	8°39' N - 111°55' E	7-1985	Island
17	Song Tu Tay	11°25'N-114°20'E	2014	New station
V. Southern Vietnam				
18	Vung Tau	10°20' N - 107°04' E	1-4-1979	Coastal
19	Phu Quoc	10°13' N - 103°58' E	4-1979	Island
20	Tho Chu	9°17' N - 103°28' E	7-10-1993	Island
21	Con Dao	8°41' N - 106°36' E	1-4-1979	Island
22	DK1- 7	8°01' N - 110°37' E	1983	Floating
23	DKI/14	7°31'41''N- 9°50'30''E	2012	Floating

NATIONAL SEA LEVEL NETWORK

Distribution of the hydro-meteorological stations of Vietnam.

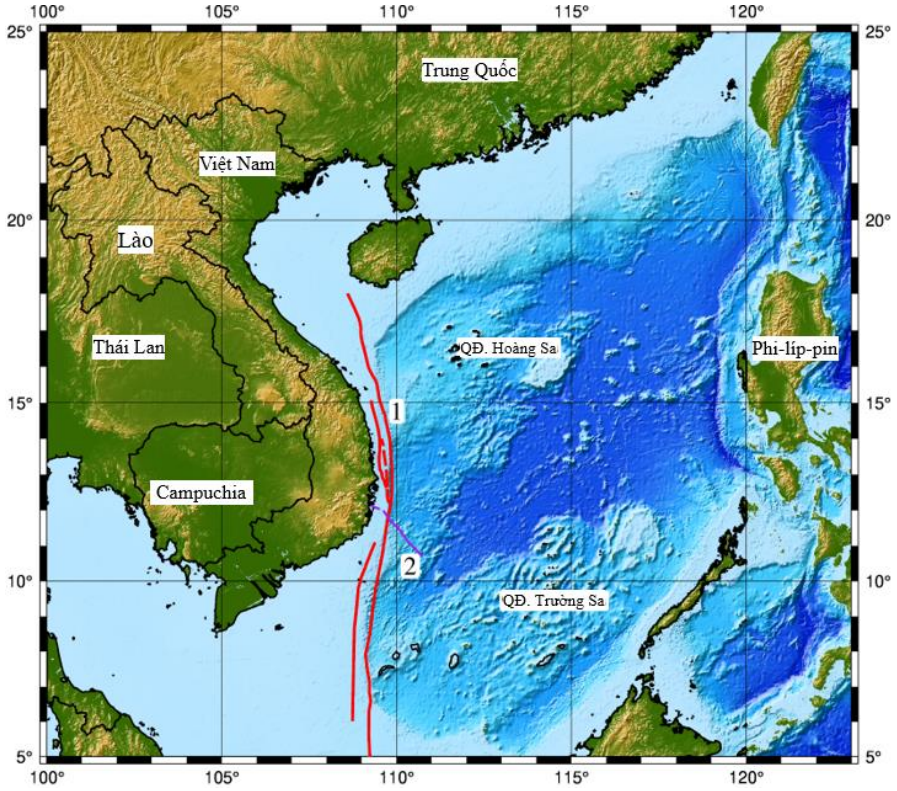
WARNING SYSTEM

TSUNAMI SOURCE ZONES

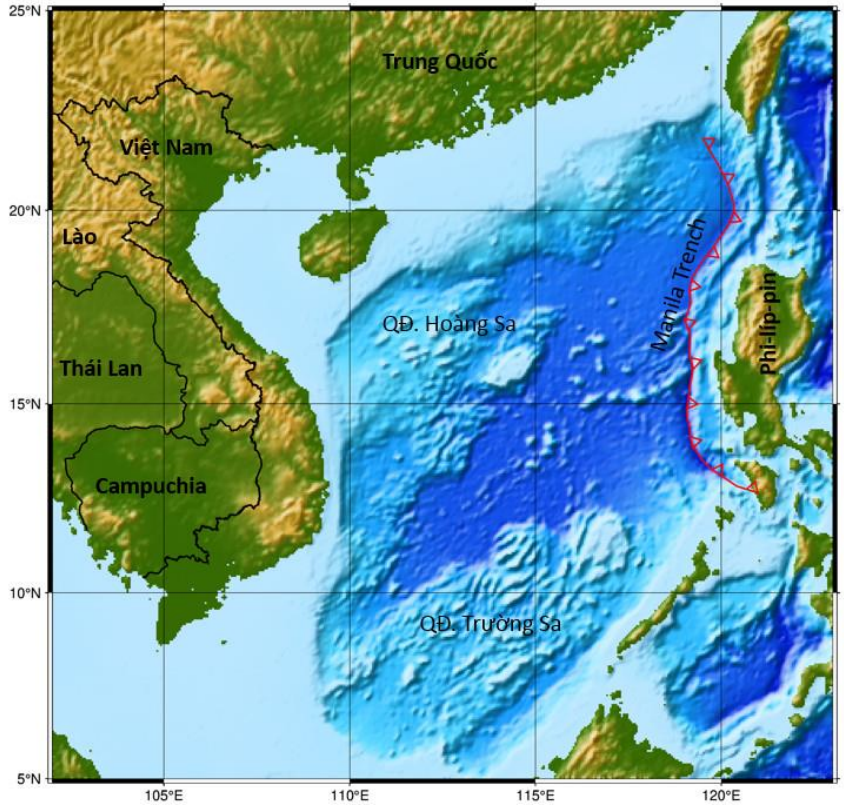


09 tsunami source zones are capable of affecting the Vietnamese coast. 1a. Riukiu-Taiwan;1b. West Taiwan; 2a. North Manila Trench; 2b. Central Manila Trench; 2c. South Manila Trench; 3. The Sulu Sea; 4. The Selebes Sea; 5. The South Banda Sea; 6a. The North Banda Sea 1; 6b. The North Banda Sea 2; 7. North of the East Vietnam Sea; 8. Northwest Borneo-Palawan; 9. The 109 meridian.

TSUNAMI SOURCE ZONES

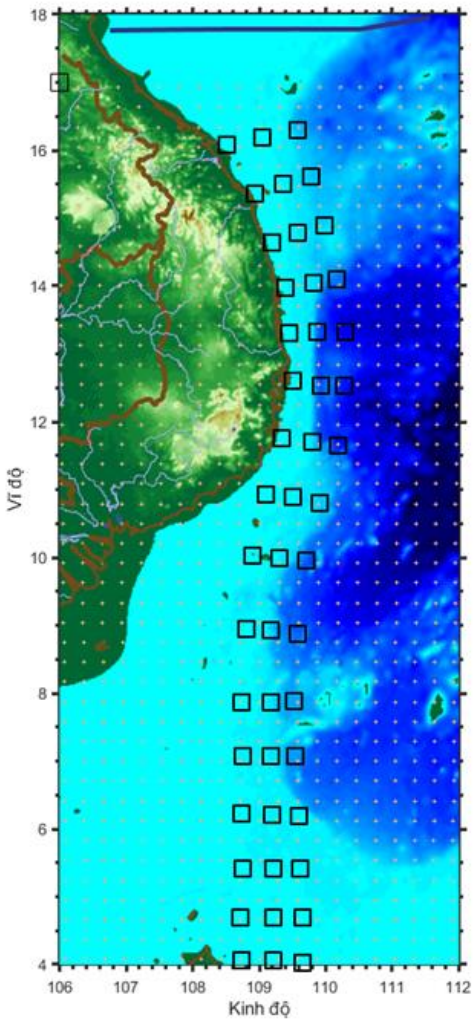


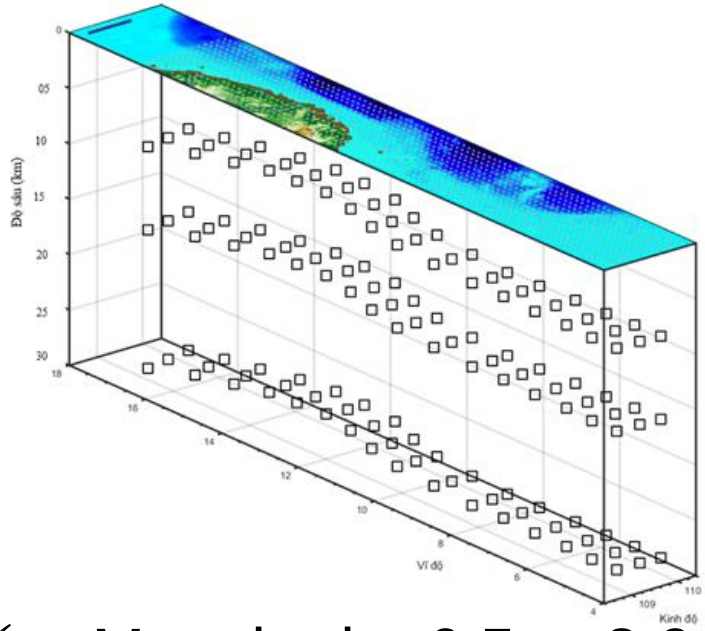
The 109^0 meridian fault



Manila Trench

TSUNAMI SCENARIOS

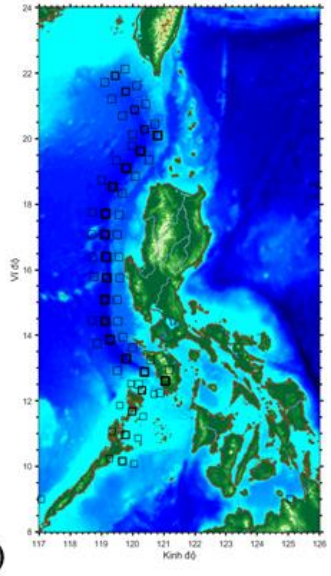




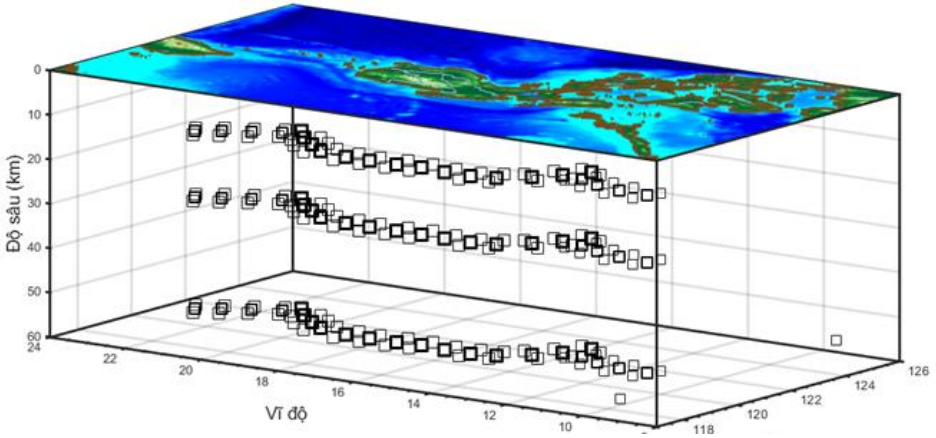
- ✓ - Magnitude: 6.5 to 8.0 with an increment of 0.5.
- ✓ Changing the epicenter (Longitude, Latitude).
- ✓ Depth (h): 10-15-25 km.
- ✓ Total 336 tsunami scenarios have been developed in the 109^0 meridian source.

TSUNAMI SCENARIOS

- ✓ - Magnitude: 6.5 to 9.3 with an increment of 0.5.
- ✓ Changing the epicenter (Longitude, Latitude).
- ✓ Depth (h): 10-15-25 km.
- ✓ - Total 666 tsunamis scenarios have been developed in the Manila Trench source



a)



TSUNAMI SOP

The threshold of criteria for declaring a potential tsunami emergency is defined depending on the source zone's location and magnitude of tsunami generating earthquake.

Source Class	Source zone name	Parameters	Templates
Local	1. The 109 meridian source (on continental shelf of Vietnam)	6.5 ≤ M < 7.0 and D ≤ 10 km 7.0 ≤ M < 7.5 và D ≤ 20 km 7.5 ≤ M < 8.0 và D ≤ 60 km M ≥ 8.0 và D ≤ 80 km	National Warning---Tsunami Tsunami Alert Level 3
		M < 6.5	Earthquake Bulletin
Regional	1. Manila Trench 2. North of the East Vietnam sea 3. Palaoan 4. Sulu Sea 5. Selebes Sea 6. Taiwan 7. Ryukyu PTWC / NWPTAC	7.0 < M D <= 100 km	Tsunami Alert Level 0
		7.0 ≤ M < 7.5 D <= 100 km	Tsunami Alert Level 1
		7.5 ≤ M D <= 100 km	Tsunami Alert Level 3
Teleseismic	Japan, Kurile, Aleutian, Cascadia Chile PTWC / NWPTAC message	M < 8.0 D <= 100 km	Tsunami Alert Level 0 (Pacific)
		8.0 ≤ M D <= 100 km no confirmed tsunami	Tsunami Alert Level 1 (Pacific)
		8.0 ≤ M D <= 100 km With confirmed wave heights in sea level data < 1 m	Tsunami Alert Level 2 (Pacific)
		8.0 ≤ M D <= 100 km With confirmed wave heights in sea level data >= 1 m	Tsunami Alert Level 3 (Pacific)

WARNING SYSTEM

TIMELINE FOR A DISTANCE TSUNAMI

STEP	TIME since EQ*	ACTIVITY	TOOLS	ACTION AND PROCEDURES
1	3-5 min.	Seismic Alarm Trigger	• CISN • Seiscomp3	• Alarm sounds from automated seismic processing system • For a felt earthquake (greater than M3.5), alert should be issued immediately to the public and national disaster response organisations in the country.
2	5 - 10 min	• Earthquake Review	• Seiscomp3 • Seisan •	• Review/update automatic phase picks and solution • Perform Interactive analysis if required • Highest priority for review is earthquake magnitude and focal depth •
4	8-9 min	Re-evaluation and issuance of new information, messages from PTAC and PTWC	• Fax • Email	• Update information on EQ and Tsunami • Check if the EQ can generate the Tsunami affecting the VN coast (based on EQ parameters)
3	11-15 min	-Informing the Directorate/ Experts about EQ occurence	• SMS • Fax • Phones • Website	• Send information to Directorate/ Experts
5	15-20 min	Tsunami threat analysis and decision making	• TTT • Tsunami scenarios database • Tidetools • Phones • SMS	• Tsunami threat threshold criteria are used for identifying tsunami type and estimated tsunami arrival time. • Calculate tsunami travel times to nearest coasts. • Expected tsunami threat area and heights are determined from tsunami simulation database. • Calling NHMS, Quy Nhon, Vung Tau Tide gauges stations • Checking real time sea level data
6	20 min	Issuance of the first tsunami Bulletin	• SMS • Fax • Phones • Website	• Issuance of tsunami arrival and height observations • (Downgrade or Cancel if tsunami is smaller or no tsunami is observed.)
7	20 min to hours	Re-analysis	• SMS • Fax • Phones • Website	• If tsunami is generated, tsunami information is regularly issued until no tsunami threat exists. Neighboring and international tsunami center information to be considered in evaluation.
8	Hours	Cancellation	• SMS • Fax • Phones • Website	• If tsunami threat no longer exists, tsunami warning cancellation is issued.
9	Days to weeks	Tsunami site survey	•	• Survey of tsunami run-up, inundation, and eyewitness observation along coastal area. • Survey of tsunami disaster on people, structures, geology, and social impact and early response
10	Week to months	Summary report	•	• Analysis of the warning center and emergency response operational procedures • Revision and update of existing SOP

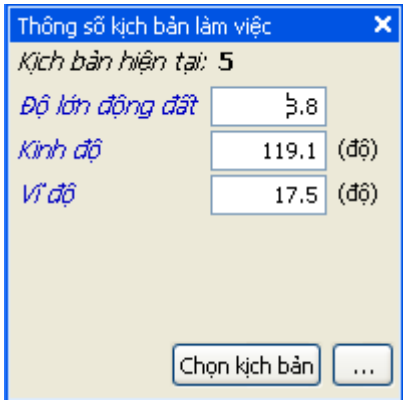
WARNING SYSTEM

TIMELINE FOR A NEAR-FIELD TSUNAMI

STEP	TIME since EQ*	ACTIVITY	TOOLS	ACTION AND PROCEDURES
1	1 min	Seismic Alarm Trigger	• CISN • Seiscomp3	• Feel earthquake and respond, receive phone call or other • Alarm sounds from automated seismic processing system • For a felt earthquake (greater than M3.5), alert should be issued immediately to the public and national disaster response organisations in the country.
2	2 min	Earthquake Review	• Seiscomp3 • Seisan	• Review/update automatic phase picks and solution • Perform Interactive analysis if required • Highest priority for review is earthquake magnitude and focal depth
3	3 min	Tsunami Threat Decision Making	• TTT • Tsunami scenarios database	• Calculate tsunami travel times to nearest coasts. • Expected tsunami threat area and heights are determined from tsunami simulation database. • Tsunami Threat threshold criteria are pre-decided using historical and other science data.
4	5 min	Issuance of warning and related tsunami information	• SMS • Fax • Phones • Website	• If warning thresholds (for earthquake magnitude or expected tsunami height) are exceeded, issue warning to tsunami-threatened areas immediately. For warning, issue expected tsunami arrival times at forecast points.
5	7 min	Re-analysis	• Tidetools • Seiscomp3	• Monitor sea level data (coastal run-up, coastal sea-level, deep-ocean gauges) • Re-evaluation of focal parameter obtained in step 2 using additional data. • Comparison to focal parameters and tsunami forecasts provided by international/regional centers
6	10 min	Re-evaluation and issuance of new information, messages from PTAC and PTWC	• SMS • Fax • Phones • Website	• Upgrading of warning if observed tsunami are higher than the expected at Step 3 • Issuance of tsunami arrival and height observations • (Downgrade or Cancel if tsunami is smaller or no tsunami is observed.)
7	10 min to hours	Information	• SMS • Fax • Phones • Website	• If tsunami is generated, tsunami information is regularly issued until no tsunami threat exists. Neighboring and international tsunami center information to be considered in evaluation.
8	Hours	Cancellation	• SMS • Fax • Phones • Website	• If tsunami threat no longer exists, tsunami warning cancellation is issued.
9	Days to weeks	Tsunami site survey	•	• Survey of tsunami run-up, inundation, and eyewitness observation along coastal area. • Survey of tsunami disaster on people, structures, geology, and social impact and early warning response
10	Week to months	Summary report	•	• Analysis of the warning center and emergency response operational procedures • Revision and update of SOP as required

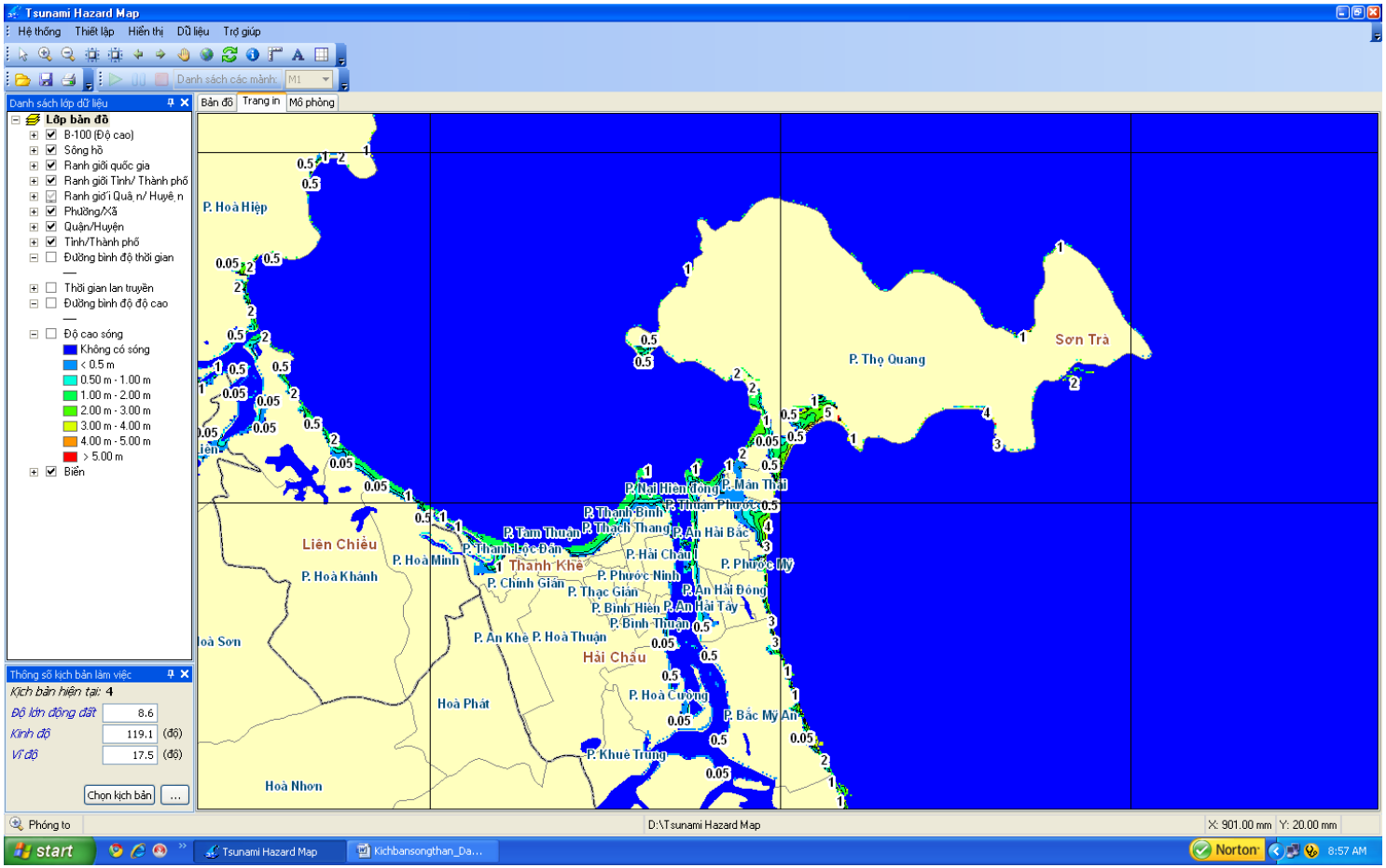
WARNING SYSTEM

TSUNAMI SCENARIO DATABASE



WARNING SYSTEM

TSUNAMI SCENARIO DATABASE



TSUNAMI WARNING DISSEMINATION

The tsunami information disseminates by fax, email and SMS.

TSUNAMI WARNING DISSEMINATION

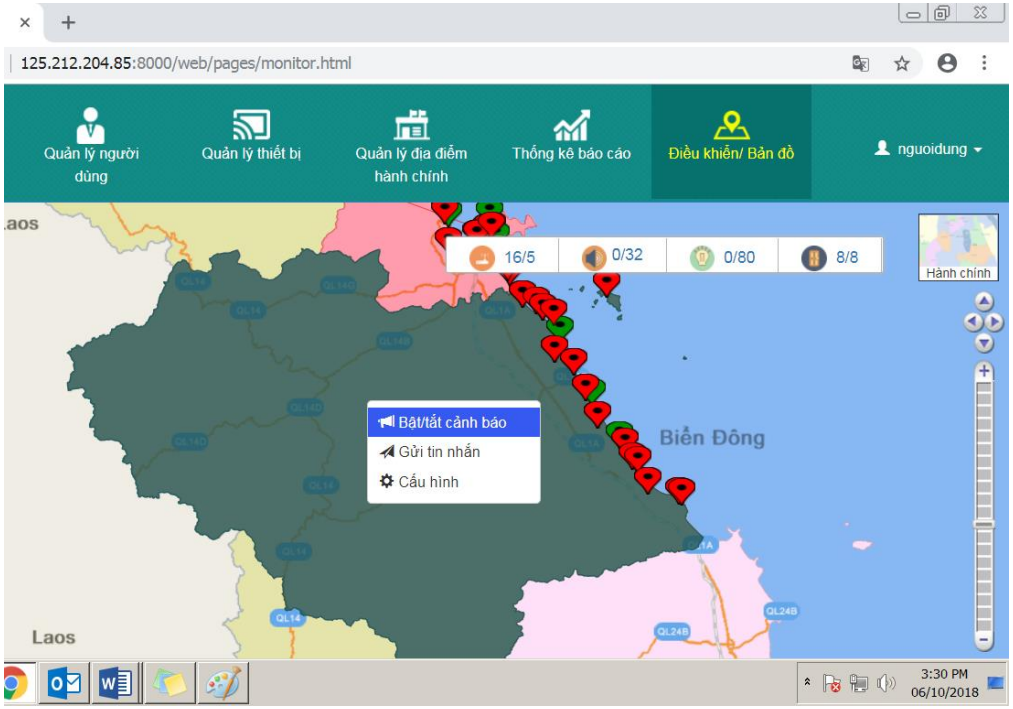
TT	TÊN CƠ QUAN	ĐIỆN THOẠI	FAX
1	**VĂN PHÒNG TRUNG ƯƠNG ĐẢNG** *(Central Bureau of Communist Party)* 1A- Hùng Vương- Ba Đình	08 04 5288 *(Phòng cơ yếu)* 08 04 54 74 *(Tổ trực)*	08 04 54 91
2	**VĂN PHÒNG CHÍNH PHỦ** *(Bureau of Government)* Số 1 Hoàng Hoa Thám	08 04 3896 0904 107 799 *(Ông Huệ, Phó vụ trưởng Vụ NN)*	08 04 4130
3	**ỦY BAN QUỐC GIA TÌM KIẾM CỨU NẠN** *National Committee for Search ank Rescue* 26- Hoàng Diệu- Ba Đình	0695.53612hoặc 04 37 33 36 64 *(Trực ban UBQGTKCN)*	04 7 33 38 45
4	**ỦY BAN NHÂN DÂN CÁC TỈNH BỊ ẢNH HƯỞNG CỦA ĐỘNG ĐẤT, CÓ KHẢ NĂNG CHỊU ẢNH HƯỞNG CỦA SÓNG THẦN** *People's Committee of the Provinces where there are the effects of Earthquake and of Tsunami*		
5	**ĐÀI TIẾNG NÓI VIỆT NAM** *Radio Vietnam* 58 Quán Sứ	04 38 25 42 38	04 8 25 57 65
6	**ĐÀI TRUYỀN HÌNH VIỆT NAM** *Vietnam Television* 43 Nguyễn Chí Thanh	8 34 46 57 *(Ban Thời sự)*	8 31 68 03
7	**BỘ TÀI NGUYÊN VÀ MÔI TRƯỜNG** *Ministry of Natural Resources and Environement* 83 Nguyễn Chí Thanh	8 24 70 02 *(Phòng dự báo)* 0913216832 *(Thứ trưởng Nguyễn Công Thành)* 0913201346 *(GĐ TT KT TV QG)* 0913079042 *(GĐ TT KT TV Biển)*	83.59221 (VP) 8 25 42 78 (Phòng dựbáo)
8	**VIỆN KHOA HỌC VÀ CÔNG NGHỆ VIỆT NAM** *Academy of Science and Technology*	04 37 5640 76 *(VP Viện)* 0913271687 *(PCT Nguyễn Khoa Sơn)* 0912 815 805 *(Chánh VP)*	04 7 56 44 83
9	**BỘ CÔNG AN** *(Ministry of the Interior)* 40 Hàng Bài – Hoàn Kiếm	04 39 36 27 80 hoặc 0694 2582 *(Trực ban Tổng cục cảnh sát)*	04 8 24 08 49
10	**BỘ BƯU CHÍNH VIỄN THÔNG** *(Ministry of Information and Communication)*		
	TẬP ĐOÀN BƯU CHÍNH VIỄN THÔNG VIỆT NAM *(Vietnam post and Telecommunications group)*	8254860hoặc 7731134	7731166
	CÔNG TY THÔNG TIN ĐIỆN TỬ HÀNG HẢI VIỆT NAM *(Vietnam Maritime Communication and Electronics Company)*	03 13 74 7062	03 13 74 7062
11	**WEBSITE CHÍNH PHỦ** *(The Government Website)*		080 4 89 24
12	**THÔNG TẤN XÃ VIỆT NAM** *(Vietnam News)*		6 36 64 13

The tsunami information is sent to many governmental disaster response organizations, but the first priority is going to the following organizations : 1) DMO, 2) the National Committee for Search and Rescue, and People Committee of the coastal provinces of Vietnam, and 3) the Media.

TSUNAMI RESPONSE

A Drill on tsunami response was conducted in Da Nang city, Central Vietnam

TSUNAMI RESPONSE



- 30 sirens in Đa Nang
- 21 sirens Quang Nam

TSUNAMI RESPONSE

A Drill on tsunami response was conducted in Da Nang and Quang Nam provinces, central Vietnam

TSUNAMI RESPONSE

A Drill on tsunami response was conducted in Da Nang and Quang Nam provinces, central Vietnam

Future plans

- To upgrade the national seismic networks with deploying more broadband seismic sensors.
- Upgrade the tsunami scenarios database for warning purpose.
- To assess the tsunami hazard for harbors and high risk areas in the Vietnamese coastal

THANK YOU !