Earthquake Sensor alarm System

Challenge Co., Ltd
October 2019

Introduction of company

◆Company Name ：Challenge Co., Ltd.

◆Company Representative ：Kazuo Sasaki

◆Date of Establishment ：April 24, 2009

◆Capital :15 million yen

◆Area of Business :Maker of disaster-/security-related products as well as systems

◆Products and Services :

Earthquake
Sensor Alarm Equipment
EQ Guard

School Guard and
Hospital Guard for ensuring security
of schools, hospitals and
shopping malls

Data center

EQ guard

School guard

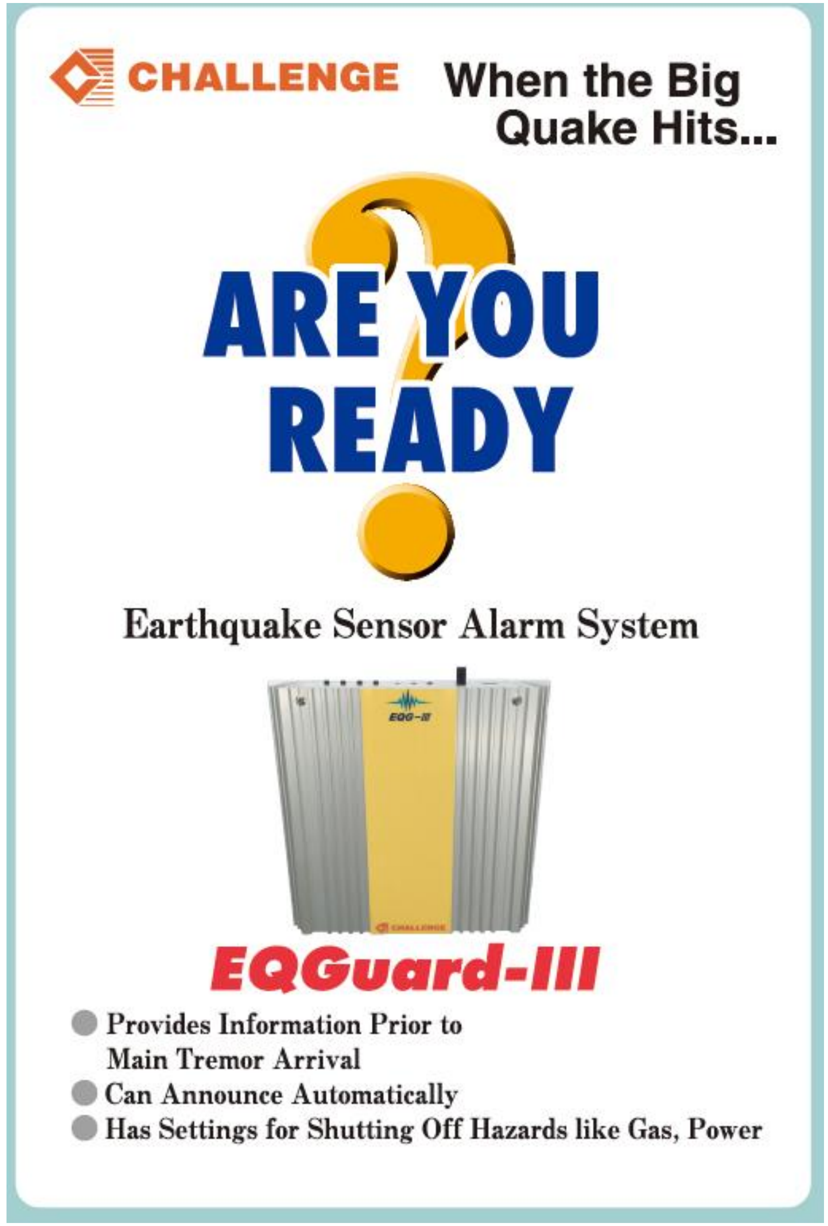
◆Headquarters :2-14-4, Kojima, Taito-ku, Tokyo, JAPAN, 111-0056

TEL 81-3-5809-2304 FAX 81-3-5809-2305

http://www.challengego.co.jp

What is the EQ guard ?

CHALLENGE



Function of EQ guard

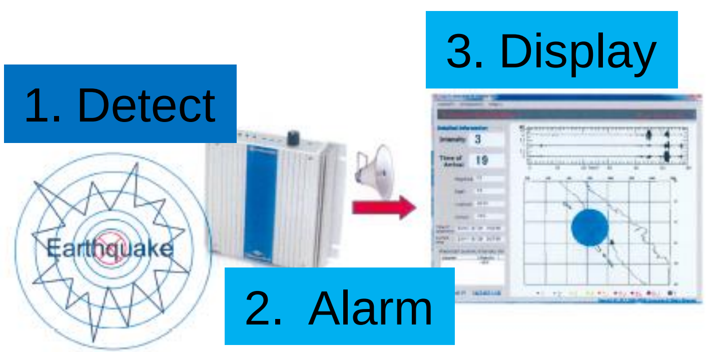
SENSOR NETWORK EARTHQUAKE NEWS FLASH

Sensor detects P wave => Sends out alarm => Displays area map also

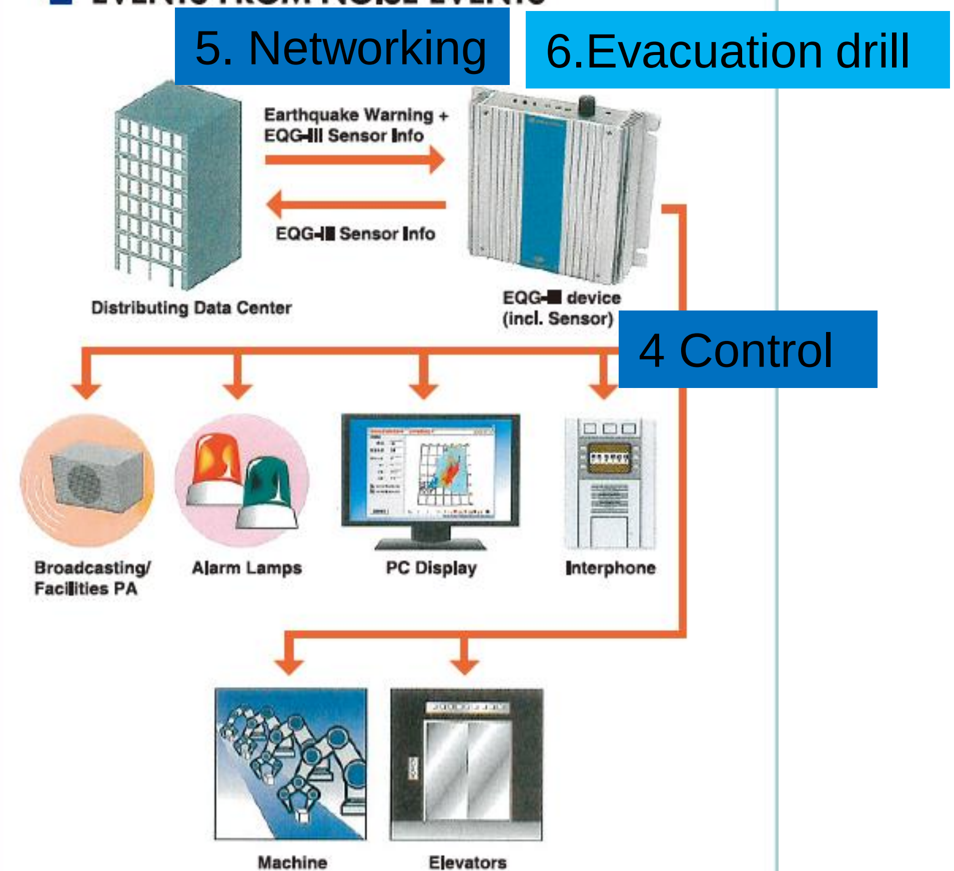
ALARM

Built-in accelerometer (MEMS Sensor) detects P wave and issue earthquake alert before the arrival of strong shaking by S wave. EQG-III has a specialized software to distinguish between earthquake and living noise generated near EQG-III, which prevents it issuing of erroneous alert.

- Accelerometer detects P wave issues Alarm immediately
- Alarm through server issues Alarm after 1 second



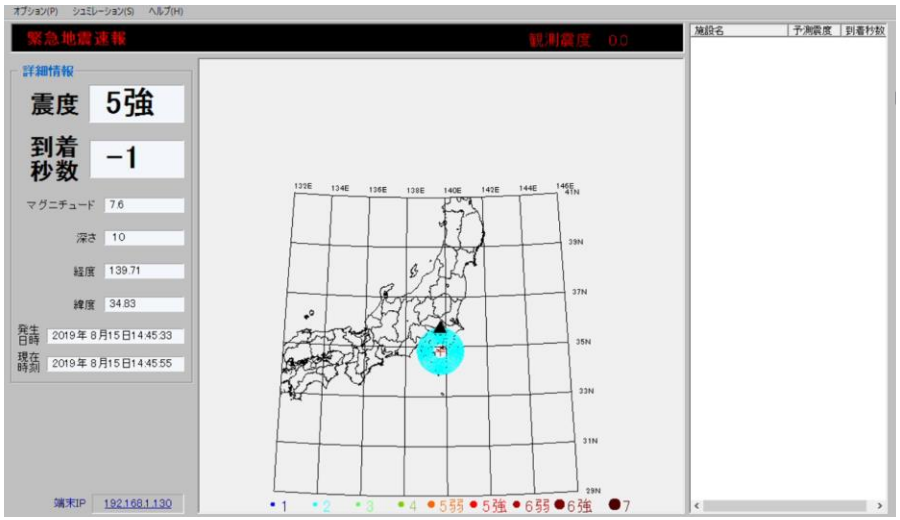
DISCRIMINATING SEISMIC EVENTS FROM NOISE EVENTS



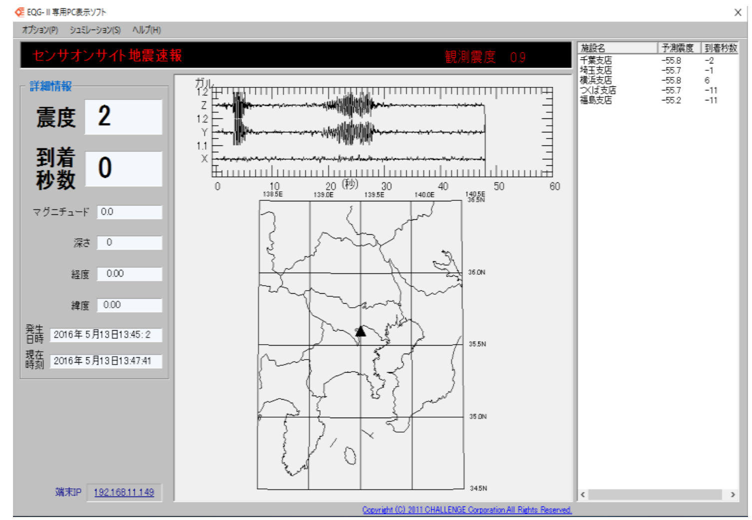
EQG-III Saves Your Lives!

CHALLENGE

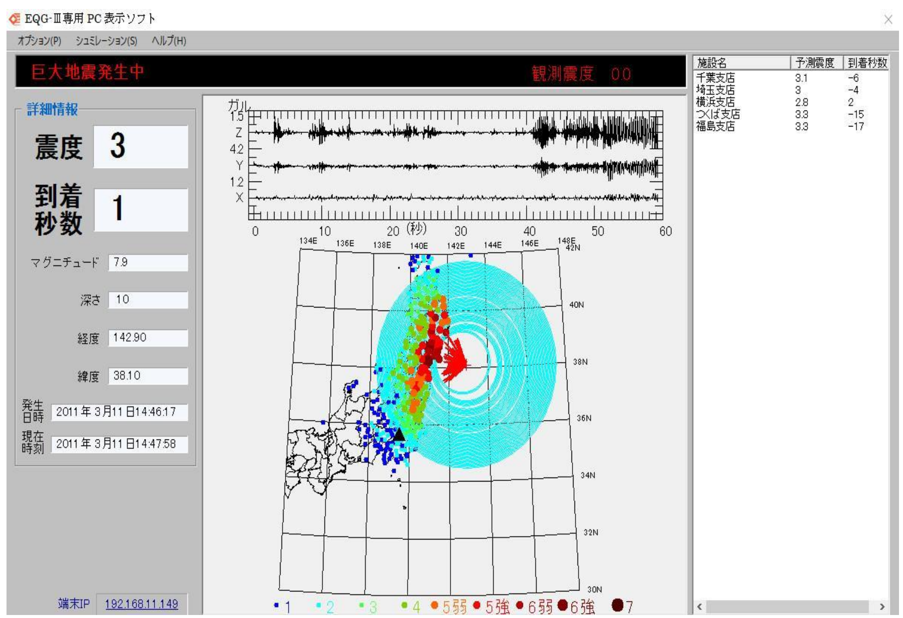
Real time display of EQ guard



Epicenter information from JMA



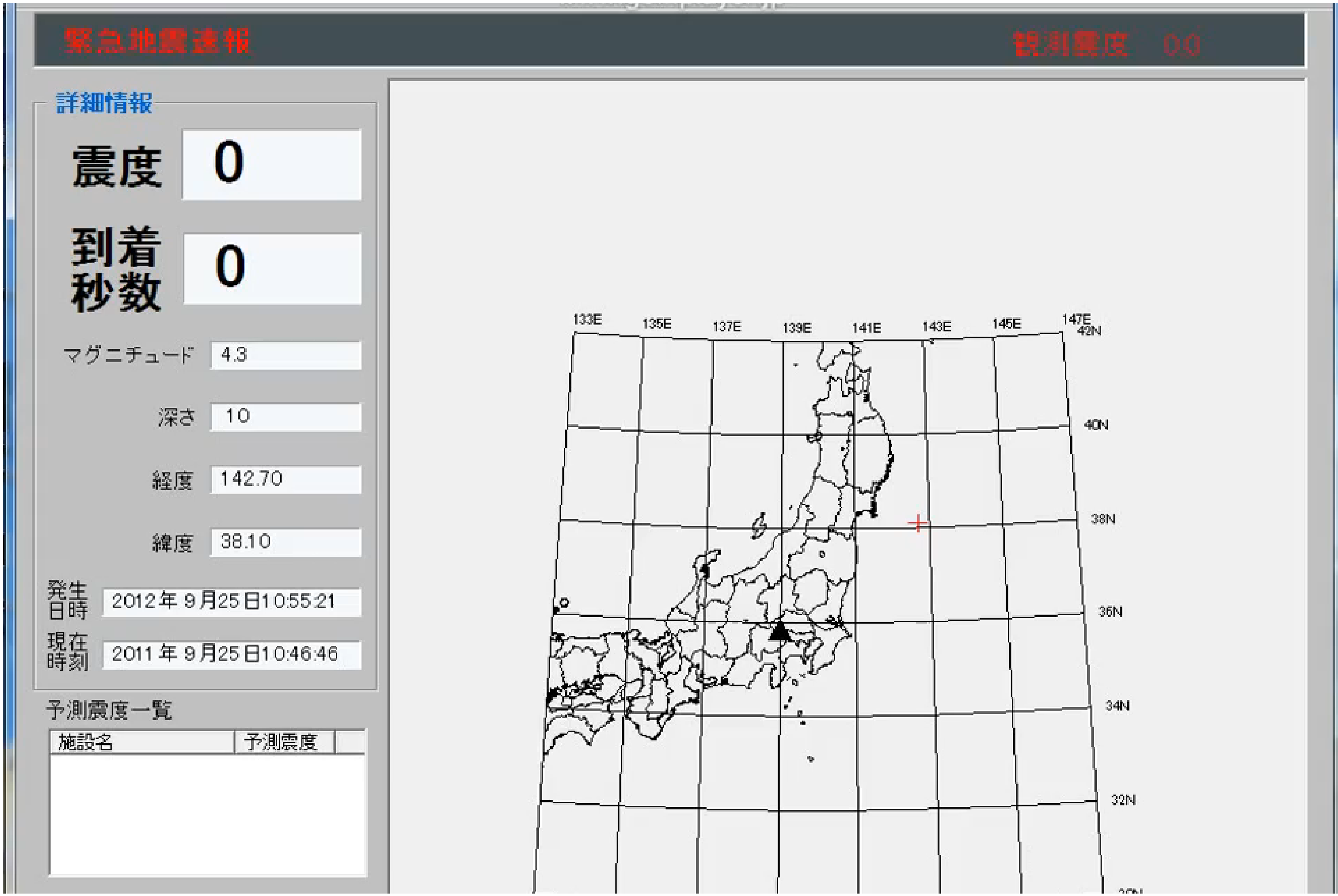
On-site alarm



The log of Tōhoku earthquake in 2011

Real time display of EQ guard
Tōhoku earthquake in 2011

CHALLENGE



Specifications of EQ guard

CHALLENGE

Specifications

Item	EQGuard III	Transmit method	TIPv4, 100BASE-TX
Display	PC display	Operational switches	Test switchx2, Reset switch,Setting-clearing switch
Noise level	0.1 gal	Power	DC5V
ETA	PC display at -99 to 999sec per sec display	Exterior(mm)	188.7x160x50.5
Warning display	LED flash display	Weight(g)	Approx.1k g
Audio/Video output	Line output, Headphone output, Volume adjust	Environment	Temp.:-10degC～+50degC,no fogging
Warning output	Loop output 6circuits	Facilities	Indoors,Power adapter

Customers

CHALLENGE

- Government and Local Government
- School, Company, Factory, Hotel and Apartment
- Construction Company, Maintenance Company and Insurance Company

Examples of customers

1,000 sets installed.

Japan: YAMAHA TOTO Nidec -All for dreams 日本電産株式会社 ROHM SEMICONDUCTOR 立命館大学 AICHI UNIVERSITY OF EDUCATION 1949

Schools, kindergarten, nursery,

Nursing home etc

Indonesia: Yogyakarta, Aceh

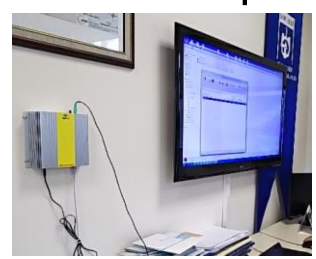
Korea: Soul

Turkey ,Romania, PNG

Patent : Acquired (No.5373435)
Launch : 2012



Japan


Turkey


Romania

PNG

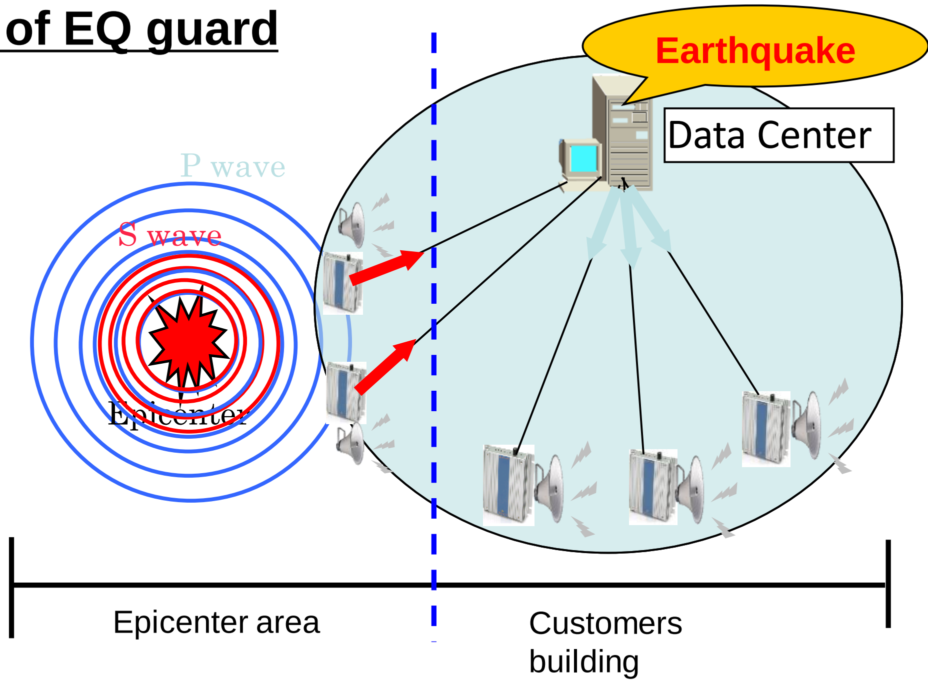
The benefit of Earthquake Early Alarm for DRR

◆Early warning system based on network of EQ guard

1.EQ guard can work as a stand alone, and also can work as a local network with several installations.

2.It is possible to construct a regional earthquake alarm system by making NW of EQ guard.

3. This system works without nation-wide dense seismometer network



◆ Contribution to global targets

- Reduce fatalities and injured people by the Earthquake Sensor Alarm System (ESAS)
- Increase introduction countries and target people by establishing ESAS in each country

◆ Contribution to SDGs

- Rectify inequality, and ensure the safety of all people by Introduction of ESAS.
- Establish resilient infrastructure by ESAS10

Image of Eq guard System

Server

Size:
68.0(W)×89.40(D)×28.5(H)mm

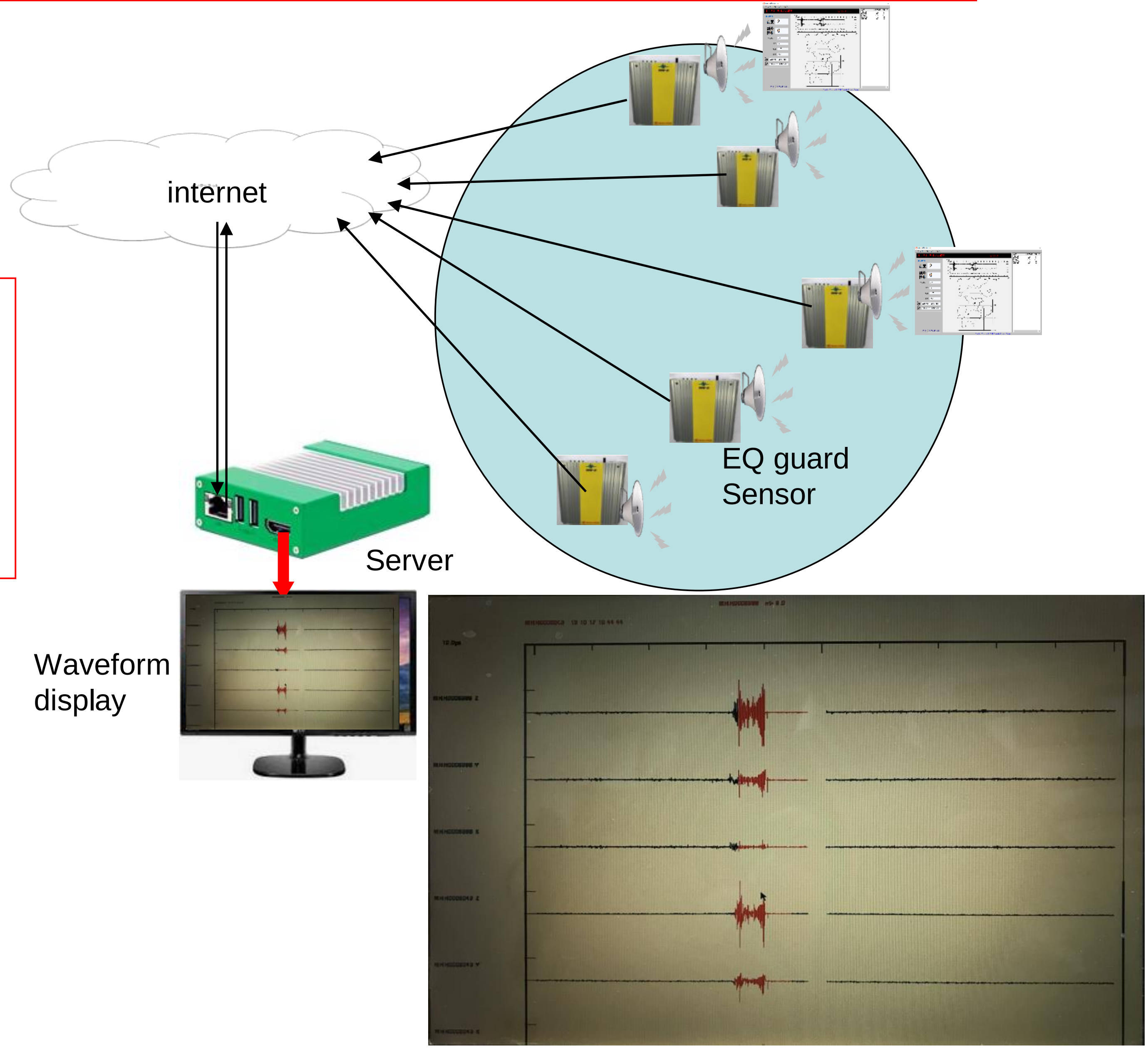
CPU: Intel® Celeron® Processor

N2830:1.83～2.16GHz

SATA :16GByte

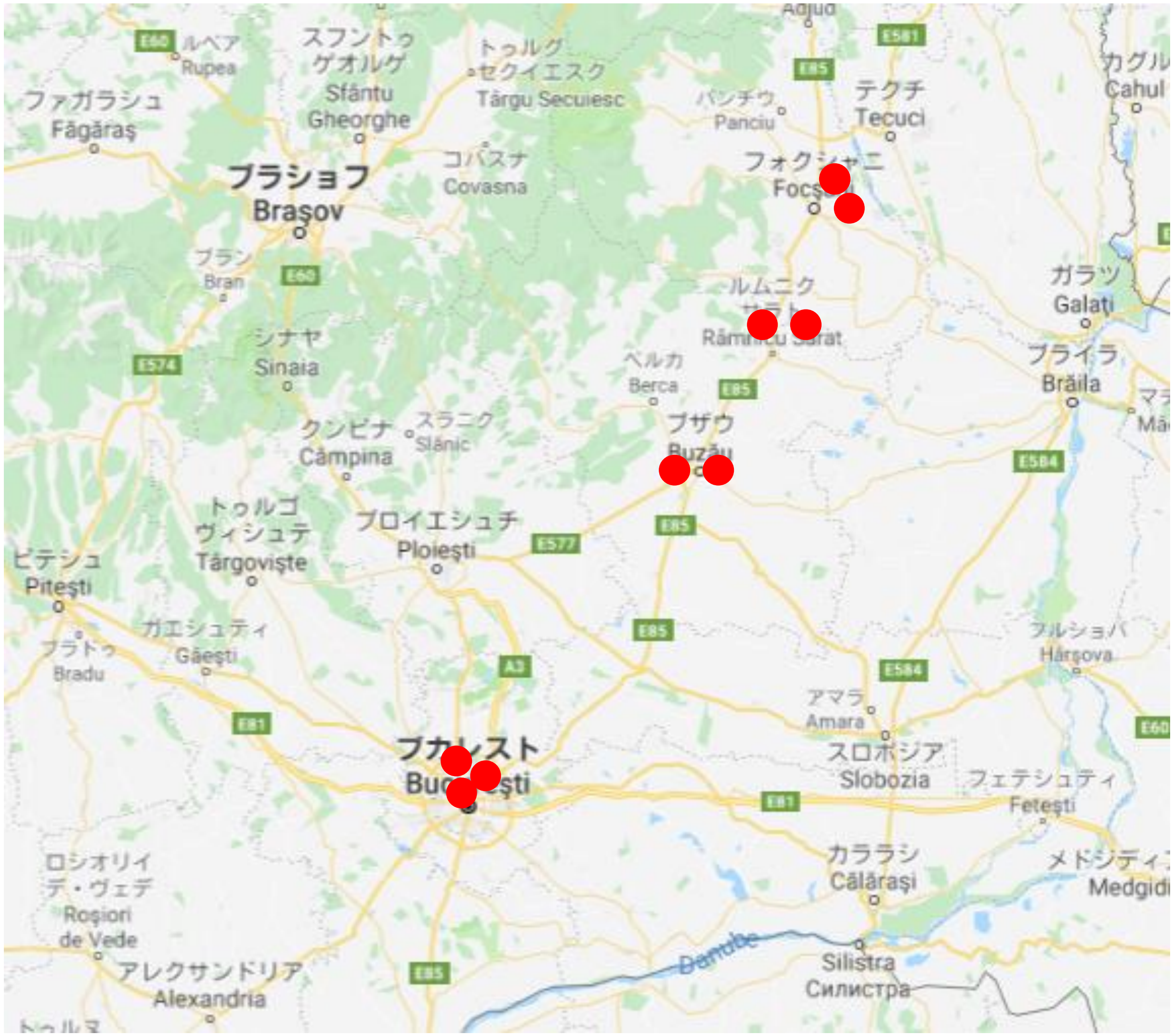
Display: HDMI

Power:DC+12V/1A



Regional alarm system in Romania

CHALLENGE

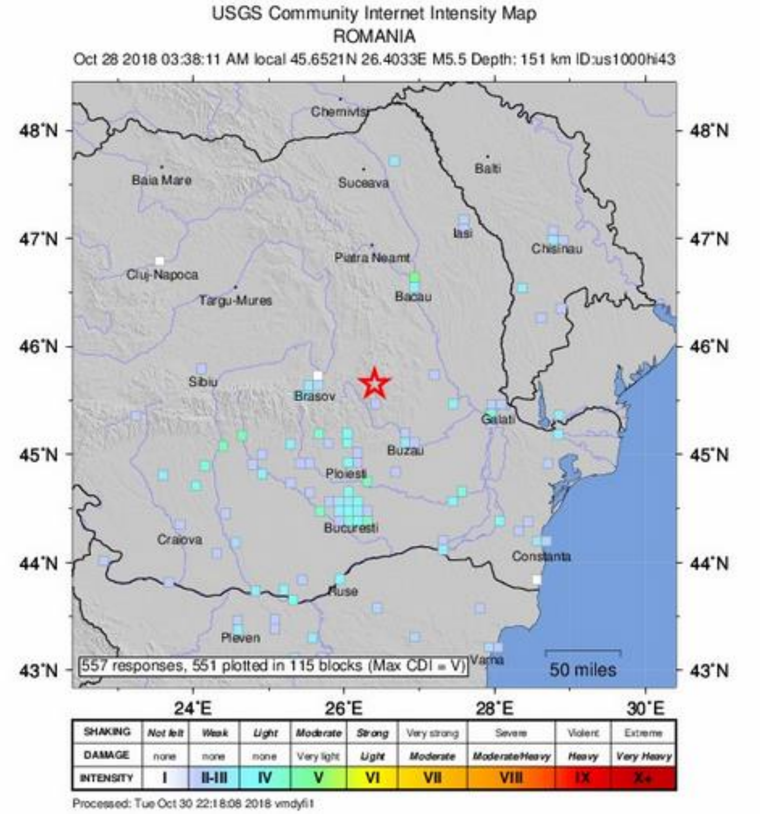


Observation data and analysis of Earthquake in Romania

2018-10-28 00:38:11 (UTC)
M5.5 -16km SE of Comandau

M 5.5 - 16km SE of Comandau

CHALLENGE



Epicenter information

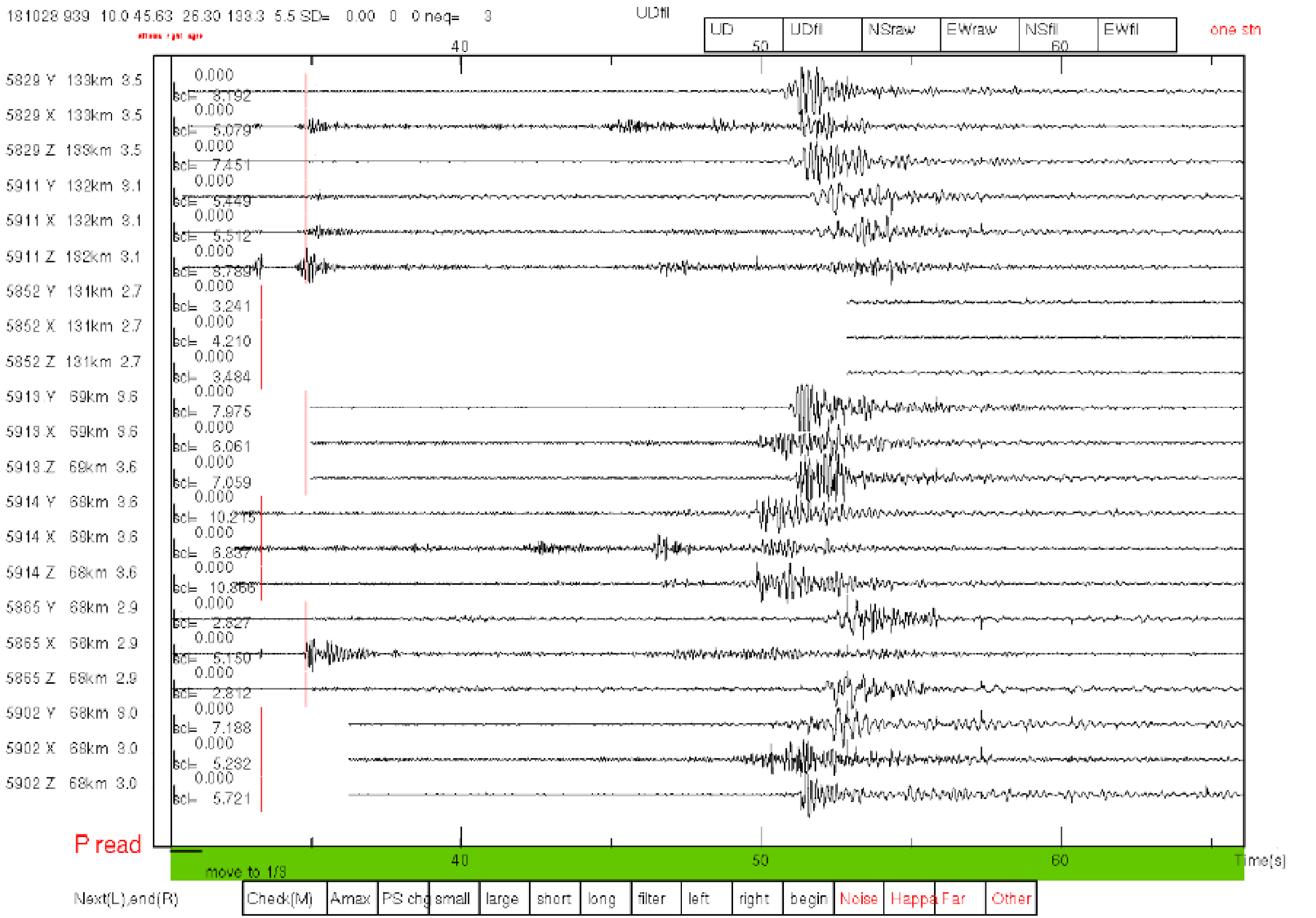
M 5.5 - 16km SE of Comandau, Romania

2018-10-28 00:38:11 (UTC)　9:38:11(JAPAN)

45.652° N 26.403° E

151.0 km depth

Waveform of sensor_EQguard



Hypocenter location information

Hypocenter location using P wave arrival times and Shaking intensities sent to the data center of Challenge Co,.Ltd from EQ GARD III stations in Romania.

Stn code	P arriv	w	P int
MHH0005829	34.8	1.0	0.5
MHH0005865	34.2	1.0	2.2
MHH0005911	34.6	1.0	1.4
MHH0005913	38.9	1.0	0.5
MHH0005914	34.8	1.0	0.9

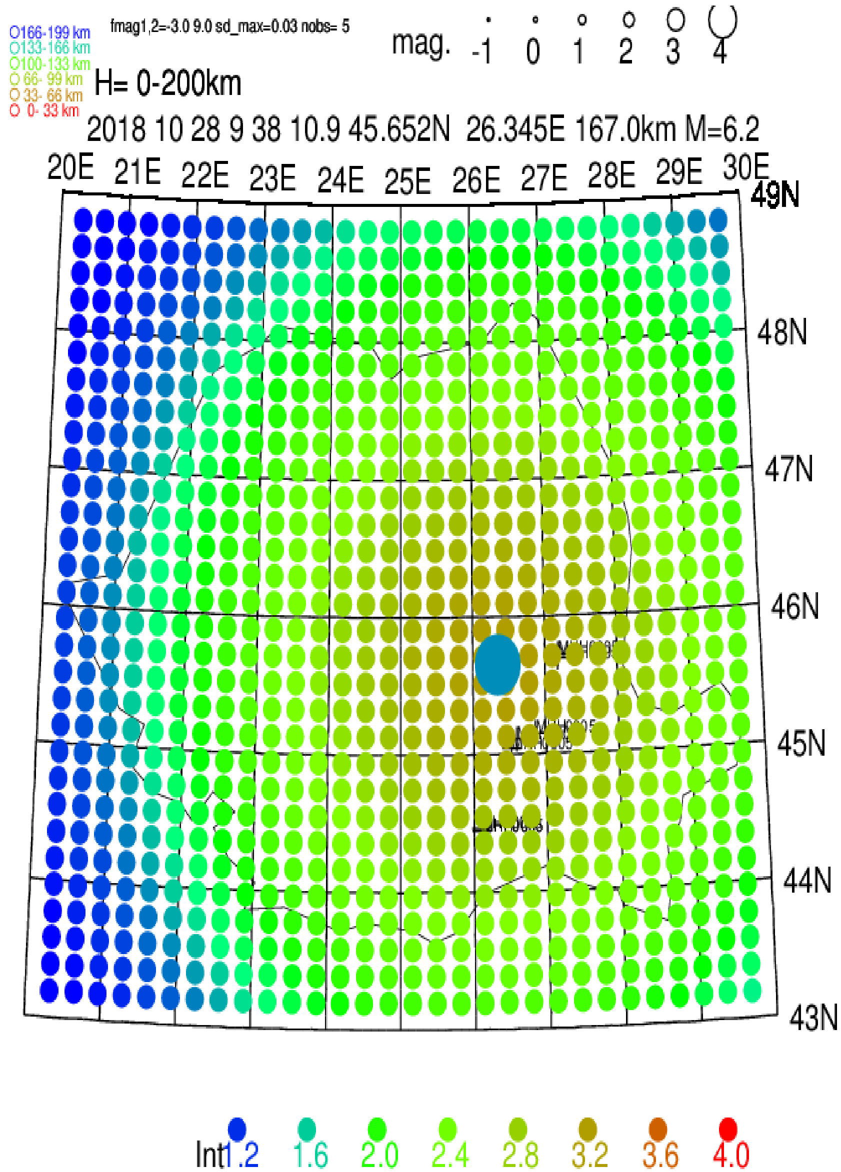
Input data used by the real-time hypocenter location. “P int” shows real-time intensity measure at times after 4 sec from P wave arrivals.

Date	H	Min	Org.(sec)	Latitude	Longitude	Depth(km)	Intensity Mag
2018 10 28	9	38	10.9	45.652	26.345	167.0	6.2

STN	Dis(km)	dep	Obs	Est
MHH0005829	67.81	167.00	3.52	3.13
MHH0005865	65.06	167.00	2.89	3.13
MHH0005911	65.53	167.00	3.06	3.13
MHH0005913	134.08	167.00	3.57	2.88
MHH0005914	67.93	167.00	3.57	3.13

Hypocenter parameters by USGS
20181028 938 10.0 45.63 26.30 151.30 5.50
Computed hypocenter location and list of estimated shaking intensity of JMA definition.
Obs: Observed JMA intensity,
Est: Estimated intensity from hypocenter location and intensity magnitude.
Hypocenter and magnitude are calculated by the use of P wave arrival times and shaking intensity measured within 4 sec from P wave arrival, which are stored on the disk of data center of Challenge Cor. And are sent from stations of EQ Guard III.
There are difference in the definition between Shaking intensity magnitude Richter magnitude.

Intensity map

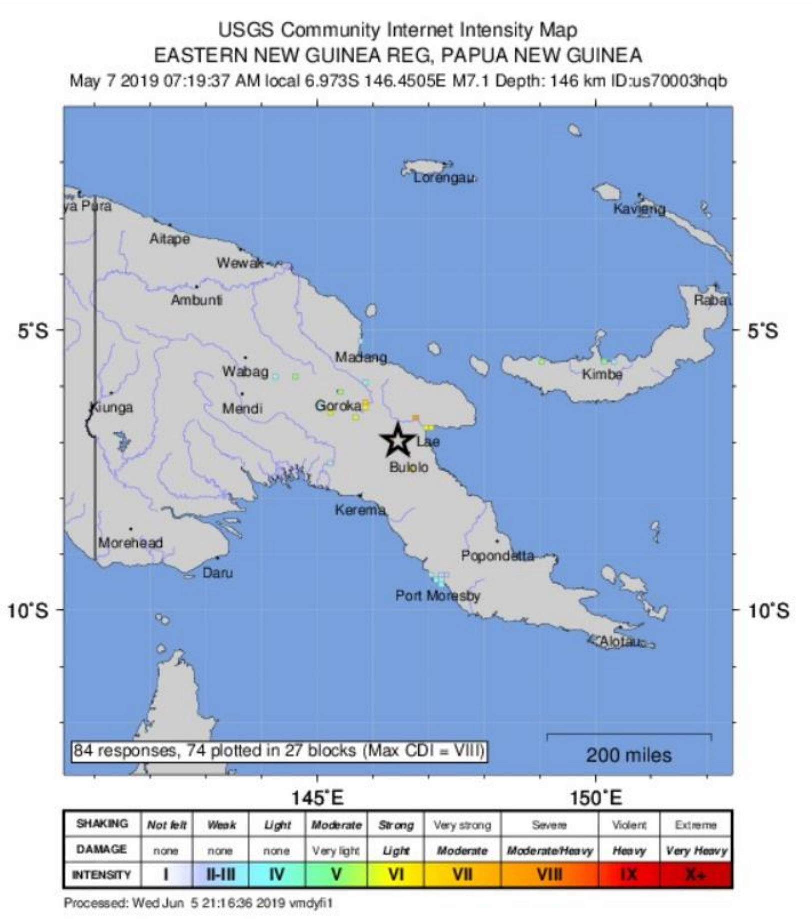


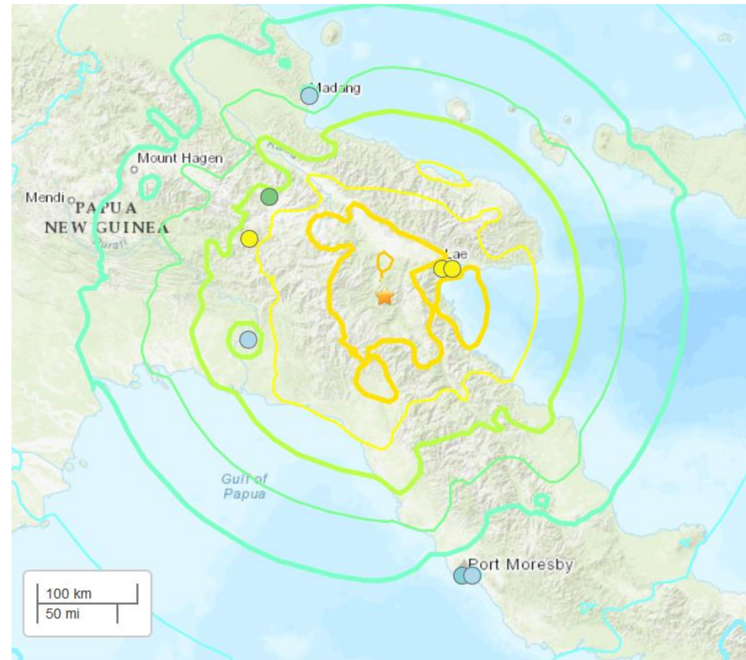
Distribution of estimated shaking intensity calculated from the P wave arrival times and shaking intensities data, which are stored on the hard disk of the data center of Challenge Co ,.Ltd , and are send from stations of EQ GARD III.

M 7.1 - 33km NW of Bulolo, Papua New Guinea 2019-05-06 21:19:37 (UTC)
2019-05-07 6:19:37(JAPAN)
6.975°S 146.449°E146.0 km depth

M 7.1 - 33km NW of Bulolo, Papua New Guinea 2019-05-06 21:19:37 (UTC)

2019-05-07 6:19:37(JAPAN) 6.975° S 146.449° E146.0 km depth





SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.05	0.3	2.76	6.2	11.5	21.5	40.1	74.7	>139
PGV(cm/s)	<0.02	0.13	1.41	4.65	9.64	20	41.4	85.8	>178
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Worden et al. (2012) Version 9: Processed 2019-07-16T21:01:46Z

△ Seismic Instrument ○ Reported Intensity ★ Epicenter ▭ Rupture

Observation data of EQ guard at Lae

MHH0005924	19	5	7	620	0731	1200.21	0.62	0.62	6.3	24.0	12
MHH0005924	19	5	7	620	1119	1200.21	0.78	0.88	6.0	24.2	12
MHH0005924	19	5	7	620	1311	1200.21	0.78	1.16	6.0	24.2	12
MHH0005924	19	5	7	620	2 63	1200.21	0.78	1.40	6.0	24.2	12
MHH0005924	19	5	7	620	2887	1200.21	0.78	1.60	6.0	24.2	12
MHH0005924	19	5	7	620	3231	1200.21	0.78	1.82	6.0	24.2	12
MHH0005924	19	5	7	620	4559	1200.21	0.78	2.05	6.0	24.2	12
MHH0005924	19	5	7	620	4987	1200.21	0.78	2.30	6.0	24.2	12
MHH0005924	19	5	7	620	6775	1200.21	0.78	2.52	6.0	24.2	2
MHH0005924	19	5	7	620	9303	1200.21	0.78	2.77	6.0	24.2	2
MHH0005924	19	5	7	62012891		1200.21	0.78	2.98	6.0	24.2	2
MHH0005924	19	5	7	62014443		1200.21	0.78	3.22	6.0	24.2	2
MHH0005924	19	5	7	62015131		1200.21	0.78	3.99	6.0	24.2	2
MHH0005924	19	5	7	62015479		1200.21	0.78	4.33	6.0	24.2	2
MHH0005924	19	5	7	62016499		1200.21	0.78	4.65	6.0	24.2	2
MHH0005924	19	5	7	62017103		1200.21	0.78	4.86	6.0	24.2	2

Sensor detected P wave 23second after earthquake happened

Sensor Serial ID	Detection time		Time of P-wave	Real time intensity	Amplitude rations of P-wave befor and after	Average frequency
	YY/MM/DD	HH:MM.SS.MS				
MHH0005924	2019/5/7	06:20:00:731	1200.21	0.62	6.3	24
MHH0005924	2019/5/7	6:20:01:119	1200.21	0.88	6	24.2
MHH0005924	2019/5/7	6:20:01:311	1200.21	1.16	6	24.2
MHH0005924	2019/5/7	6:20:02:063	1200.21	1.4	6	24.2
MHH0005924	2019/5/7	6:20:02:887	1200.21	1.6	6	24.2
MHH0005924	2019/5/7	6:20:03:231	1200.21	1.82	6	24.2
MHH0005924	2019/5/7	6:20:04:559	1200.21	2.05	6	24.2
MHH0005924	2019/5/7	6:20:04:987	1200.21	2.3	6	24.2
MHH0005924	2019/5/7	6:20:06:775	1200.21	2.52	6	24.2
MHH0005924	2019/5/7	6:20:09:303	1200.21	2.77	6	24.2
MHH0005924	2019/5/7	6:20:12:891	1200.21	2.98	6	24.2
MHH0005924	2019/5/7	6:20:14:443	1200.21	3.22	6	24.2
MHH0005924	2019/5/7	6:20:15:131	1200.21	3.99	6	24.2
MHH0005924	2019/5/7	6:20:15:479	1200.21	4.33	6	24.2
MHH0005924	2019/5/7	6:20:16:449	1200.21	4.65	6	24.2
MHH0005924	2019/5/7	6:20:17:103	1200.21	4.86	6	24.2

The Max observation seismic intensity is 4.86(japan) at Lae (7~8MMI).

M 5.7 - 20km ESE of Marmaraereglisi, Turkey

2019-09-26 10:59:26 (UTC)

2019-09-26 13:59:26 (Turkey)

2019-09-26 19:59:26(JAPAN)

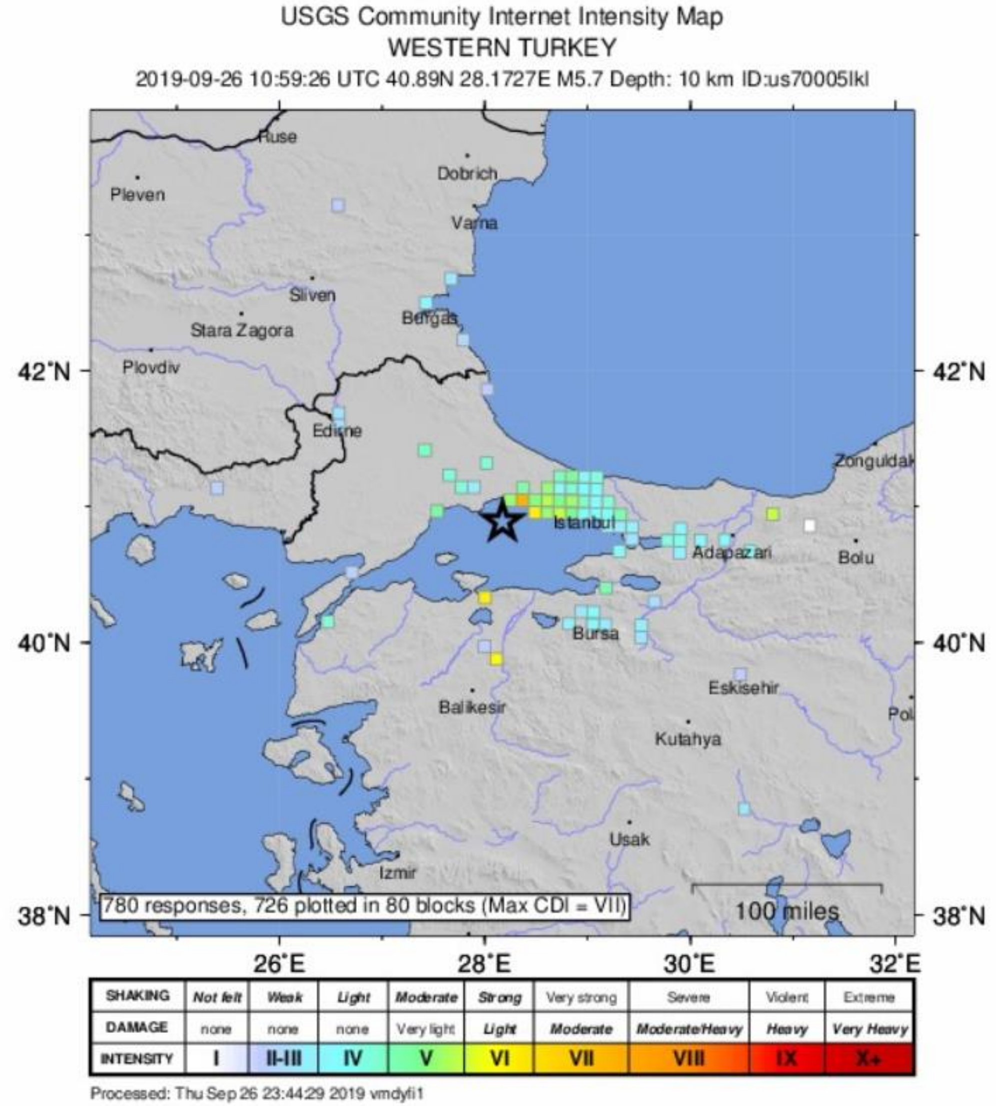
40.890° N 28.173° E

10.0 km depth

M 5.7 - 20km ESE of Marmaraereglisi, Turkey

2019-09-26 10:59:26 (UTC) 2019-09-26 13:59:26 (Turkey) 2019-09-26 19:59:26(JAPAN)

40.890° N 28.173° E



Observation data of EQ guard at İzaydaş

Setting place:İzaydaş (Katı Atık Arıtma Tesisi) 4th floor
Sensor ID:MHH0005870

```
MHH0005870 19 926195952835  3591.28   -9.89   2.68   7.3   33.5
MHH0005870 19 926195953327  3591.28   -9.89   3.74   7.3   33.5
MHH0005870 19 926195956439  3591.28   -9.89   3.98   7.3   33.5
MHH0005870 19 92620 010755     9.18   -9.89   3.48   9.3    5.7
MHH0005870 19 92620 011515     9.18   -9.89   3.79   9.3    5.7
MHH0005870 19 92620 012935     9.18   -9.89   4.00   9.3    5.7
```

Sensor detected P wave 26second after earthquake happened

Sensor Serial ID	Detection time YY/MM/DD	Detection time HH:MM.SS.MS	Time of P-wave	Real time intensity	Amplitude rations of P-wave befor and after	Average frequency
MHH0005870	2019/9/26	19:59:52:835	3591.28	2.68	7.3	33.5
MHH0005870	2019/9/26	19:59:53:327	3591.28	3.74	7.3	33.5
MHH0005870	2019/9/26	19:59:56:439	3591.28	3.98	7.3	33.5
MHH0005870	2019/9/26	20:00:10:755	9.18	3.48	9.3	5.7
MHH0005870	2019/9/26	20:00:11:515	9.18	3.78	9.3	5.7
MHH0005870	2019/9/26	20:00:12:935	9.18	4	9.3	5.7

The Max observation seismic intensity is 4.00(japan) at İzaydaş (6MMI).

Observation data of EQ guard at Hospital 3

Setting place:Hospital
Sensor ID:MHH0005886
Distance from epicenter: 206 Km

```
MHH0005886 19 926195953955  3589.35   -9.89    0.93    10.6    39.4
MHH0005886 19 926195954567  3589.35    1.21    1.21    10.6    39.4
MHH0005886 19 92620 0 8 43     5.22    2.67    2.67    14.5     1.4
```

Sensor detected P wave 27second after earthquake happened

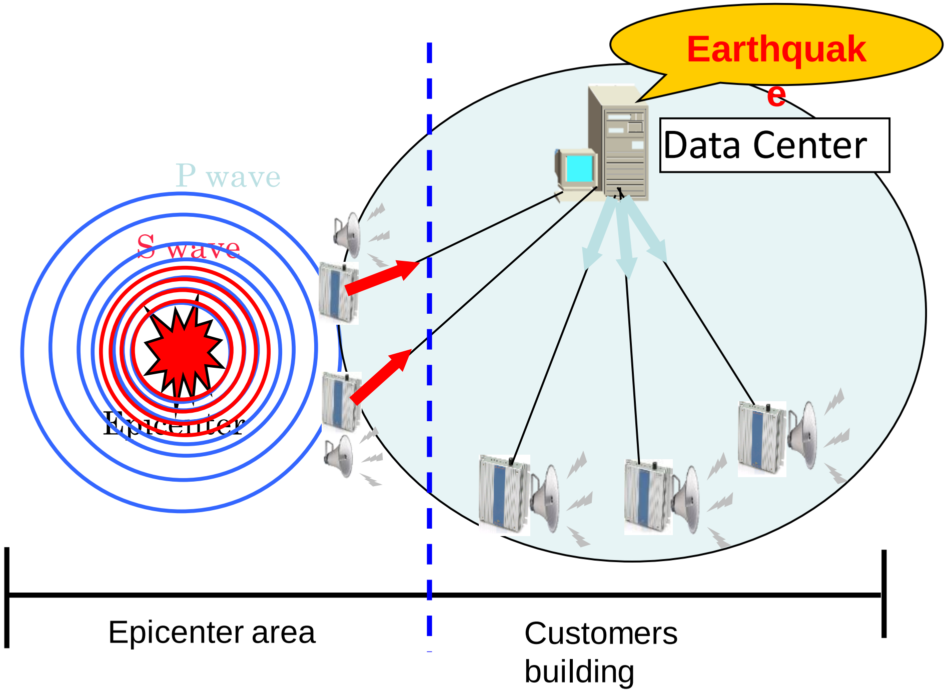
Sensor Serial ID	Detection time		Time of P-wave	Real time intensity	Amplitude rations of P-wave befor and after	Average frequency
	YY/MM/DD	HH:MM.SS.MS				
MHH0005886	2019/9/26	19:59:53:955	3589.35	0.93	10.6	39.4
MHH0005886	2019/9/26	19:59:54:567	3589.35	1.21	10.6	39.4
MHH0005886	2019/9/26	20:00:08:043	5.22	2.67	14.5	1.4

The Max observation seismic intensity is 2.67(japan)
at hospital (5MMI).

Evacuation Drills

People inside the building

CHALLENGE



evacuation

80% of deaths could be prevented by 5 seconds prior alarm if people were well trained. Evacuation drill is very important.

The Video of evacuation drill in Japan

Evacuation Drills in Romania 2018.11~2019.2

Evacuation Drill in Bucharest

Date:12/11/2018 PM:15:00~

School: Colegiul Economic Virgil Madgearu

Video of Evacuation Drill

News of Local media

CHALLENGE

Simulare și exercițiu de amploare în caz de cutremur, cu participarea japonezilor, la CN Pedagogic "Spiru Haret" Focșani

Ziarul de Vrancea
20 feb 2019 | 721 vizualizări
Distribuie: Like 0

Sistem de anunţarea seismelor cu 20 de secunde înainte să se producă, instalat în trei şcoli din Bucureşti

19 februarie 2019, 16:56 de Claudia Spridon Devino fan
Salvează în arhivă
cuvinte cheie: seism, scoli, cutremur, echipamente cutremur
0 (0 voturi)
0 comentarii

https://adevarul.ro/news/societate/Scoli-dotate-echipament-anunta-cutremurul-20-secunde-produca-efecte-1_5c6c17dc445219c57e56ccf4/index.html

VIDEO și GALERIE FOTO: JAPONEZI la Colegiul Pedagogic din Focșani pentru un exercițiu în caz de CUTREMUR

De Monitorul de Vrancea - joi, 21-02-19 704 0

Share

https://www.ziaruldevrancea.ro/special/educatie/simulare-si-exercitiu-de-amploare-in-caz-de-cutremur-cu-participarea-japonezilor-la-cn-pedagogic-spiru-haret-focsani

https://monitoruldevrancea.ro/2019/02/21/video-si-galerie-foto-japonezi-la-colegiul-pedagogic-din-focsani-pentru-un-exercitiu-in-caz-de-cutremur/

Video of Seminar

https://www.ziaruldevrancea.ro/special/educatie/simulare-si-exercitiu-de-amploare-in-caz-de-cutremur-cu-participarea-japonezilor-la-cn-pedagogic-spiru-haret-focsani

The Questionnaire of 4 schools

All of the Questionnaire

2019/2/19~2019/2/21
4 school
students(total)　　625　　4 校全体

Exercițiul de Cutremur și Acțiune "Sfaturi pentru a vă proteja de cutremur"Chestionar

I. Ai efectuat corect exercițiul　　訓練は正しく行えたか

A.Efectuat	B. Neefectuat	No anser
出来た 621	4	0
99.4%	0.6%	

2.Intensitatea sunetului alarmei　　音量は適正か

A. Satisfăcător	B. Nesatisfăcător	No anser
適正 563	61	1
90.1%	9.8%	0.1%

3.Claritatea sunetului　　メッセージは適正か

A. Satisfăcător	B. Nesatisfăcător	No anser
適正 545	79	1
87.2%	12.6%	0.2%

4.Crezi ca alarma este　　訓練は効果があるか

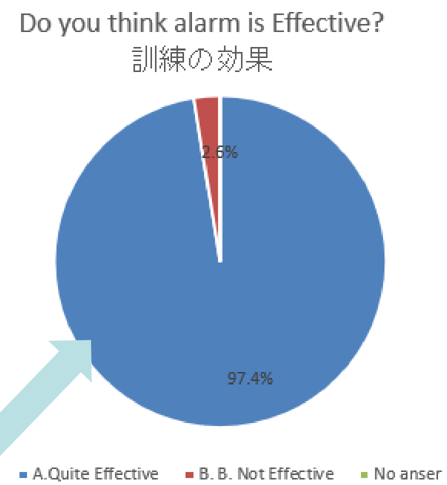
A. Eficientă	B. Neeficientă	No anser
効果あり 609	16	0
97.4%	2.6%	

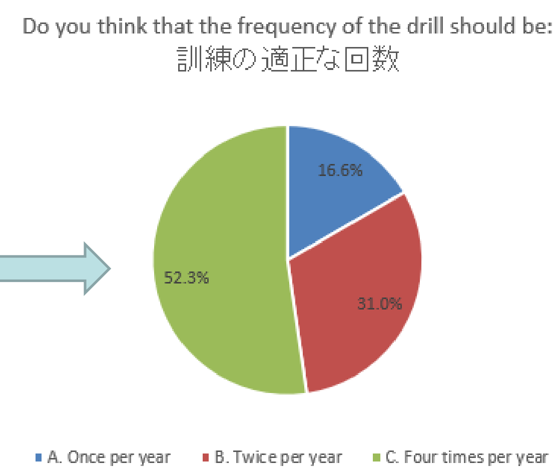
5. Crezi ca frecvența exercițiului trebuie sa fie:　　訓練回数は年何回が適当か

A. O dată pe an	B. De două ori pe a	C. De patru ori pe an
1回 104	2回 194	4回 327
16.6%	31.1%	52.3%

6. Crezi ca sistemul de alarmare in caz de cutremur este:　　アラームシステムは必要か

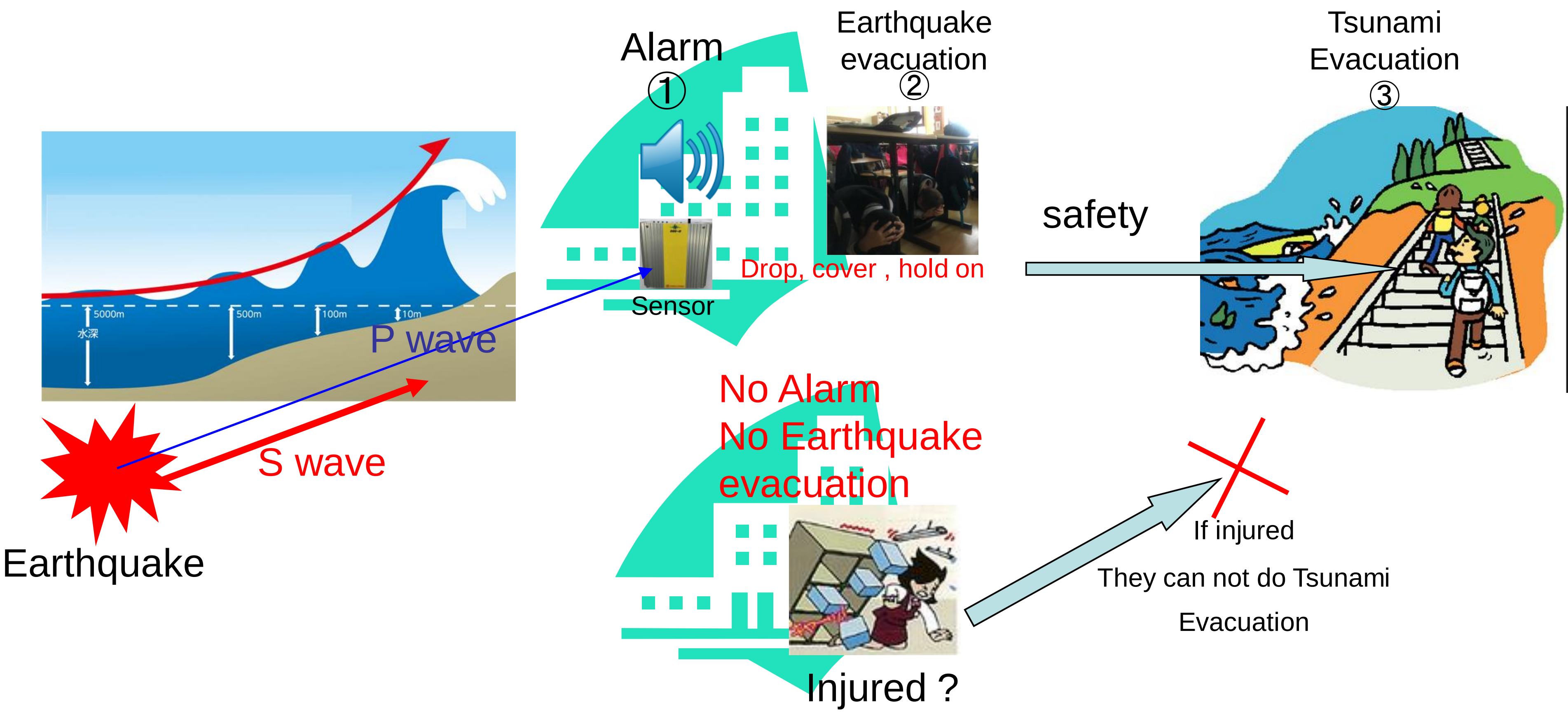
A. Necesar	B. Nu este necesar	No anser
必要 615	10	0
98.4%	1.6%	





Alarm + Evacuation drill save people

CHALLENGE



①+ ② + ③ = perfect Evacuation drill ➡ people be safe

Japan’s efforts for promoting the SDGs

Reflecting the philosophy of human security, "no one left behind"

Creating a prosperous and vibrant future through promoting the SDGs

Japan. Committed to SDGs

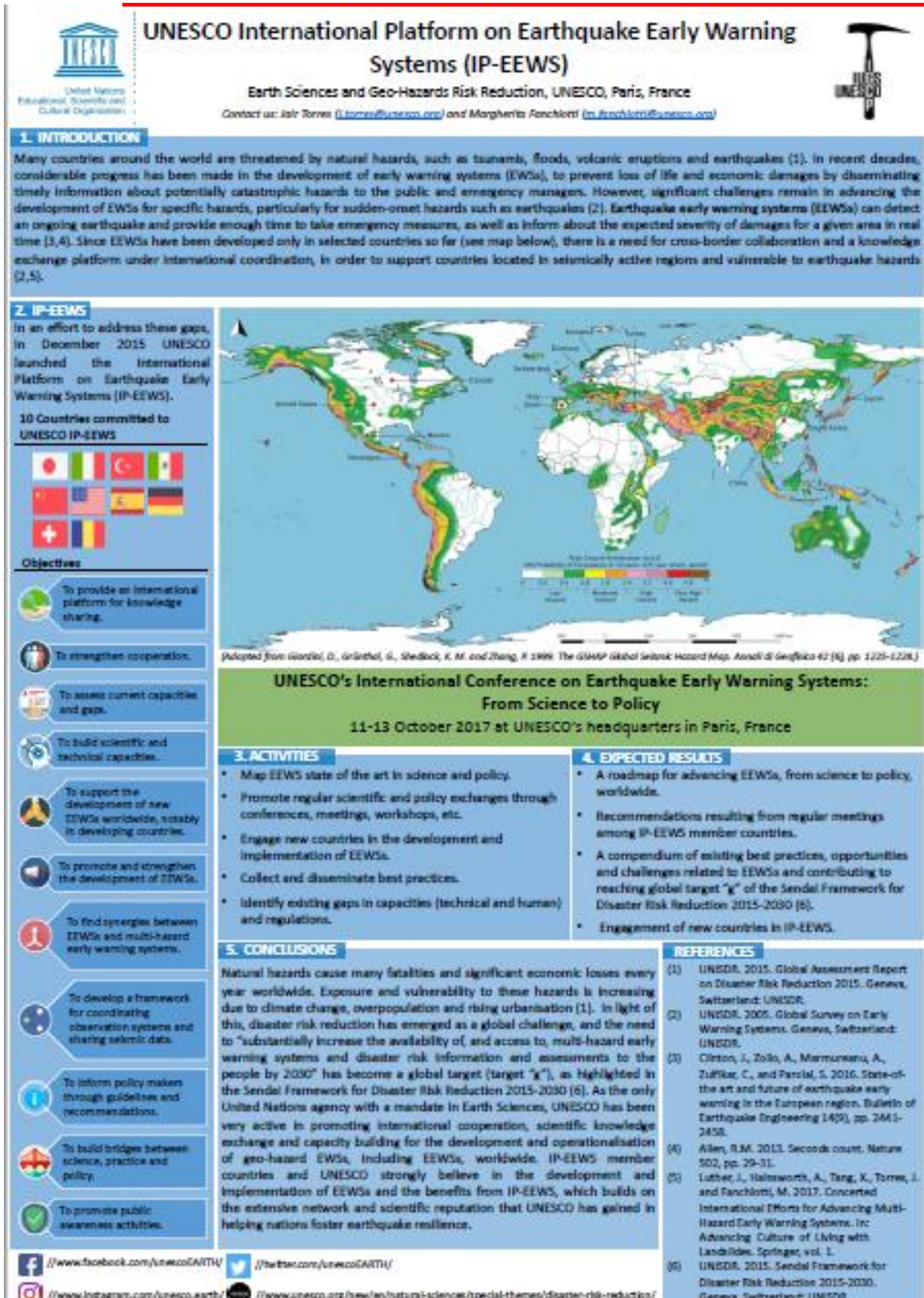
Ministry of Foreign Affairs of Japan

Method of building earthquake early warning system

CHALLENGE

	Conventional method		New method	
Observation network	Nationwide network		Observation network / alarm / evacuation drill =Set	
	cost	30,000US$@1,000unit=30milionUS$	cost	3,000 us$@10 units = 30,000US$
	period	10 years, 20 years, 30 years	period	3 months
alarm	Receiver / Alarm required		Pre-set	
Evacuation drill	Separate		Easy to conduct with just push test button	

Collaboration with UNESCO・UNDP



UNESCO International Platform on Earthquake Early Warning Systems (IP-EEWS)

Earth Sciences and Geo-Hazards Risk Reduction, UNESCO, Paris, France

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1. INTRODUCTION

Many countries around the world are threatened by natural hazards, such as tsunamis, floods, volcanic eruptions and earthquakes (1). In recent decades, considerable progress has been made in the development of early warning systems (EWSs), to prevent loss of life and economic damages by disseminating timely information about potentially catastrophic hazards to the public and emergency managers. However, significant challenges remain in advancing the development of EWSs for specific hazards, particularly for sudden-onset hazards such as earthquakes (2). **Earthquake early warning systems (EEWSs) can detect an ongoing earthquake and provide enough time to take emergency measures, as well as inform about the expected severity of damages for a given area in real time (3,4).** Since EEWSs have been developed only in selected countries so far (see map below), there is a need for cross-border collaboration and a knowledge exchange platform under international coordination, in order to support countries located in seismically active regions and vulnerable to earthquake hazards (2,5).

2. IP-EEWS

In an effort to address these gaps, in December 2015 UNESCO launched the International Platform on Earthquake Early Warning Systems (IP-EEWS).

10 Countries committed to UNESCO IP-EEWS

Objectives

- To provide an international platform for knowledge sharing.
- To strengthen cooperation.
- To assess current capacities and gaps.
- To build scientific and technical capacities.
- To support the development of new EEWSs worldwide, notably in developing countries.
- To promote and strengthen the development of EEWSs.
- To find synergies between EEWSs and multi-hazard early warning systems.
- To develop a framework for coordinating observation systems and sharing seismic data.
- To inform policy makers through guidelines and recommendations.
- To build bridges between science, practice and policy.
- To promote public awareness activities.

(Adapted from Giardini, D., Grünthal, G., Shedlock, K. M. and Zhang, P. 1999. The GSHAP Global Seismic Hazard Map. Annali di Geofisica 42 (6) pp. 1225-1228.)

UNESCO's International Conference on Earthquake Early Warning Systems: From Science to Policy

11-13 October 2017 at UNESCO's headquarters in Paris, France

3. ACTIVITIES

- Map EEWS state of the art in science and policy.
- Promote regular scientific and policy exchanges through conferences, meetings, workshops, etc.
- Engage new countries in the development and implementation of EEWSs.
- Collect and disseminate best practices.
- Identify existing gaps in capacities (technical and human) and regulations.

4. EXPECTED RESULTS

- A roadmap for advancing EEWSs, from science to policy, worldwide.
- Recommendations resulting from regular meetings among IP-EEWS member countries.
- A compendium of existing best practices, opportunities and challenges related to EEWSs and contributing to reaching global target "g" of the Sendai Framework for Disaster Risk Reduction 2015-2030 (6).
- Engagement of new countries in IP-EEWS.

5. CONCLUSIONS

Natural hazards cause many fatalities and significant economic losses every year worldwide. Exposure and vulnerability to these hazards is increasing due to climate change, overpopulation and rising urbanisation (1). In light of this, disaster risk reduction has emerged as a global challenge, and the need to "substantially increase the availability of, and access to, multi-hazard early warning systems and disaster risk information and assessments to the people by 2030" has become a global target (target "g"), as highlighted in the Sendai Framework for Disaster Risk Reduction 2015-2030 (6). As the only United Nations agency with a mandate in Earth Sciences, UNESCO has been very active in promoting international cooperation, scientific knowledge exchange and capacity building for the development and operationalisation of geo-hazard EWSs, including EEWSs, worldwide. IP-EEWS member countries and UNESCO strongly believe in the development and implementation of EEWSs and the benefits from IP-EEWS, which builds on the extensive network and scientific reputation that UNESCO has gained in helping nations foster earthquake resilience.

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Presentation ceremony of EQ guard at JBP meeting

21 January 2019 (Tokyo)

Meeting of Regional office of UNDP

29 January 2019 (Bangkok)

To the World