

# **International Training Workshop on Disaster Reduction Evacuation planning and shelter management 2011**

**May 23-27, 2011  
NCDR, Taiwan**



## **National Report**

**by Captain SONG Ekmahachai ,Royal Thai Navy.  
Acting DIRECTOR of Warning and Dissemination section**

**Operational Center of NDWC**

**THAILAND**

**Ministry of Information and Communication Technology**

## OBJECTIVES



NDWC is located on Rattanathibet Road, Bang Kra Sor, Muang, Nonthaburi



**National Disaster Warning Center (NDWC) was officially established on May 30<sup>th</sup> 2005 to be responsible for end-to-end multi-hazards disaster early warning (Receiving information Warning, Preparedness, Response, Recovery)**

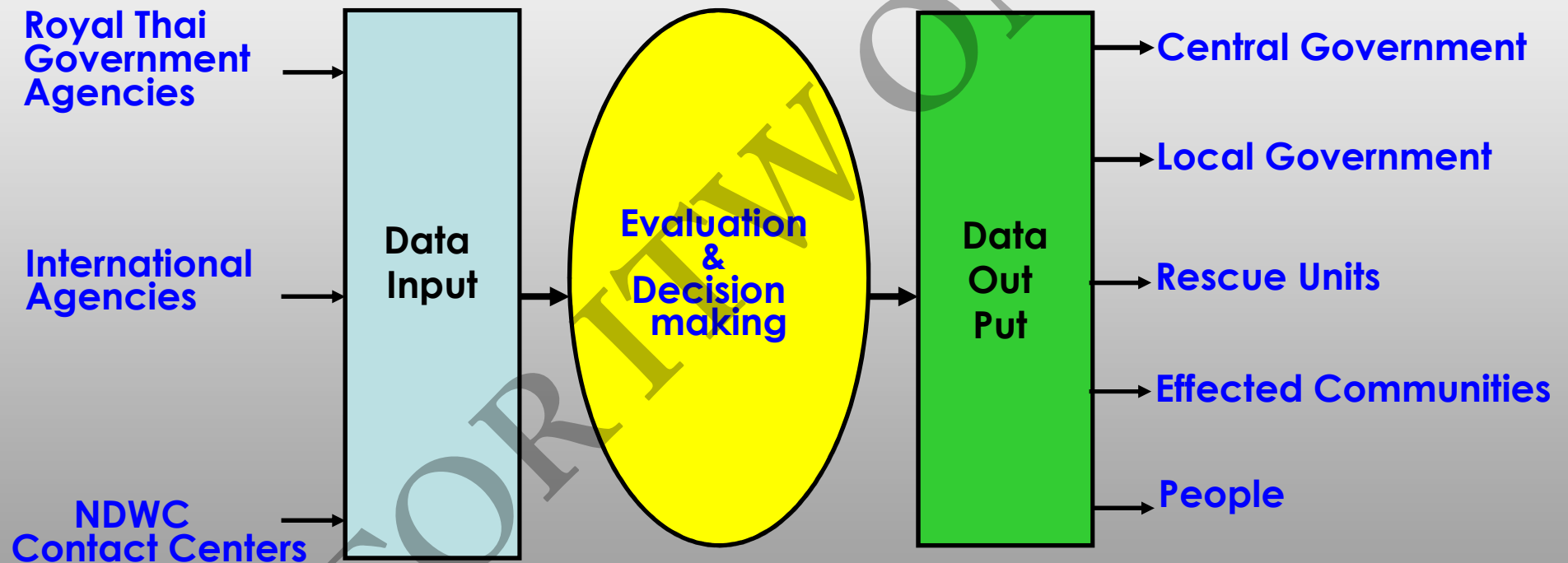
# **THAILAND National Disaster Warning Center New Building**



# **THAILAND National Disaster Warning Center New Building**



# Concept of Operation



# Tsunami Information Message

## Advisory (Magnitude 5.0 – 6.4)

At 22.42 An Earthquake occurred in Andaman Sea Magnitude 6.0 off the Andaman coast, Thailand. A Tsunami is not EXPECTED.

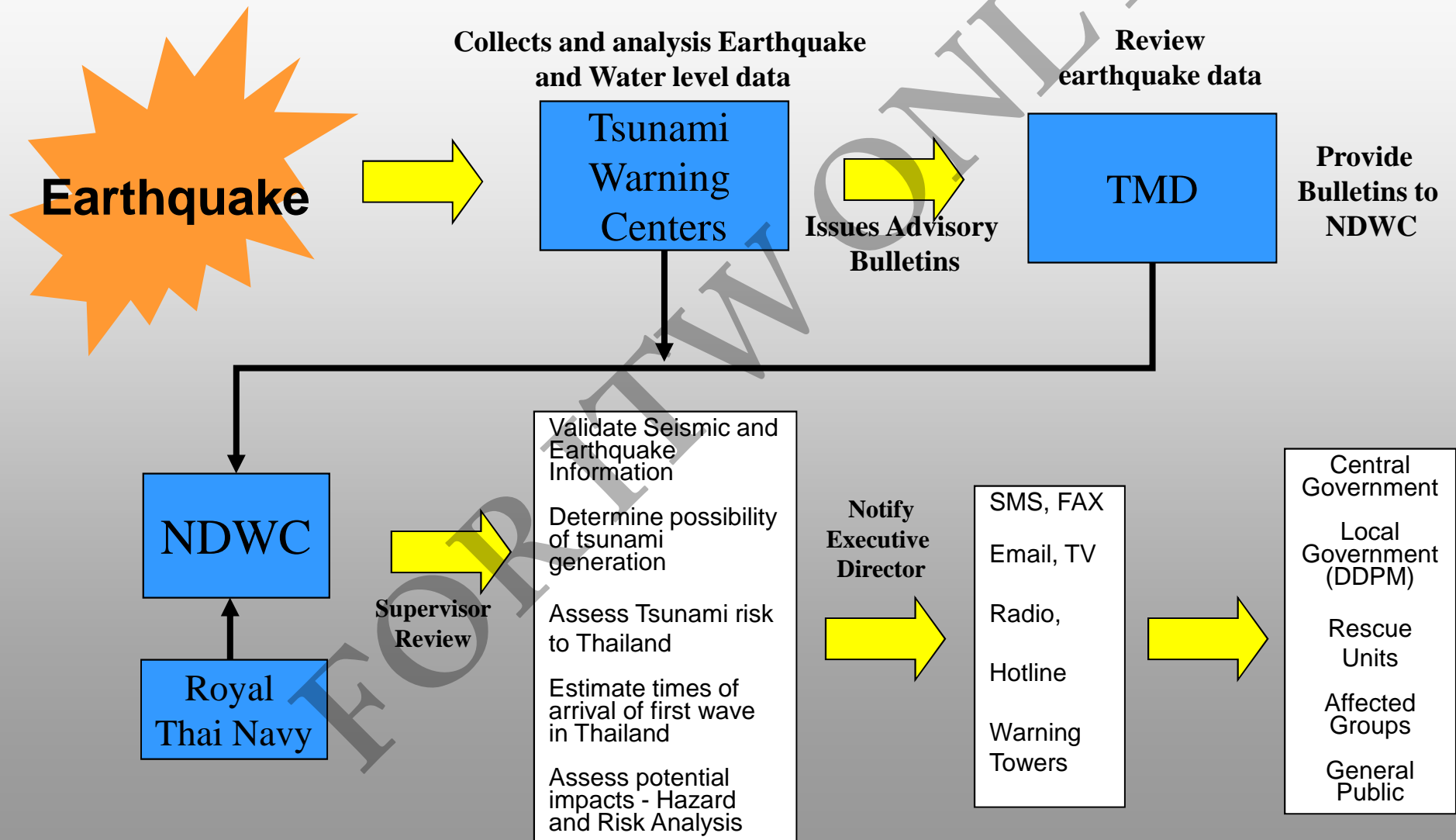
## Watch (Magnitude 7.0 – 7.7)

At 22.42 An Earthquake occurred in Andaman Sea Magnitude 7.5 off the Andaman coast of Thailand. A destructive Tsunami may have been generated. Prepare to evacuate persons to higher ground & follow further information.

## Warning (Magnitude More Than 7.8)

At 22.42 An Earthquake occurred in Andaman Sea Magnitude 7.9 off the Andaman coast of Thailand A destructive Tsunami will be generated. Immediately evacuate persons to higher ground (evacuate at once to higher ground) & follow further information.

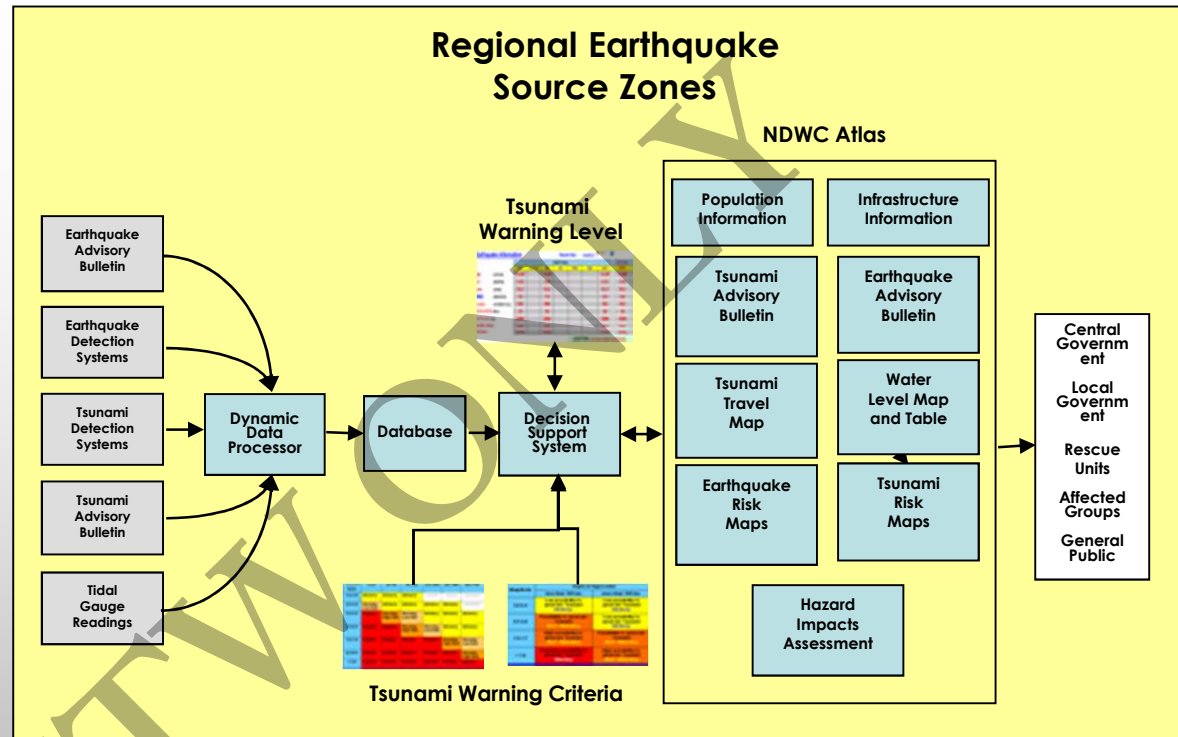
# Early Warning Notification Process



## STANDARD OPERATING PROCEDURE FOR EARTHQUAKE AND TSUNAMI



National Disaster Warning Center, Thailand  
July 2006 Version



**NDWC is the first country in the Indian Ocean Rim to develop standard operating procedure (SOP) for earthquake and tsunami since 2005. NDWC utilizes a comprehensive decision support system for emergency management, namely; DisasterAWARE Developed under the technical cooperation with the Pacific Disaster Center (PDC)**



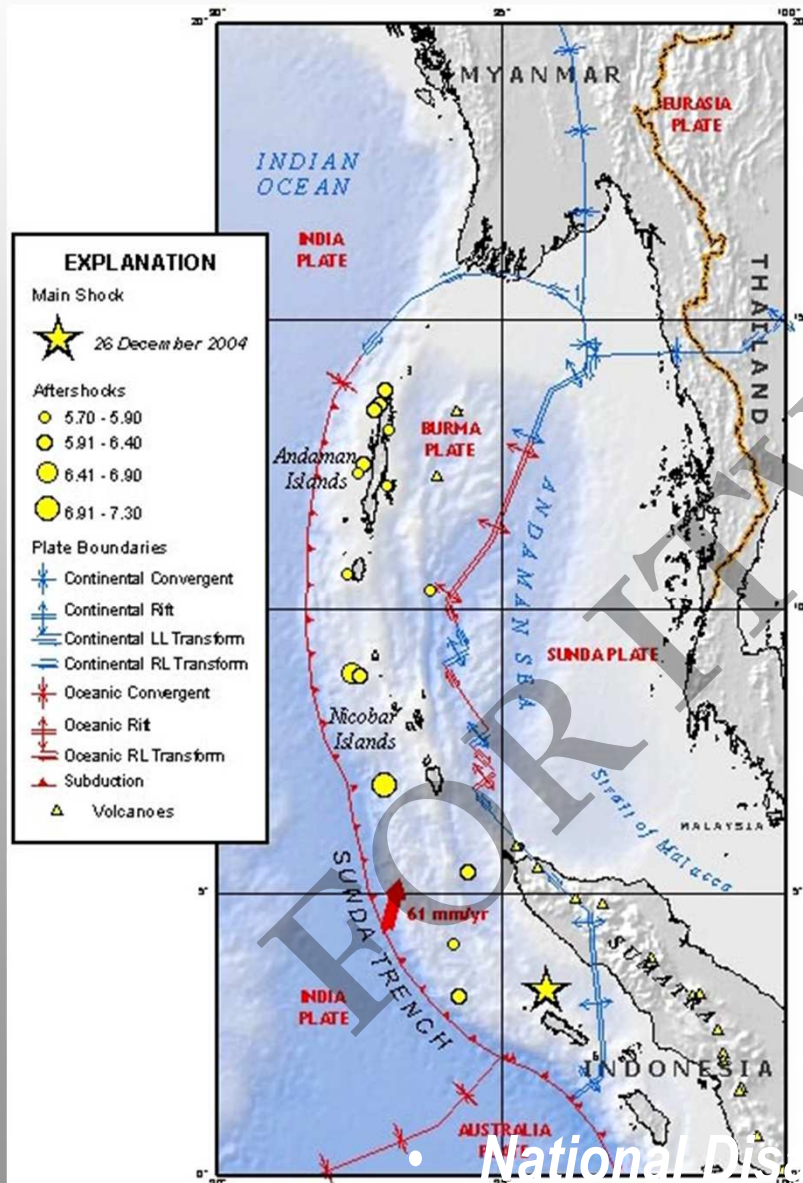
**Tsunami Warning and Full-Scale Evacuation Drills**  
**NDWC carried out tsunami warning and full-scale evacuation drills two times: the Pacific Wave Exercise 06 on 17<sup>th</sup> May 2006 and the Andaman Wave 07 on 25<sup>th</sup> July 2007**



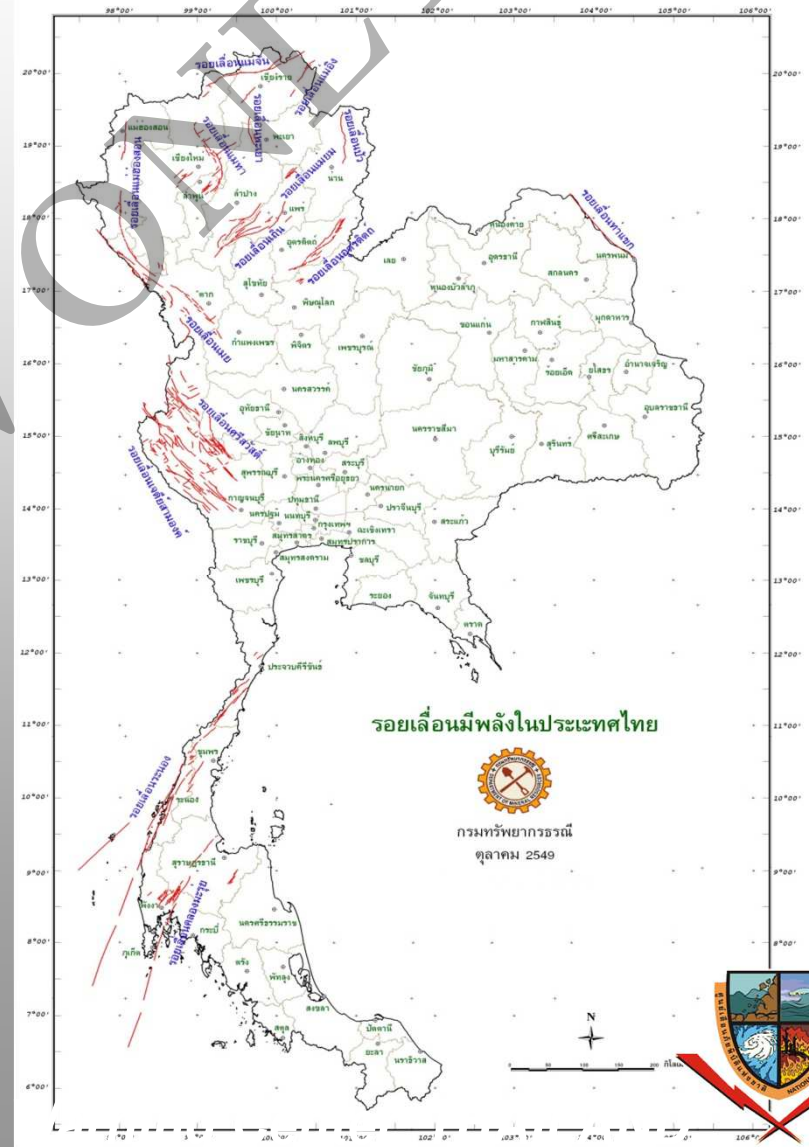
**NDWC receives tsunami confirmation from a Deep-Ocean Assessment and Reporting of Tsunamis (DART) deployed in the High Seas of the Indian Ocean from 1 – 5 December 2006.**

# Risk Area in THAILAND

## Fault in Andaman



## Active Fault in THAILAND



- **Na**

er, **THAILAND**

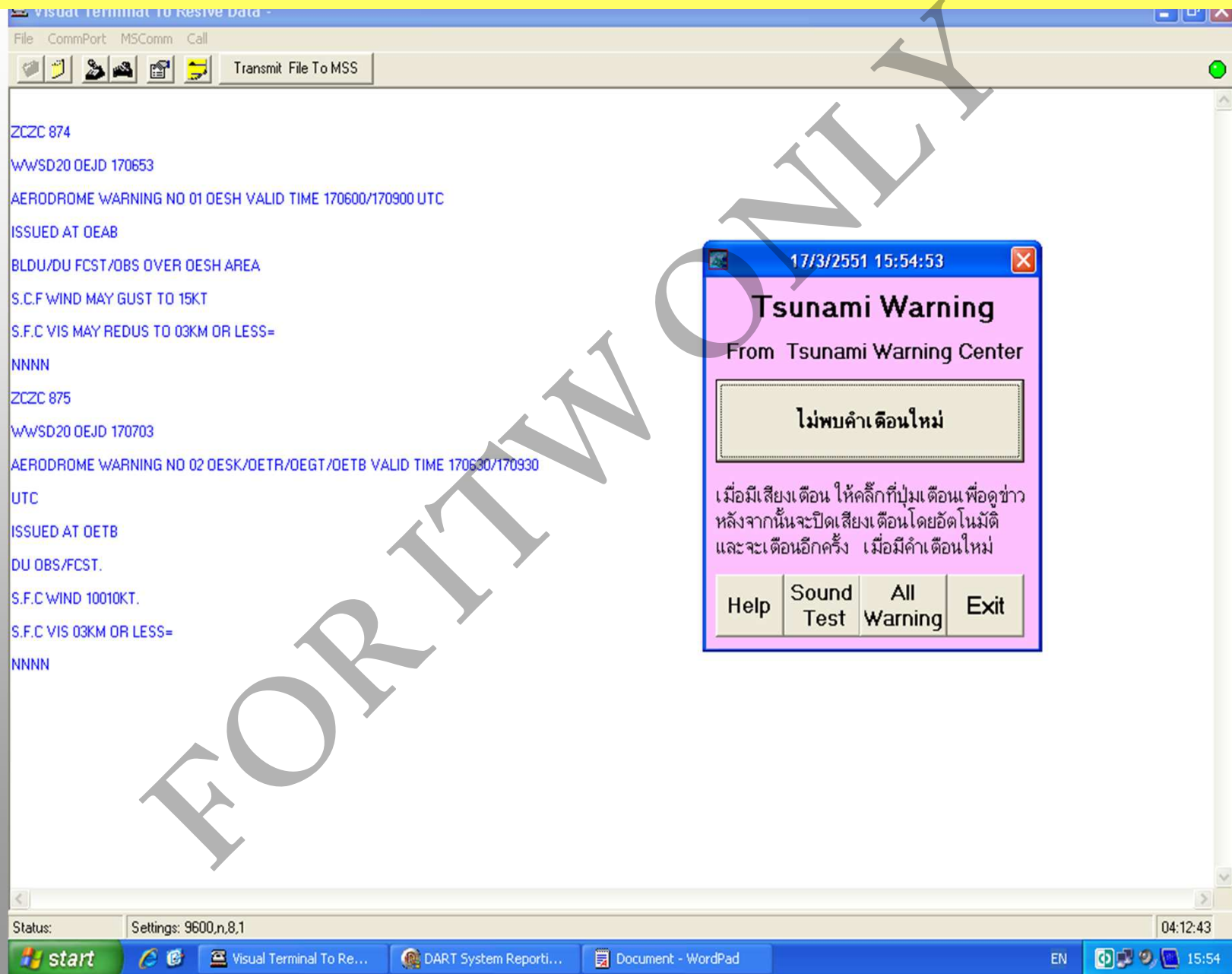
# INPUT : Website Intigration SOFTWARE

Seismic Watch v.1.2										Pre-Analysis Selection Box	
Data Refresh (on) Alert Mode (on) Source											
Last Update	6/7 15:51:17	<input checked="" type="checkbox"/> E <input checked="" type="checkbox"/> U <input type="checkbox"/> K <input checked="" type="checkbox"/> G	EUG								
Origin Time - UTC	Thailand	Mag.	Form	Lat.	Long.	Dep.	Region	Source			
6/7 08:14:01	6/7 15:14:01	3.6	ML	37.25	45.40		NORTHWESTERN IRAN	EMSC		<input type="checkbox"/>	
6/7 06:57:29	6/7 13:57:29	2.5	ML	51.20	15.96		POLAND	EMSC		<input type="checkbox"/>	
6/7 05:50:54	6/7 12:50:54	3	ML	47.02	84.42		EASTERN KAZAKHSTAN	EMSC		<input type="checkbox"/>	
6/7 05:37:51	6/7 12:37:51	3.1	ML	30.94	49.97		WESTERN IRAN	EMSC		<input type="checkbox"/>	
6/7 05:24:42	6/7 12:24:42	3.8	ML	35.80	-10.79		AZORES-CAPE ST. VINCENT RIDGE	EMSC		<input type="checkbox"/>	
6/7 04:32:35	6/7 11:32:35	3.8	ML	37.40	-23.48		AZORES ISLANDS REGION	EMSC		<input type="checkbox"/>	
6/7 04:06:17	6/7 11:06:17	2.3	ML	51.20	15.98		POLAND	EMSC		<input type="checkbox"/>	
6/7 03:36:55	6/7 10:36:55	2.5	ML	39.11	17.05		SOUTHERN ITALY	EMSC		<input type="checkbox"/>	
6/7 03:32:50	6/7 10:32:50	2.7		39.61	-124.10	4.8	Offshore Northern California	USGS		<input type="checkbox"/>	
6/7 02:58:02	6/7 09:58:02	3.3	ML	36.62	54.81		NORTHERN IRAN	EMSC		<input type="checkbox"/>	
6/7 02:31:27	6/7 09:31:27	2.9	ML	45.56	26.57		ROMANIA	EMSC		<input type="checkbox"/>	
6/7 01:31:47	6/7 08:31:47	2.6	ML	45.98	8.47		NORTHERN ITALY	EMSC		<input type="checkbox"/>	
6/7 01:17:48	6/7 08:17:48	5.1	mb	46.65	-54.42	20	Newfoundland, Canada	GEOFON		<input type="checkbox"/>	
6/7 01:09:21	6/7 08:09:21	6.1		16.68	-93.48	124.8	Chiapas, Mexico	USGS		<input type="checkbox"/>	
6/7 01:09:19	6/7 08:09:19	6	Mw	16.68	-93.58		CHIAPAS, MEXICO	EMSC			
6/7 01:09:07	6/7 08:09:07	5.9	mb	16.84	-94.11	20	Oaxaca, Mexico	GEOFON		<a href="#">analysis</a>	
5/7 23:43:37	6/7 06:43:37	2.8	ML	37.00	14.43		SICILY, ITALY	EMSC			
5/7 23:10:38	6/7 06:10:38	2.5		32.74	-115.43	15.5	Southern California	USGS			
5/7 21:30:02	6/7 04:30:02	2.9		32.09	-116.39	5.5	Baja California, Mexico	USGS			
5/7 21:28:37	6/7 04:28:37	2.7		53.63	-164.17	15	Unimak Island Region, Alaska	USGS			
5/7 19:25:57	6/7 02:25:57	5.3	mb	-30.24	-71.01	95	Near Coast of Central Chile	GEOFON			
5/7 19:25:49	6/7 02:25:49	4.9		-30.35	-71.46	44.7	Coquimbo, Chile	USGS			
5/7 18:32:52	6/7 01:32:52	2.7		35.56	-118.28	4.3	Central California	USGS			
5/7 16:34:12	5/7 23:34:12	5		-27.00	-176.38	25.2	Kermadec Islands Region	USGS			
5/7 16:34:10	5/7 23:34:10	4.9	mb	-26.96	-176.35	10	South of Fiji Islands	GEOFON			
5/7 15:32:33	5/7 22:32:33	4.9		40.49	141.91	35.9	Near The East Coast Of Honshu, Japan	USGS			
5/7 15:25:42	5/7 22:25:42	2.5		59.20	-138.01	0.1	Southeastern Alaska	USGS			
5/7 14:51:49	5/7 21:51:49	4.5		46.49	153.04	52.4	Kuril Islands	USGS			
5/7 13:26:26	5/7 20:26:26	5.3	mb	-42.67	-19.17	20	Southern Mid Atlantic Ridge	GEOFON			
5/7 13:26:23	5/7 20:26:23	5.2		-42.25	-19.59	10	Southern Mid-Atlantic Ridge	USGS			
5/7 13:00:18	5/7 20:00:18	4.6		3.25	95.50	26.2	Off The West Coast Of Northern Sumatra	USGS			
5/7 08:38:16	5/7 15:38:16	2.8		52.92	-177.32	100	Andreanof Islands, Aleutian Is., Alaska	USGS			
5/7 07:27:38	5/7 14:27:38	3.7	ML	39.51	20.03	20	Greece-Albania Border Region	GEOFON			
5/7 06:04:03	5/7 13:04:03	2.5		54.42	-164.71	100	Unimak Island Region, Alaska	USGS			

- National Disaster Warning Center, THAILAND



# INPUT : THE GLOBAL TELECOMMUNICATION SYSTEM (GTS) – WMO

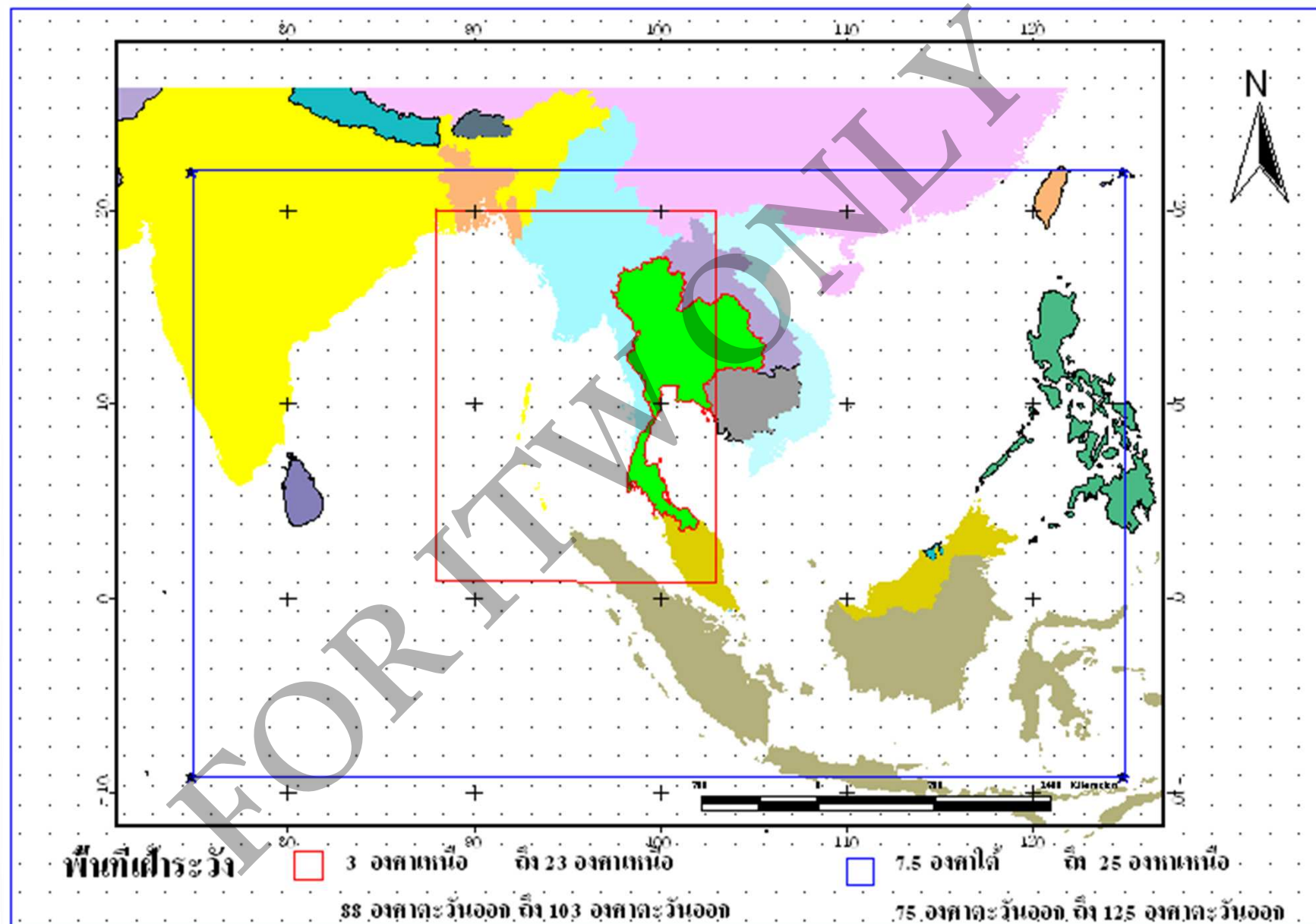


# Tsunami Criteria

## Tsunami Possibility Compared with Magnitude and Depth of Hypocenter

Magnitude (Richter)	Depth of Hypocenter	
	less than 100 km.	more than 100 km.
5.0-6.4	Low possibility to generate Tsunami Advisory	Low possibility to generate Tsunami Advisory
6.5-6.9	Possibility to generate Tsunami Alert / Advisory	Low possibility to generate Tsunami Advisory
7.0-7.7	High possibility to generate Tsunami Alert / Watch	Possibility to generate Tsunami Alert / Watch

# Seismic awareness zones of Thailand tsunami preparedness



1.Red —

2.Blue —

3.Out of Blue

# SOP for tsunami warning of the NDWC

## Zone 1: Red Box (3°N – 23°N and 88°E – 103°E)

Depth: Magnitudes	Hypocenter	
	< 100 km	> 100 km
5.0 - 6.5 Richter	Do not generate tsunami Reporting	Do not generate tsunami Reporting
6.6 – 7.7 Richter	Potential to generate tsunami Watching (tracking more information)	Potential to generate tsunami Watching (tracking more information)
> 7.8 Richter	High tsunami potential Warning	Tsunami potential Watching (tracking more information)

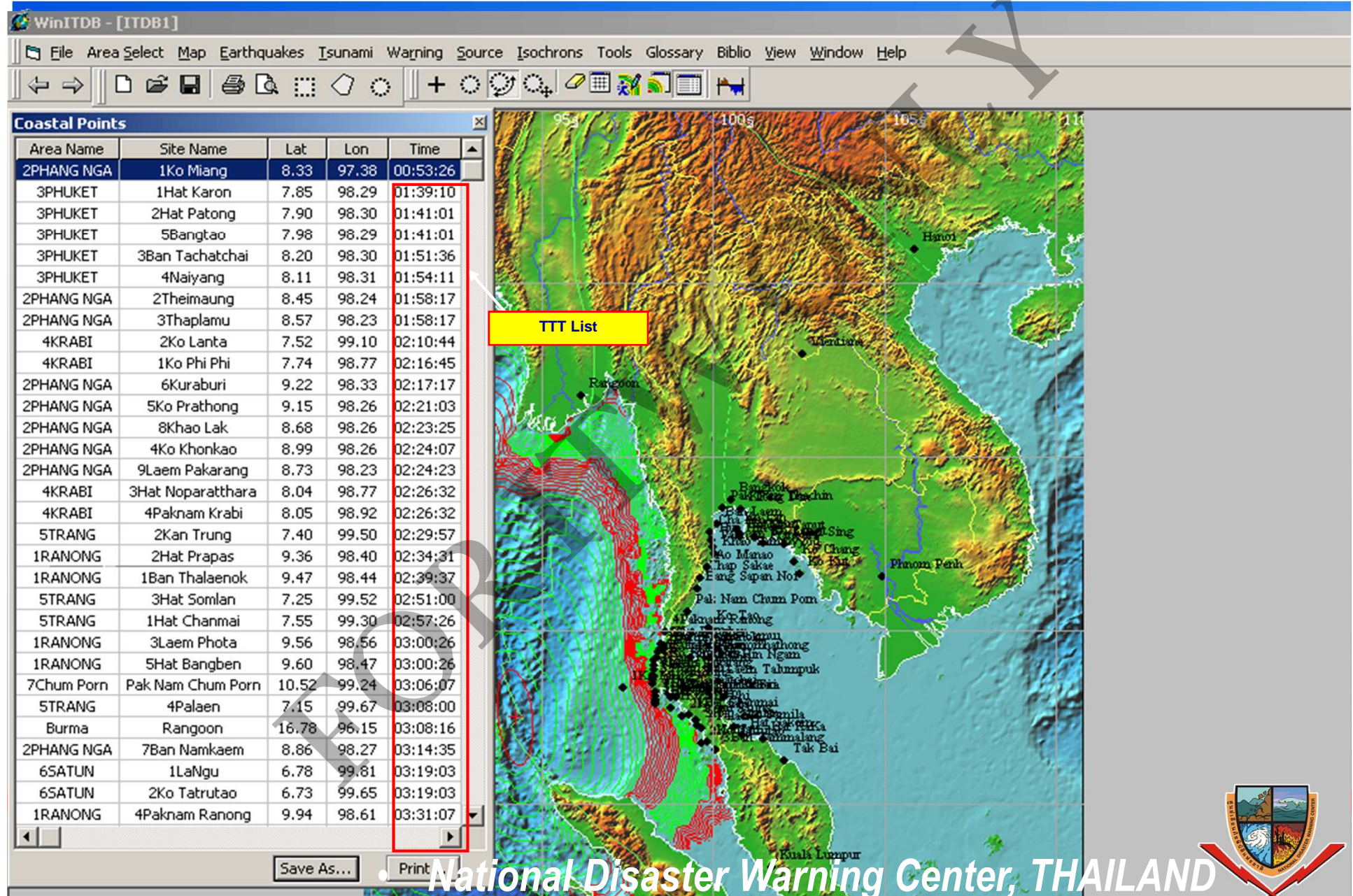
## Zone 2: Blue Box (75°S – 25°N and 75°E – 125°E)

Depth: Magnitudes	Hypocenter	
	< 100 km	> 100 km
5.7 - 7.0 Richter	Do not generate tsunami Reporting (tracking more information)	Do not generate tsunami Reporting
> 7.1 Richter	Potential to generate tsunami Watching (tracking more information)	Potential to generate tsunami Watching (tracking more information)
	If no tsunami occurs, then status changed to Warning	If a tsunami occurs, then status changed to Warning

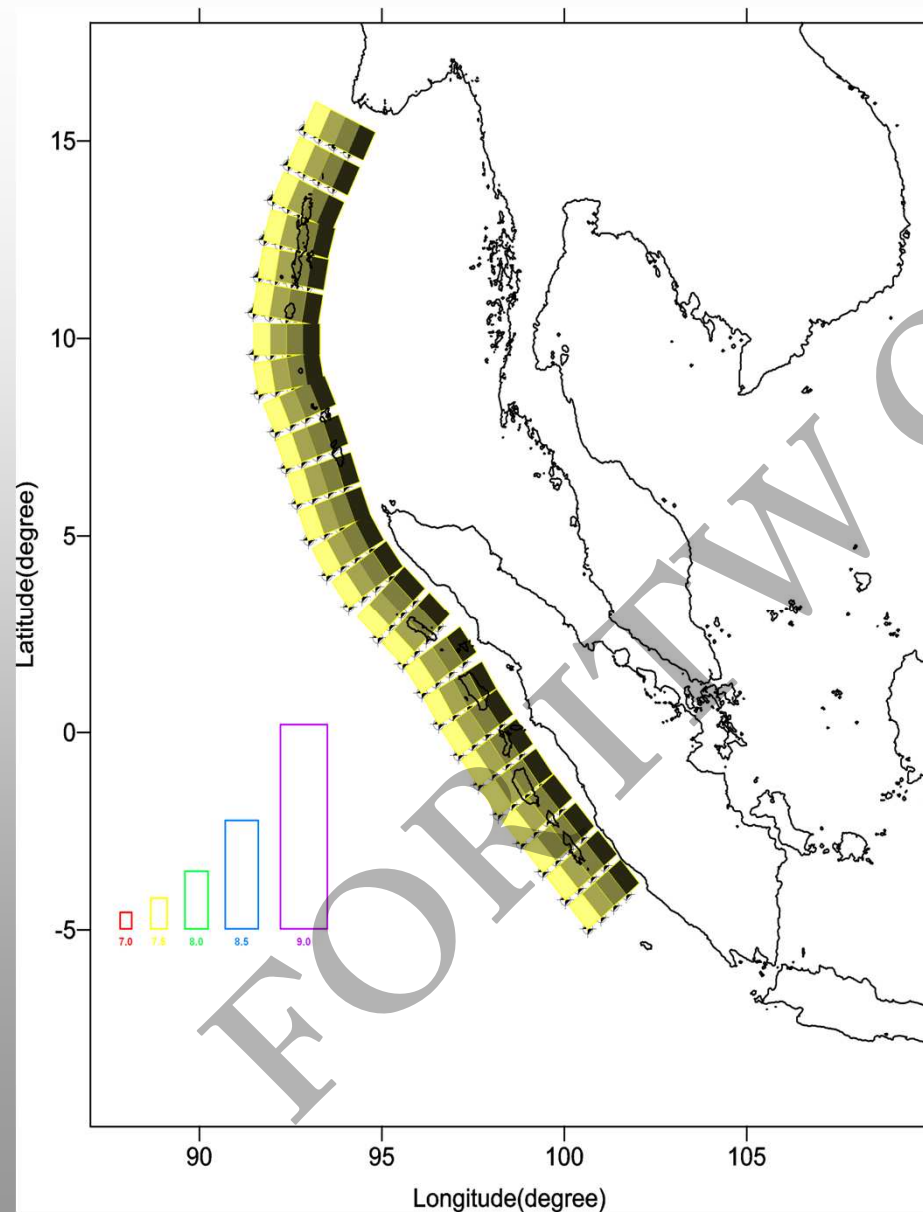
## Zone 3: Other areas not included in the Red and Blue Boxes

Depth: Magnitudes	Hypocenter	
	< 100 km	> 100 km
> 7.0 Richter	Have no impact on Thailand Reporting	Have no impact on Thailand Reporting

# TSUNAMI modeling



# Tsunami Simulation



**The Information from  
TSUNAMI Simulation**

- ETA
- Wave high

• *National Disaster Warning Center, THAILAND*



# Pre-form bulletin

การแจ้งเตือนภัยแผ่นดินไหวในทะเล

ฉบับที่ 1/48

จาก ศูนย์เตือนภัยพิบัติแห่งชาติ

ถึง ผู้เกี่ยวข้องและผู้ปฏิบัติ

วันที่ 23 กรกฎาคม 2548 เวลา 22.55 น.

## สถานการณ์

เมื่อวันที่ 23 กรกฎาคม 2548 เวลา 22.42 น. ได้เกิดแผ่นดินไหวในทะเล

ขนาด 8.0 ริกเตอร์ ที่ความลึกใต้ผิวโลก 33 กิโลเมตร

## สถานที่เกิดเหตุ

ศูนย์กลางที่ ละติจูด 4.39 องศาเหนือ ลองจิจูด 93.42 องศาตะวันออก

บริเวณเกาะสุมาตรา ระยะห่าง 654 กิโลเมตร จากชายฝั่งอันดามันของไทย

## การประเมินสถานการณ์

คาดว่าจะมีโอกาสสูงที่จะเกิดคลื่นสึนามิ เป็นเกณฑ์แจ้งเตือนภัย

## คำแนะนำ

ภัยคลื่นสึนามิ อาจเป็นอันตรายต่อพื้นที่บริเวณแนวชายฝั่ง จังหวัดภูเก็ต พังงา กระบี่ ระนอง สตูล และตรัง

- ให้แจ้งเตือนภัยและอพยพประชาชนไปยังพื้นที่ปลอดภัย
- ให้ปฏิบัติตามแผนบรรเทาสาธารณภัยบริเวณพื้นที่รับผิดชอบ
- ให้ติดตามสถานการณ์และเฝ้าฟังการแจ้งข่าวเพิ่มเติม

คำแนะนำอื่นๆ คาดว่าเวลาที่คลื่นสึนามิ จะกระทบฝั่งตามหาดต่างๆ ดังนี้

จังหวัด	พื้นที่	เวลาที่คาดว่าจะเกิดคลื่นสึนามิ กระทบหาด
ภูเก็ต	กะรน	00:28 น.
ภูเก็ต	ป่าตอง	00:31 น.
ภูเก็ต	สุรินทร์	00:29 น.
ภูเก็ต	บางเทา	00:33 น.
ภูเก็ต	ในยาง	00:35 น.
ภูเก็ต	ท่าฉัตรชัย	00:36 น.
พังงา	เกาะลันตา	00:18 น.
พังงา	เกาะสุรินทร์	00:32 น.
พังงา	ท้ายเหมือง	00:48 น.
พังงา	เขาหลัก	00:56 น.
พังงา	น้ำเค็ม	01:00 น.



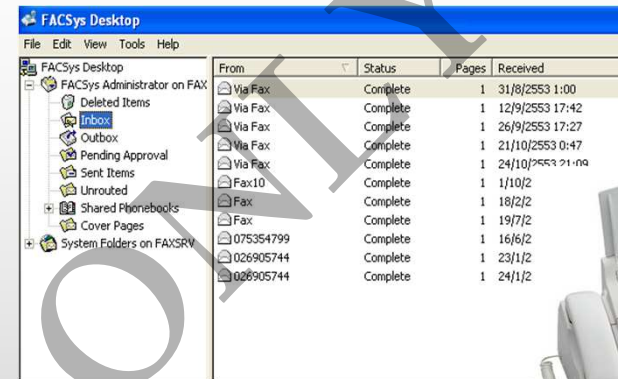
# Tools for Dissemination

- SMS. ( $\geq$  20 Million Mobile phones )
- Fax. (16 ports)
- E-mail
- Send Information to TV Station
  - TV subscript
  - TV Pool
- Warning Tower (328 Towers)
- Local Government's Relay stations (140 stations)
- Local Dissemination Network (500 small towers and 1,500 special radios)
- Radio Station
- Call Center 192
- GIN (Government Information Network)
  - National Disaster Warning Center, THAILAND





Short Message Service (SMS)



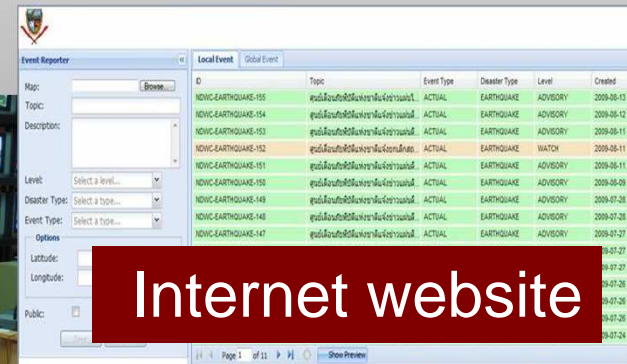
Fax Server 16 ports



TV Pool (nationwide)



10 Hot Line

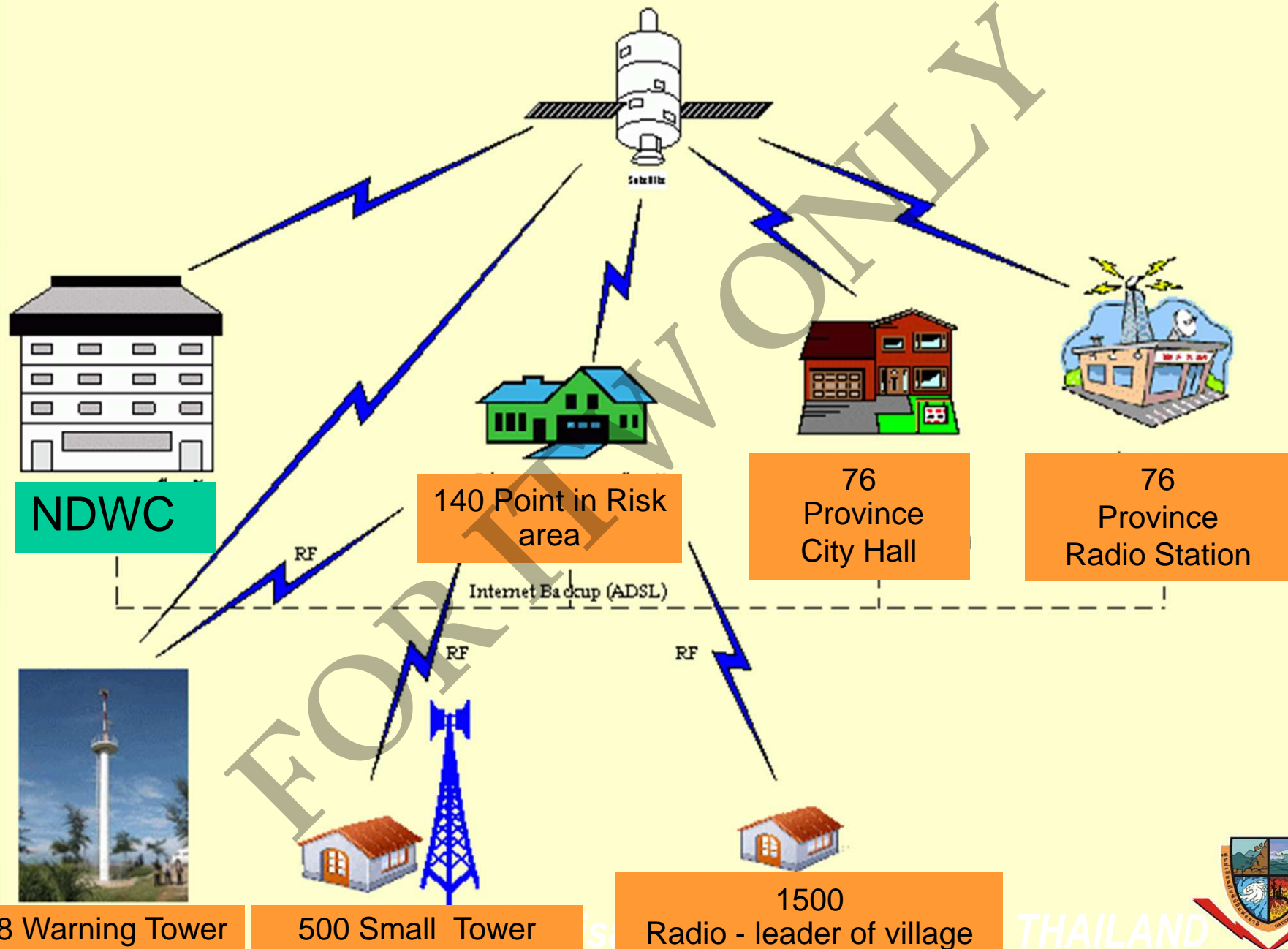


Internet website



328 Warning Towers

# Warning System

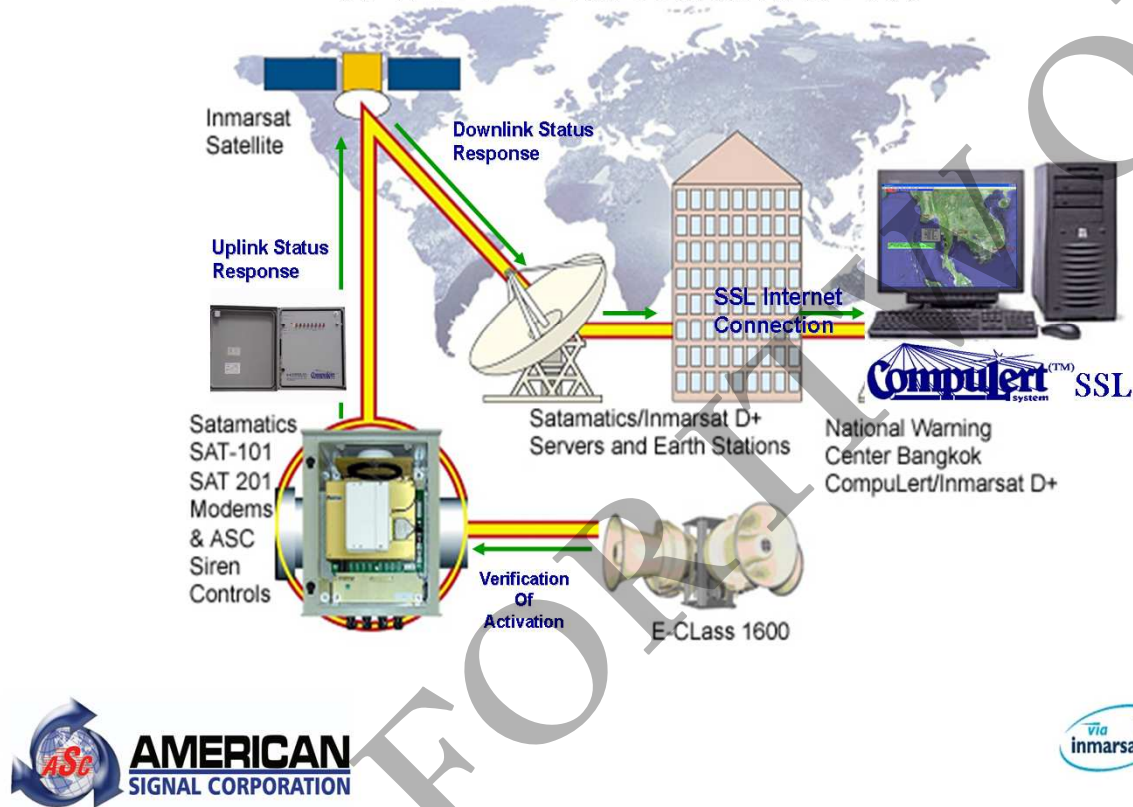




**Warning Towers**

# Warning tower communication diagram

## INMARSAT D+ Communications



- *National Disaster Warning Center, THAILAND*



# Warning tower



# Warning Towers



**136 Towers**



# 48 Towers

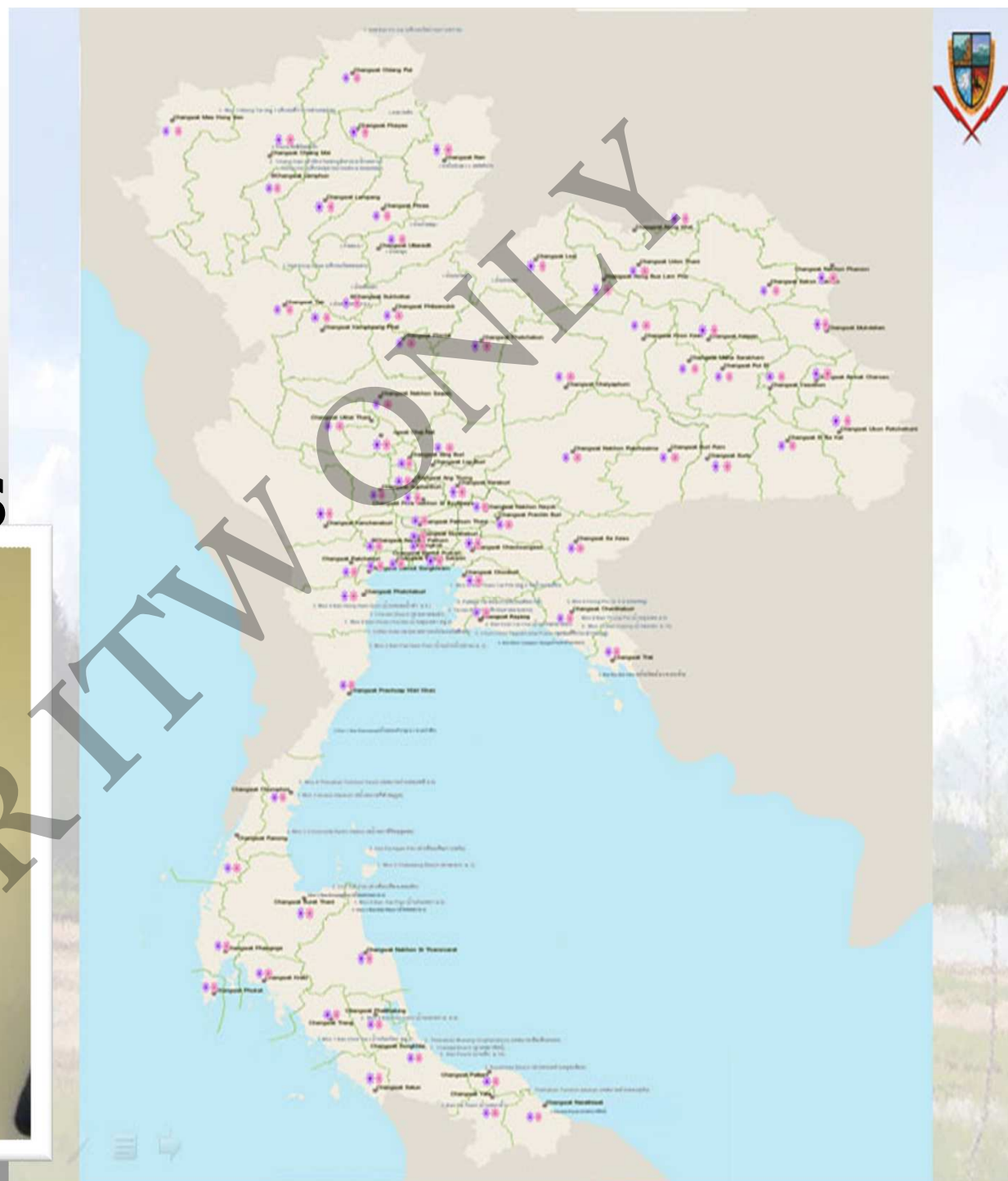


**144 Towers**

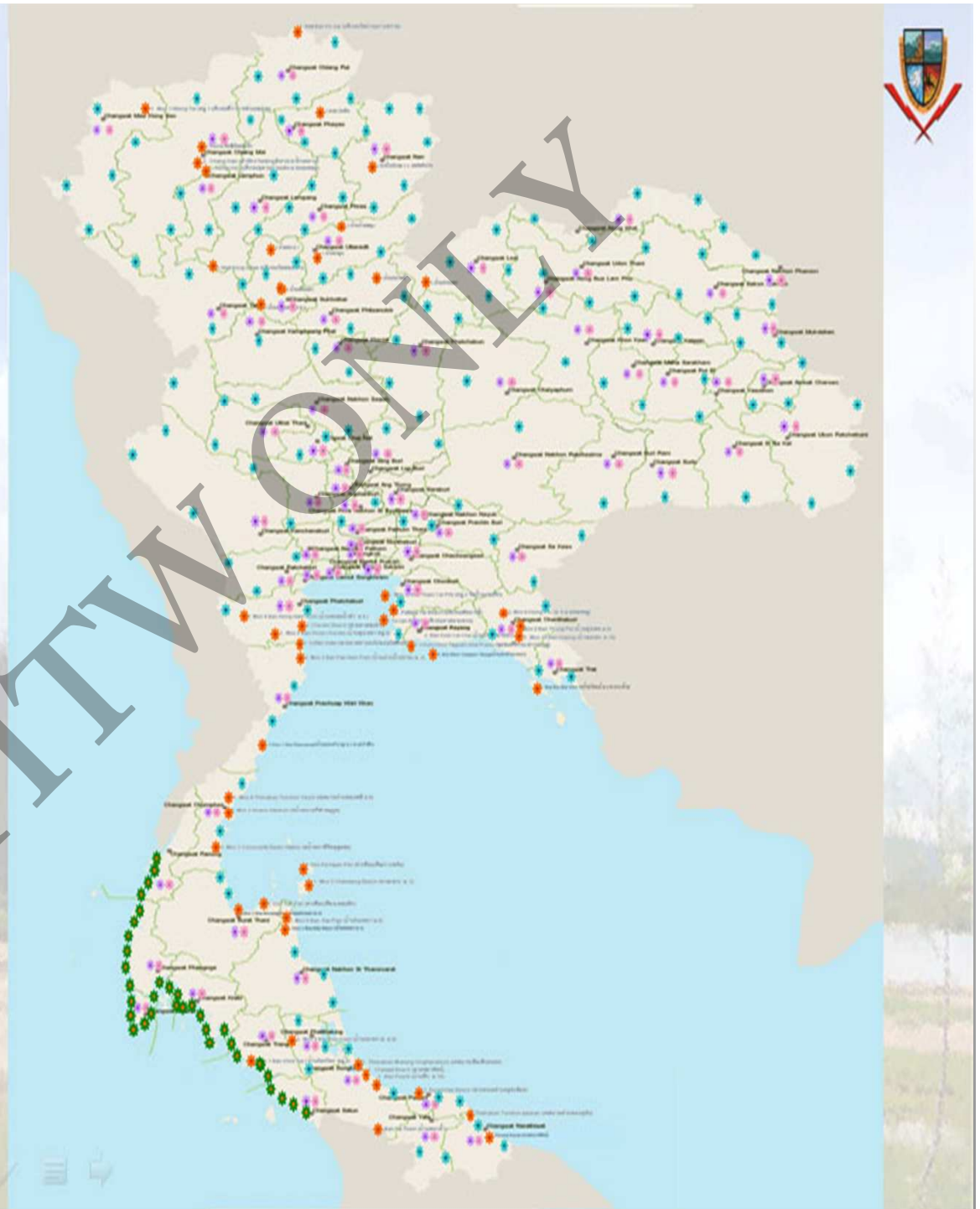


**328 Towers**





**480 Items**



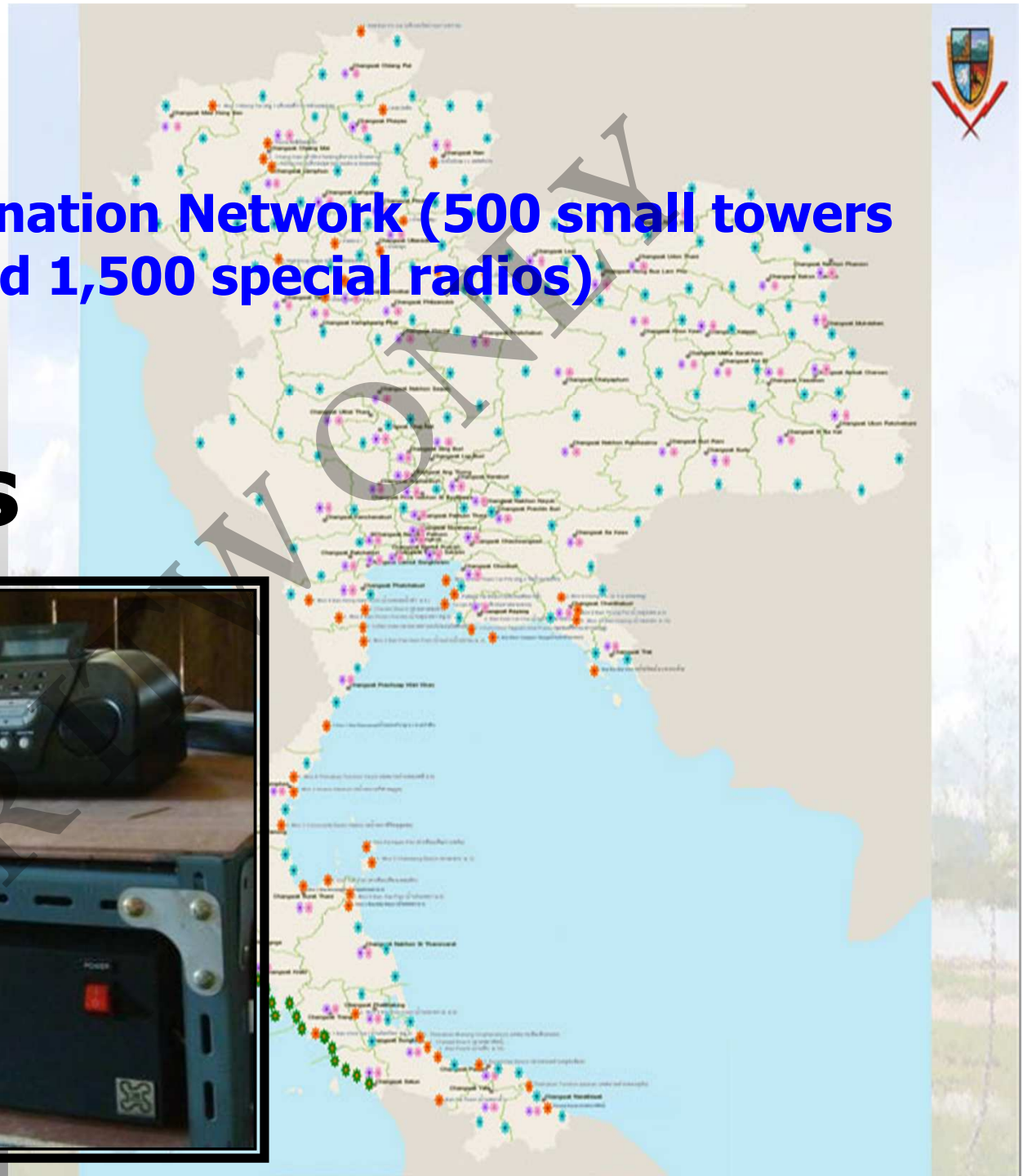
# Local Government's Relay stations

140 Sets



## Local Dissemination Network (500 small towers and 1,500 special radios)

**2,000 Sets**



# Small tower



# Prerecord Sound sample

 **M3 Tsunami Evacuation**

 **M2 Tsunami Advisory**

 **M5 Typhoon Evacuation**

 **M9 Termination**

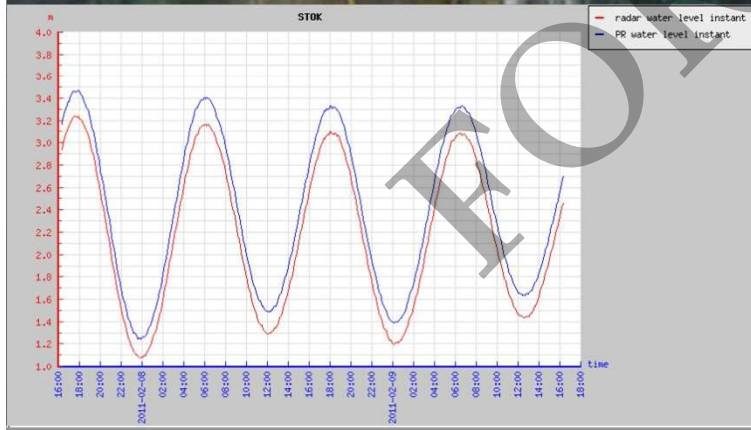
 **M12 Forest Floods**

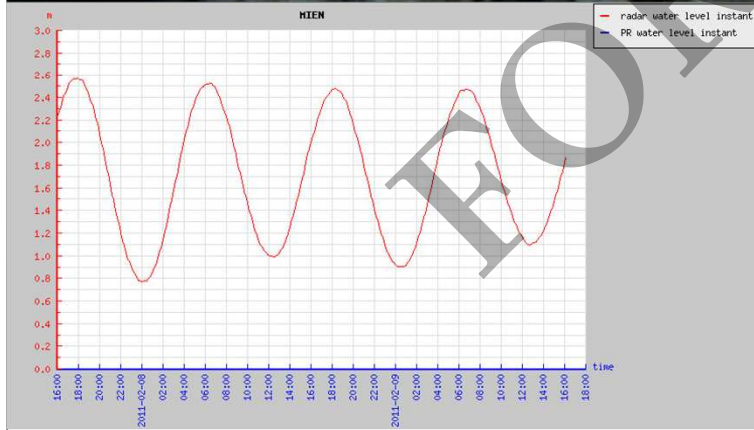
 **M8 Testing Towers**

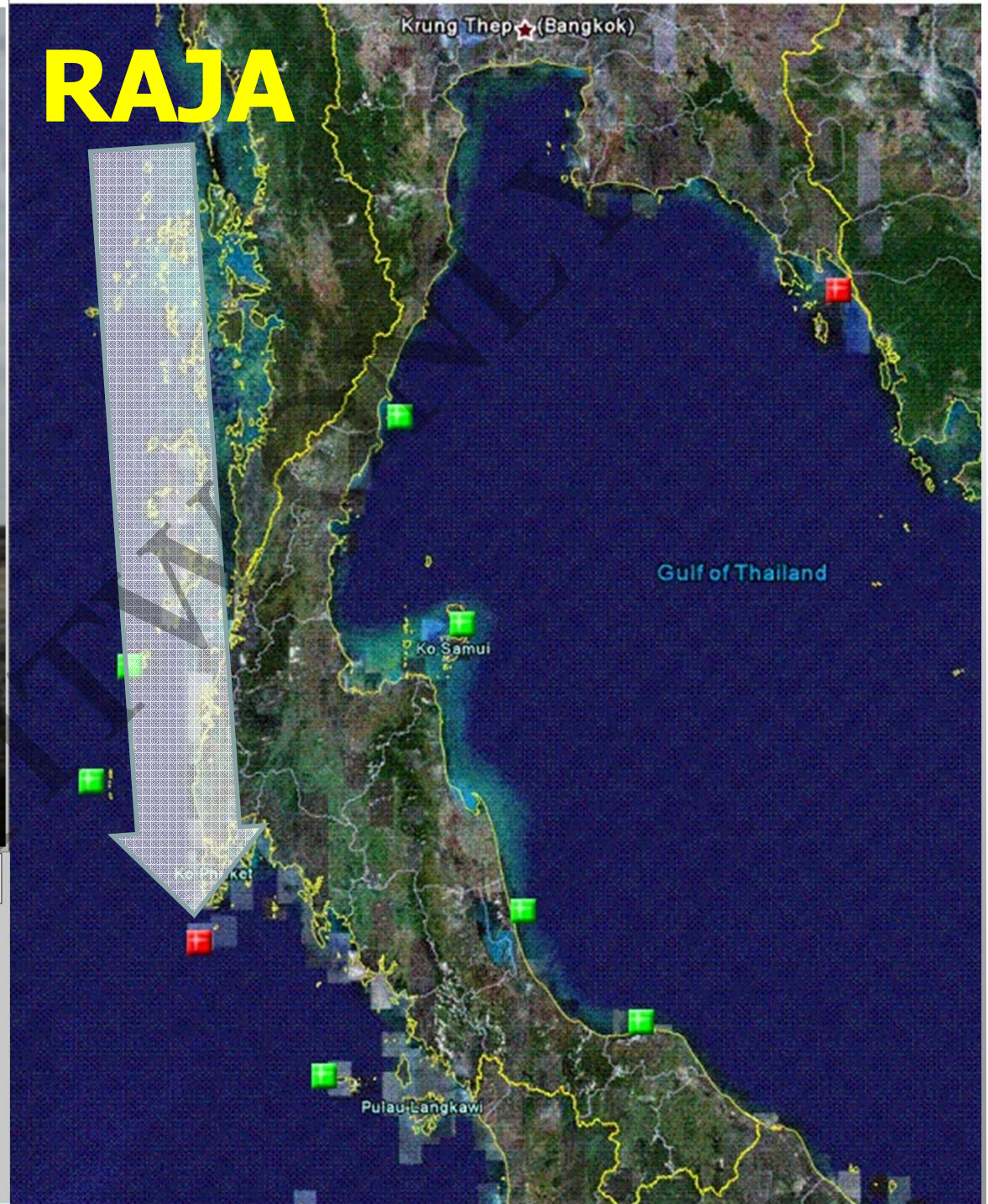
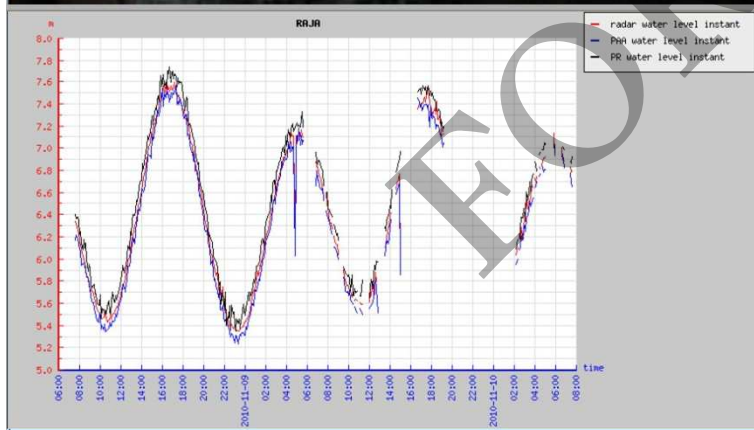
## 9 Tidal Gates



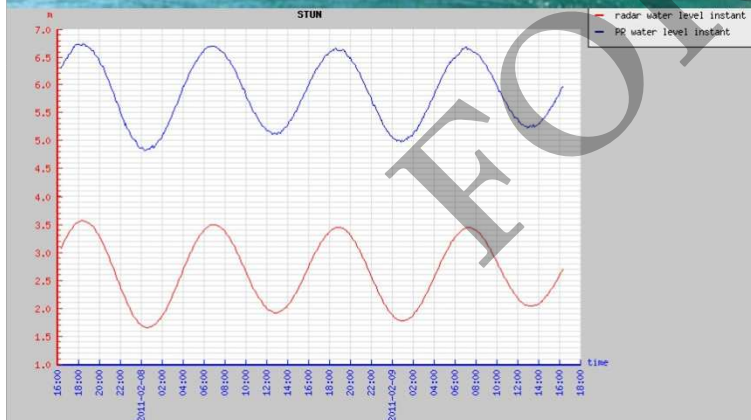
# STOK



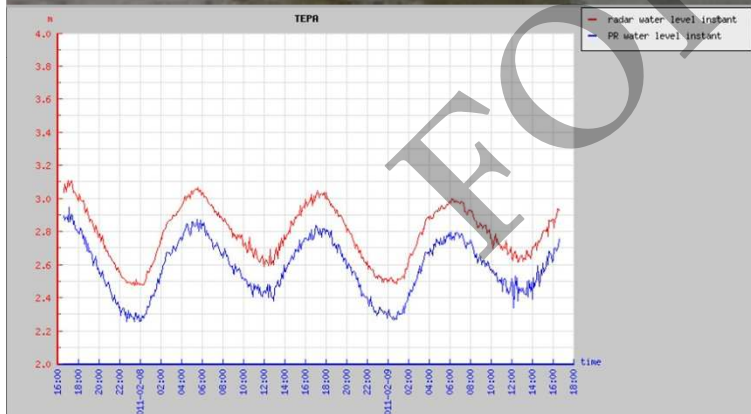




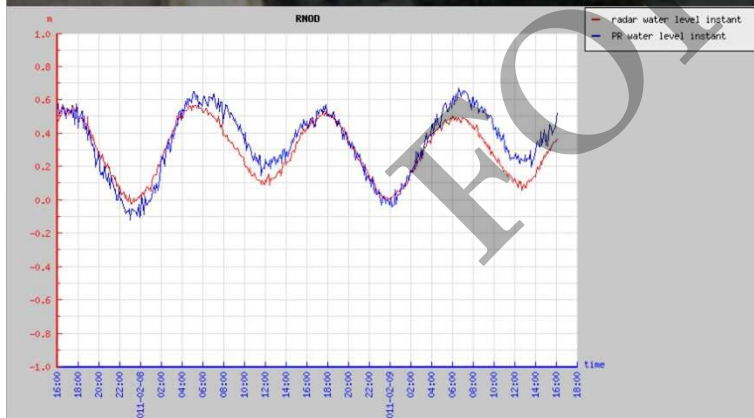
# STUN

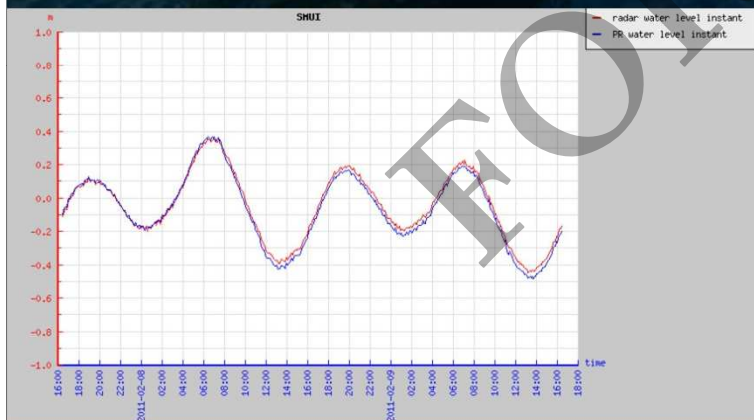


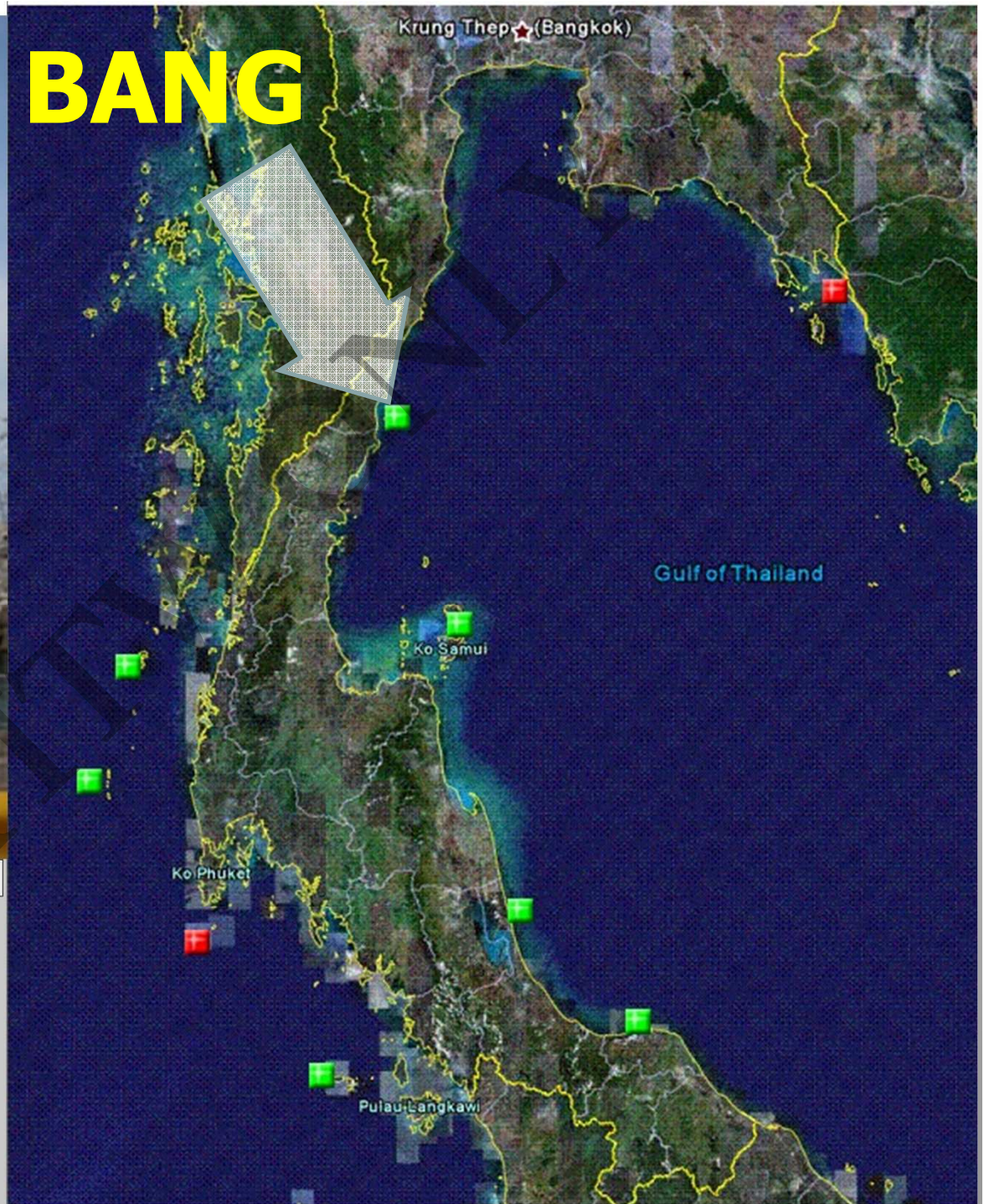
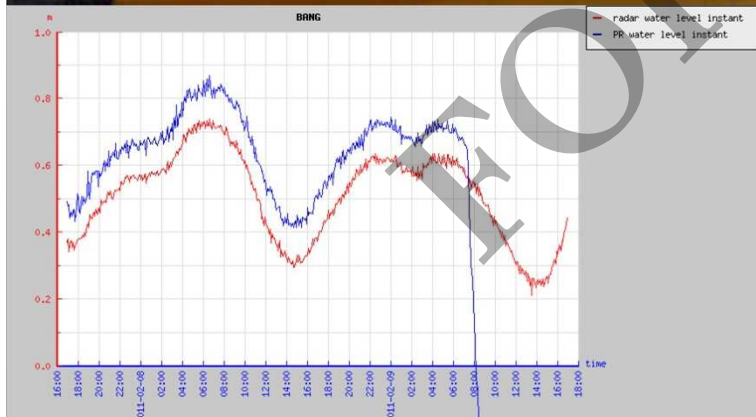
# RNOD



# TEPA







**TRADE**

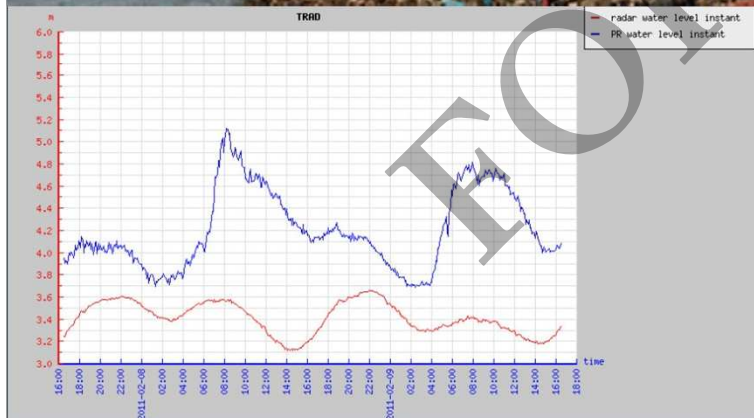
Krung Thep (Bangkok)

Gulf of Thailand

Ko Samui

Ko Phuket

Pulau Langkawi



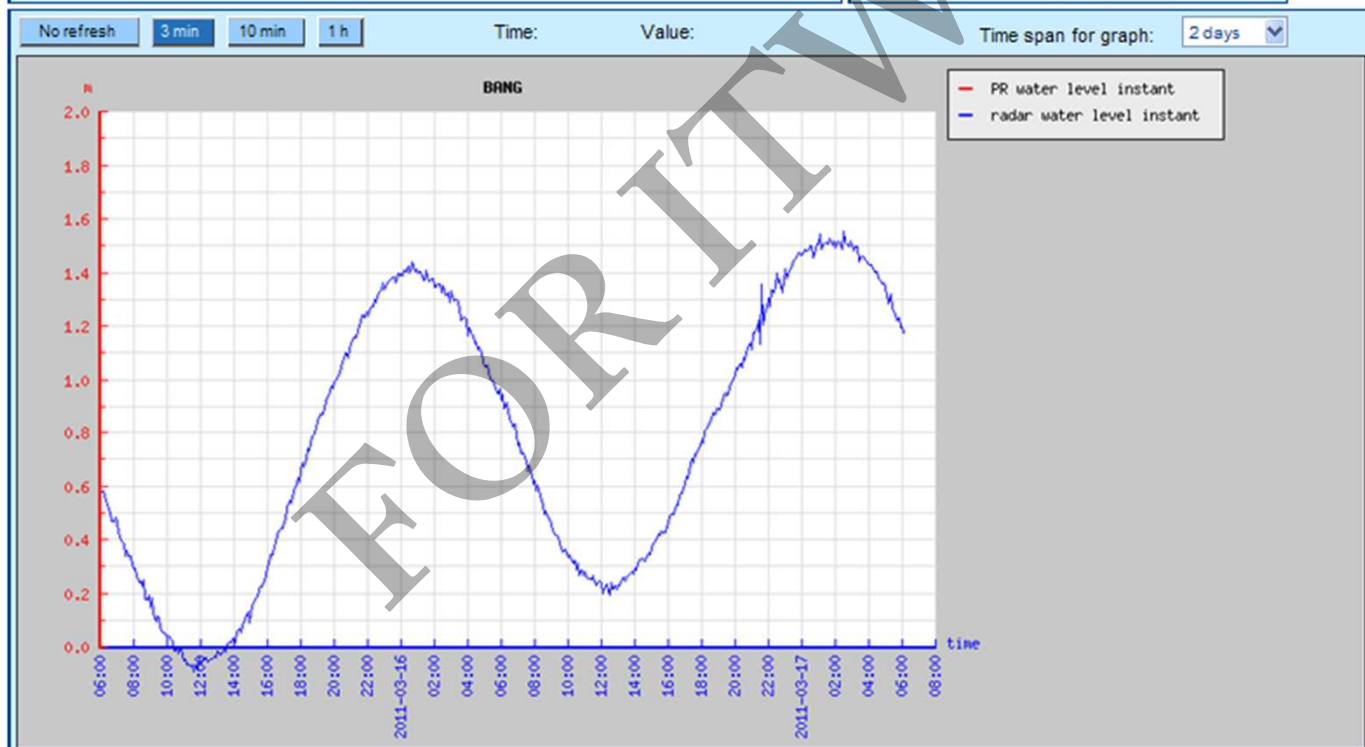
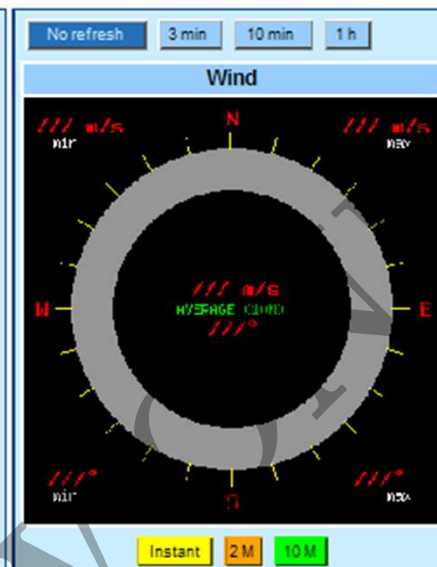
Back ?

Change Settings

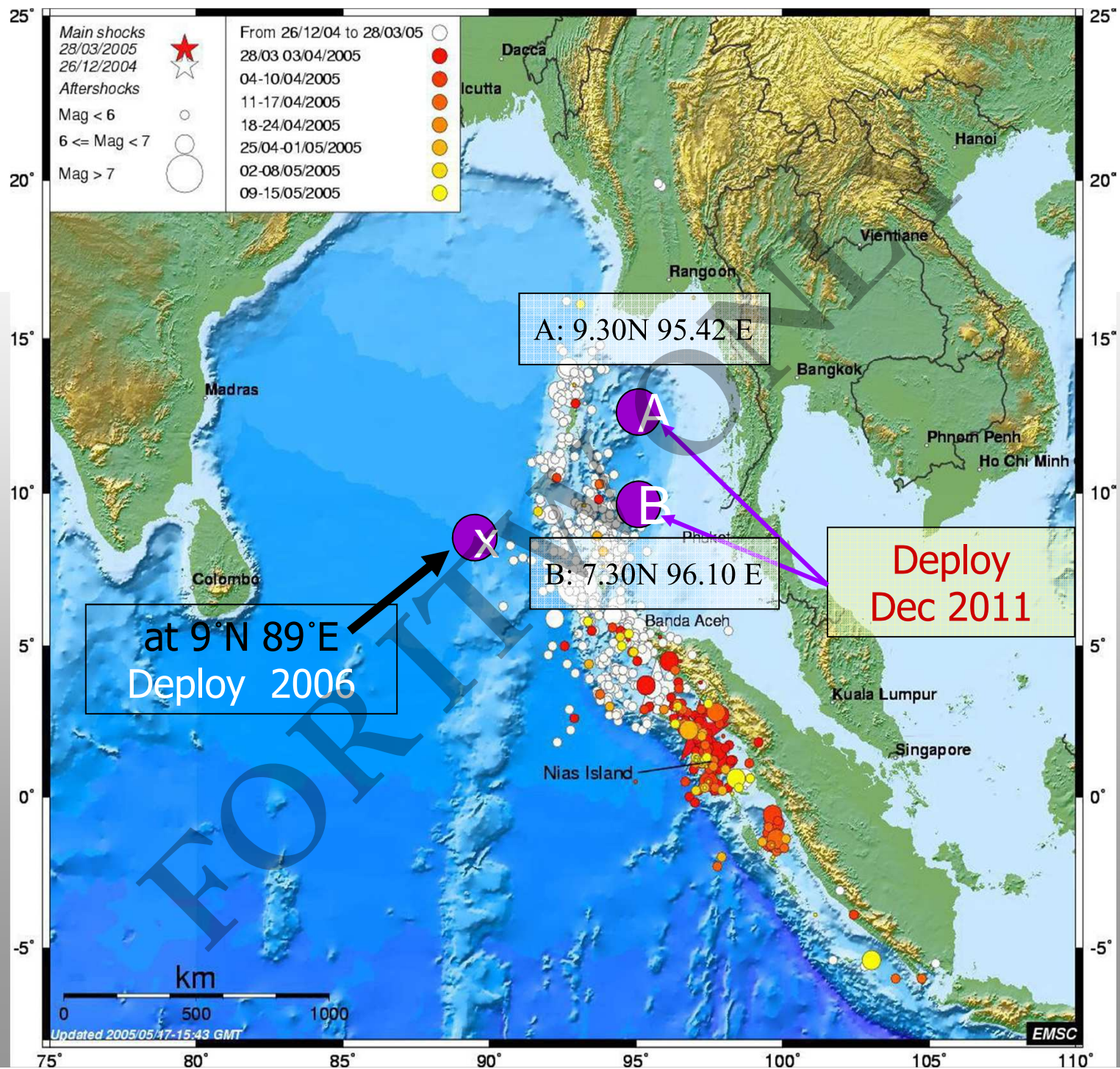
Change Layout

No refresh 3 min 10 min 1 h

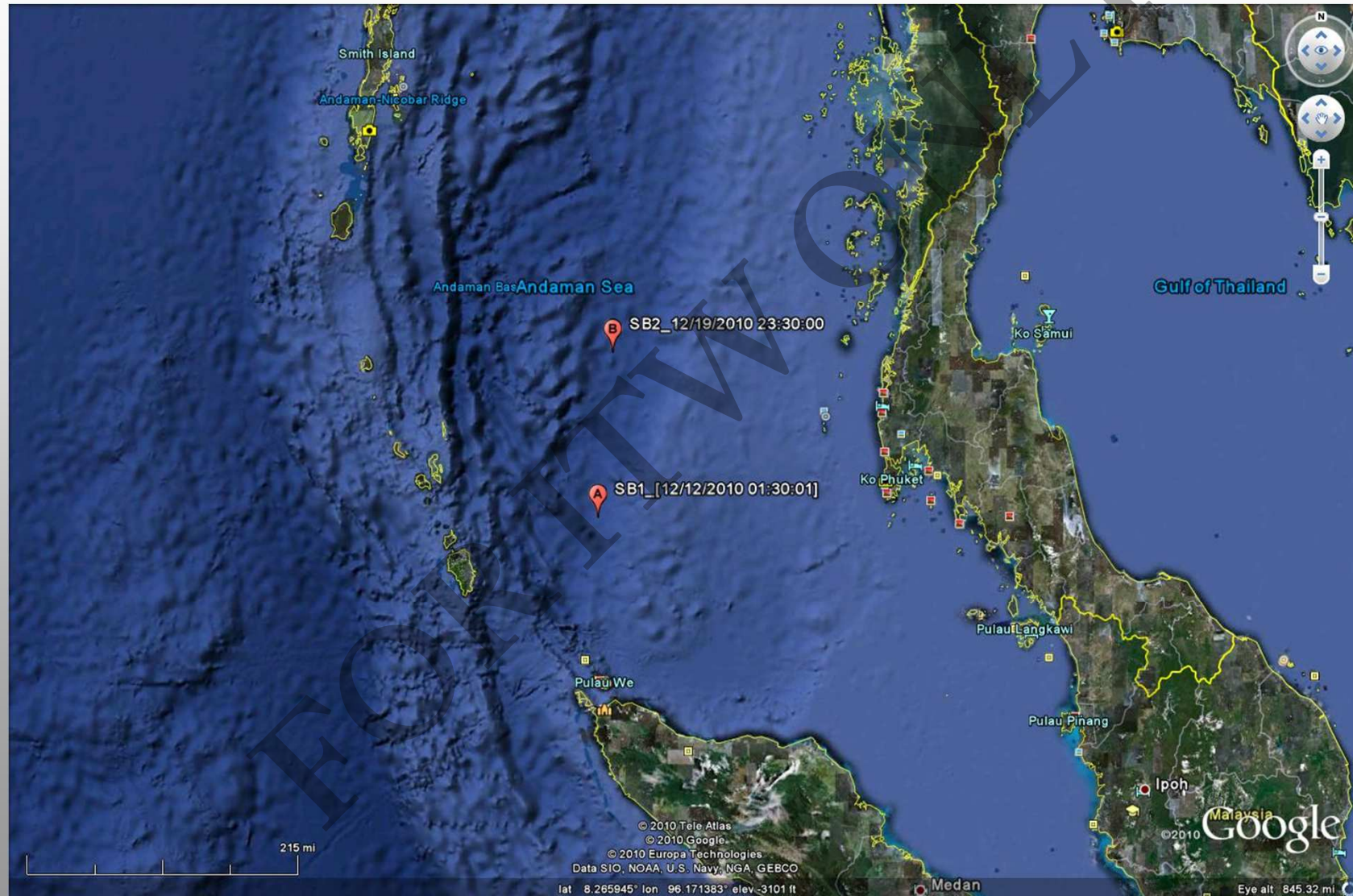
Variable	Instant	Min	Max	Avg/sum	Time
air temperature 1 hour average	///	///	///	///	
air temperature 1 hour max	///	///	///	///	
air temperature 1 hour min	///	///	///	///	
wind direction 10 min max	///	///	///	///	
wind direction 10 min min	///	///	///	///	
precipitation 1 hour	///	///	///	///	



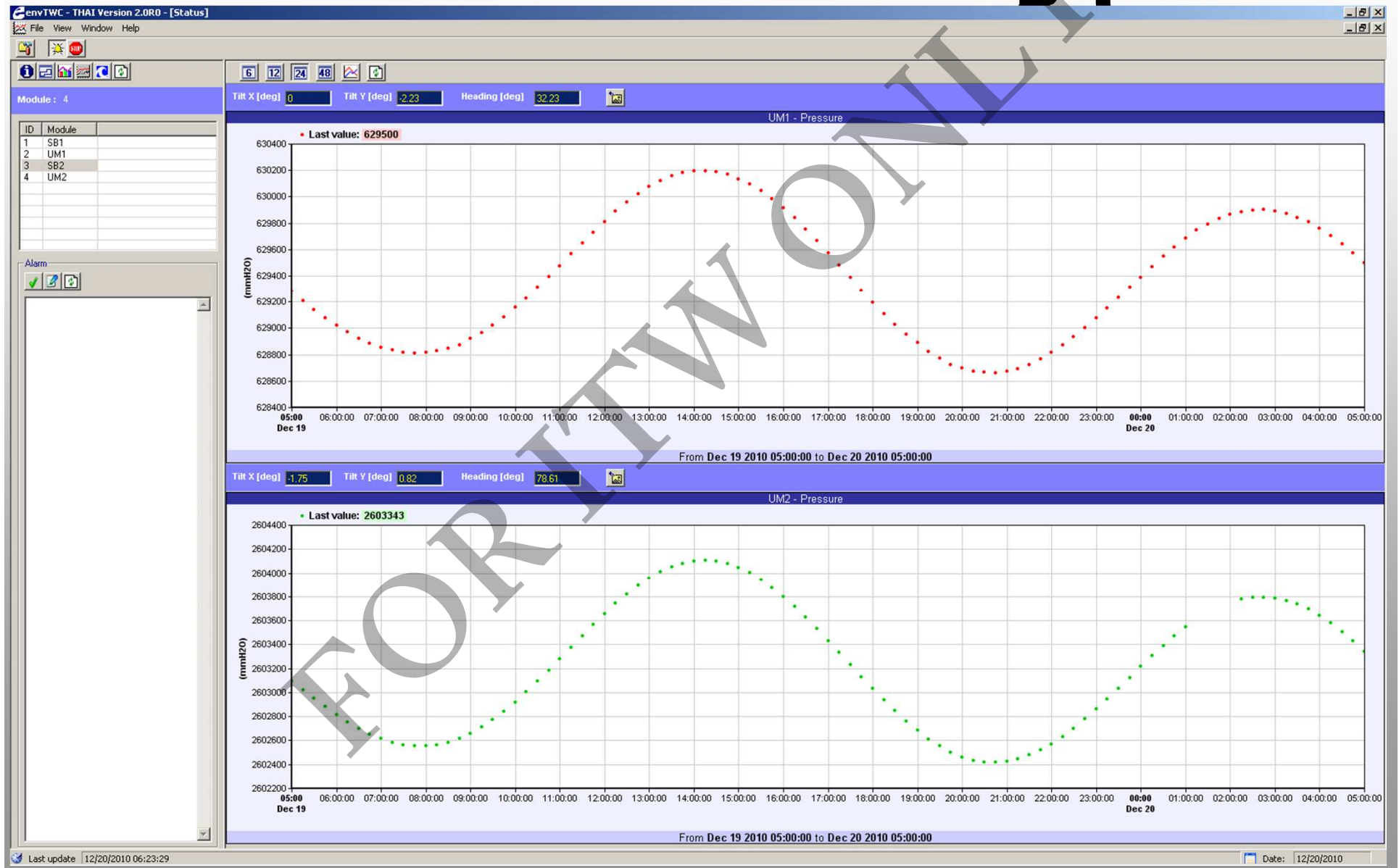




# Buoy Positions in Andaman sea



# Real Time monitoring plot



# Tsunami Warning and Evacuation Drill 2008

**มั่นใจปลอดภัย**

**ฝึกซ้อม** เตือนภัย อพยพหลบภัย สึนามิ **2551**  
**7 กรกฎาคม 2551** เวลา 9.30 - 10.30 น.

ซ้อมพร้อมกัน 6 จังหวัด ระนอง, พังงา, ภูเก็ต, กระบี่, ตรัง, สตูล โดยมี รองนายกรัฐมนตรี (นายสุวิทย์ คุณกิตติ) เป็นประธาน

**FOR SAFETY**

**TSUNAMI WARNING and EVACUATION DRILL 2008**  
**July 7, 2008 9.30 am. - 10.30 am.** Ranong Phang-Nga Phuket Krabi Trang Satun  
Presentation of Opening by : Deputy Prime Minister Suwit Khunkitti

เข้าสู่ศูนย์เตือนภัยพิบัติแห่งชาติ



- National Disaster Warning Center, THAILAND



# Evacuation sign



- *National Disaster Warning Center, THAILAND*



# Evacuation sign



พื้นที่เสี่ยงภัยคลื่นยักษ์

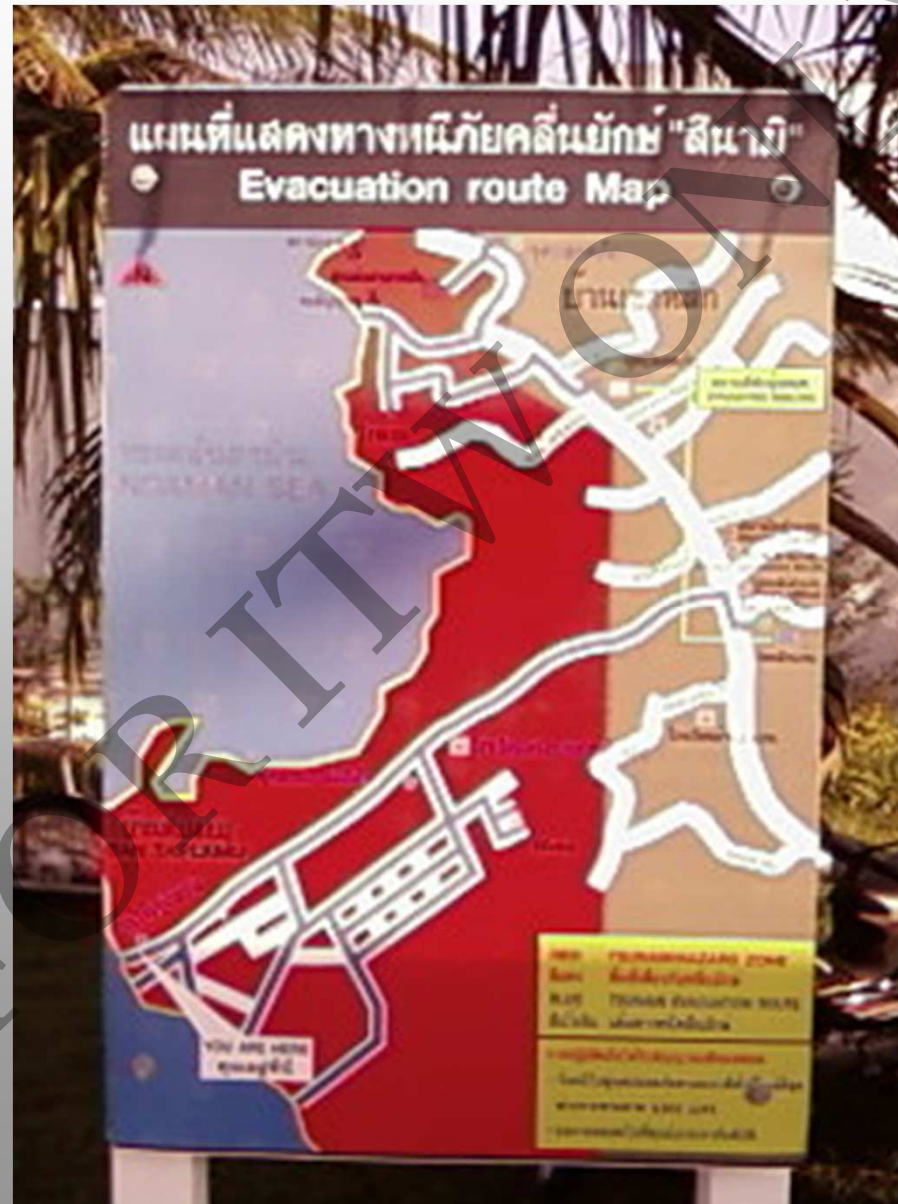
# Evacuation sign



# Evacuation route map

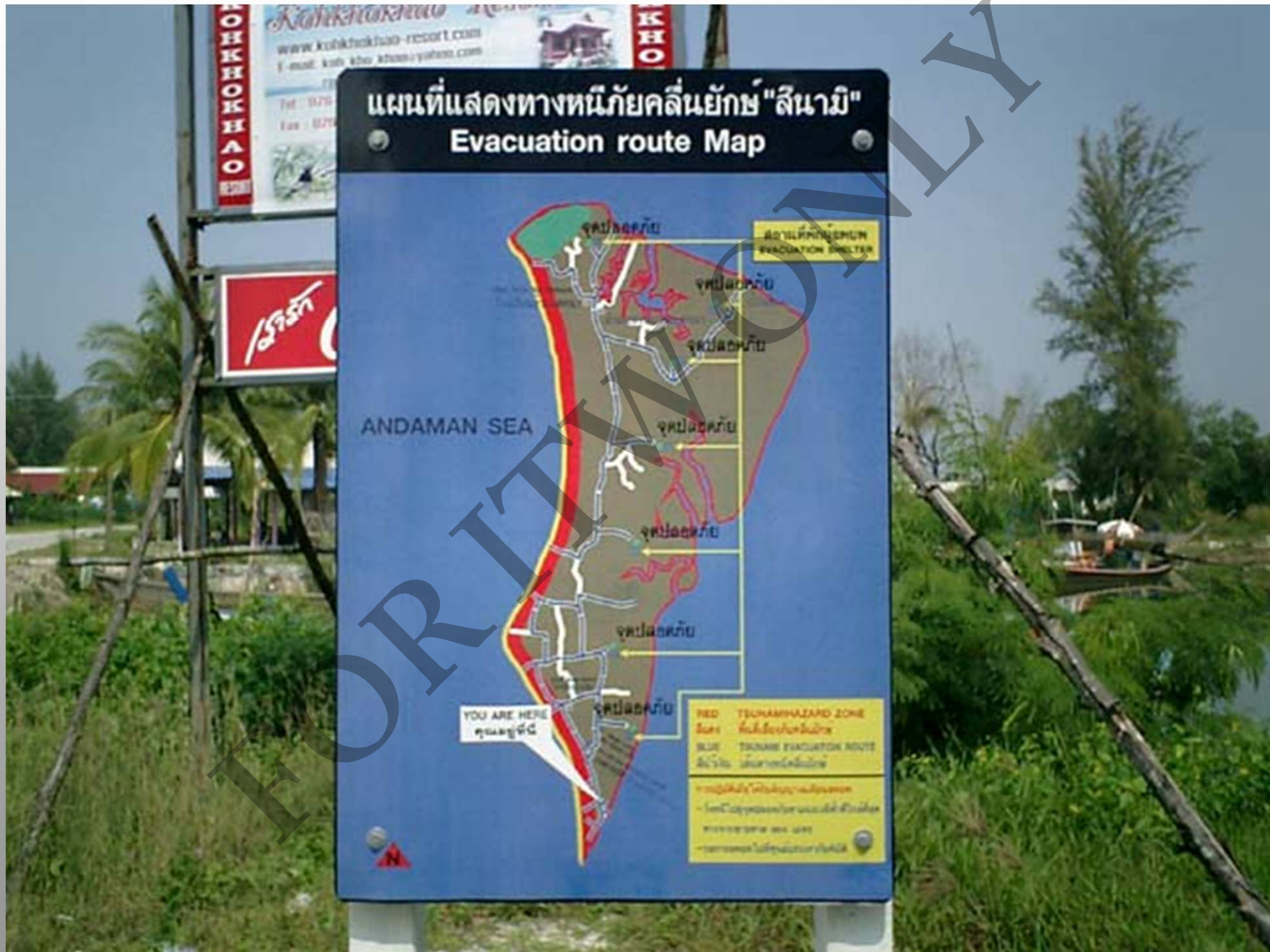


# Evacuation route map



# Evacuation route map





# Evacuation route map

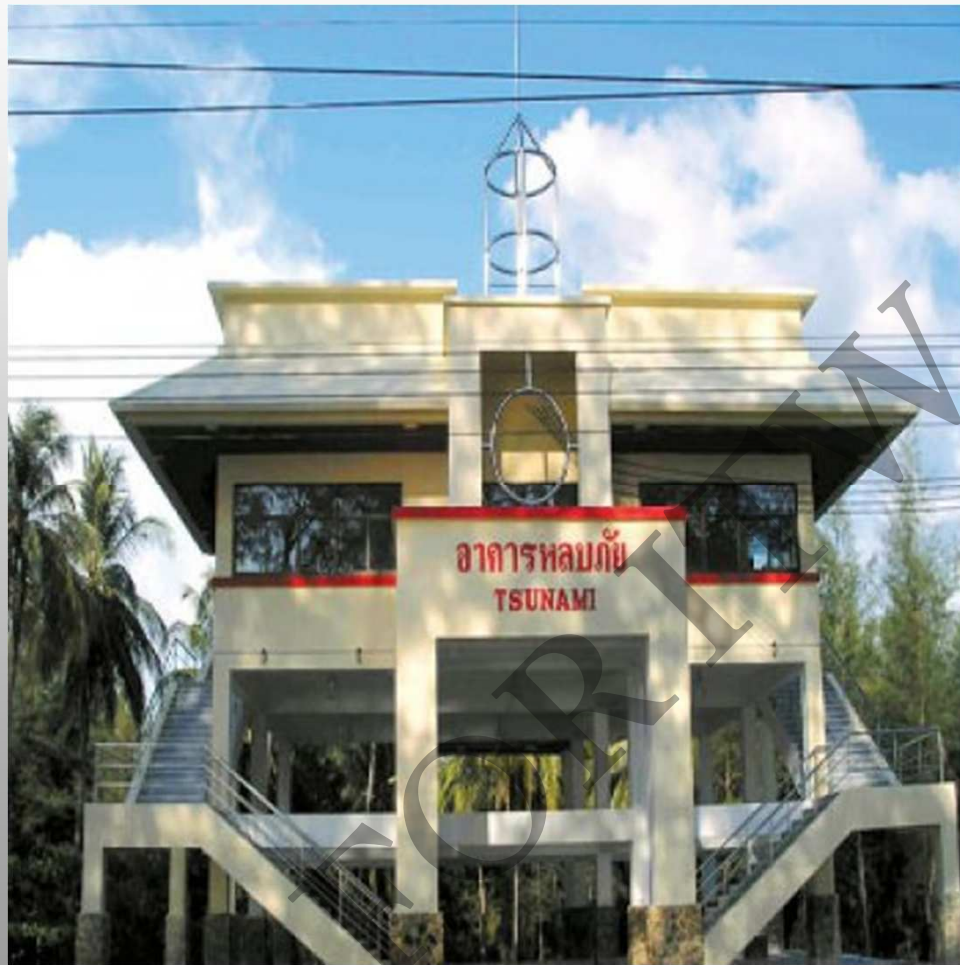




# Evacuation route map



# Evacuation Shelter





- *National Disaster Warning Center, THAILAND*



# Response activities



- *National Disaster Warning Center, THAILAND*





**National Disaster Warning Center**  
**THAILAND**

**Ministry of Information and Communication Technology**

**Thank You**