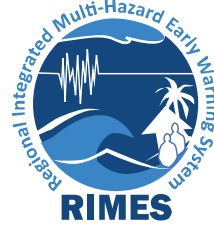




Myanmar Department of  
Meteorology and Hydrology



Strengthening of Myanmar's Multi-Hazard Early Warning System

**1<sup>ST</sup> STANDARD OPERATING PROCEDURE TESTING**  
18 November 2013, National Earthquake Data Center (NEDC),  
Department of Meteorology and Hydrology (DMH), Nay Pyi Taw, Myanmar

## **DRAFT ACTIVITY REPORT**

### **1. Background**

Myanmar's Department of Meteorology and Hydrology (DMH) is the government agency mandated to observe, analyze, predict, and provide warning services for weather- and climate-related hazards, including hazards of geologic and oceanic origins, to contribute to the safety and socio-economic benefit and welfare of communities through, among others, protection of lives and properties, reduction of the impact of natural hazards, and sustainable resource management and development. Donor support has contributed significantly to improving DMH provision of these services. With recent political and economic changes, manifested in the country's opening up to the west, inflow of external support could overwhelm DMH, in the absence of a framework for coherent, integrated, efficient, and effective engagement with donors.

The project on *Strengthening Myanmar's Multi-Hazard Early Warning System*, supported by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) through the Trust Fund for Tsunami, Disaster and Climate Preparedness, shall assist DMH in developing a capacity building program framework for addressing capacity gaps, as well as fill immediate capacity gaps in earthquake monitoring and tsunami warning, and decision-support tools for disaster risk management.

### **2. Objective**

In November 2013, NEDC staffs were trained on SeisComP3 and Tide Tool software configuration, operation, and maintenance, to enhance capacity of NEDC on seismic and sea level data acquisition, processing, interpretation, and reporting on earthquake and tsunami characteristics during tsunami events. The 1<sup>st</sup> Standard Operating Procedure (SOP) testing was conducted on 18 November 2013 to evaluate current practices of NEDC for generating warning information, and determine areas for improvement in NEDC's day-to-day operation of software, which have been installed and given training for.

### **3. Participants**

The activity targeted NEDC technical officers who have responsibilities in earthquake monitoring and tsunami watch, as well as operational system maintenance support. Eleven (11) officers from DMH participated in the exercise, as listed in Table 1.

Table1. List of workshop participants

Participant Name	Position
1. Dr. Yin Myou Min Htwe	Assistant Director
2. Mr. Kyaw Kyaw Lin	Assistant Director
3. Mr. Tun Lin Kyaw	Deputy Superintendent
4. Mr. Phyo Maung Maung	Deputy Superintendent
5. Ms. Kyi Kyi Sue	Deputy Superintendent
6. Mr. Myat Min Aung	Senior Observer
7. Mr. Kyaw Zar Naing	Senior Observer
8. Mr. Ngun Za Tang	Junior Observer
9. Mr. Zay Min	Junior Observer
10. Mr. Phyo Kyaw Kyaw	Junior Observer
11. Mr. Thant Zin Oo	Junior Observer

#### 4. Earthquake Scenario for the Exercise

The earthquake scenario used for the exercise is an event off West Coast of Northern Sumatra, with magnitude M8.5. Miniseed file was used to playback this event on SeisComP3 which has been installed at NEDC, as shown in Figure 1. Observed tsunami recorded at ten (10) sea level stations, which include Seblat (Indonesia), Telukdalam (Indonesia), Meulabor (Indonesia), Nancory (India), Cocos Island (Australia), Trinconmalee (Sri Lanka), Koh Taphao Noi (Thailand), Male (Maldives), Hanimadoo (Maldives), and Visakapatnam (India), were also provided in Microsoft Excel to practice participants on confirming tsunami generation and reading/updating tsunami parameters during the event.

Series of RIMES bulletin for this event were placed on RIMES website, for participants to access and extract tsunami forecast information, as shown in Figure 2.

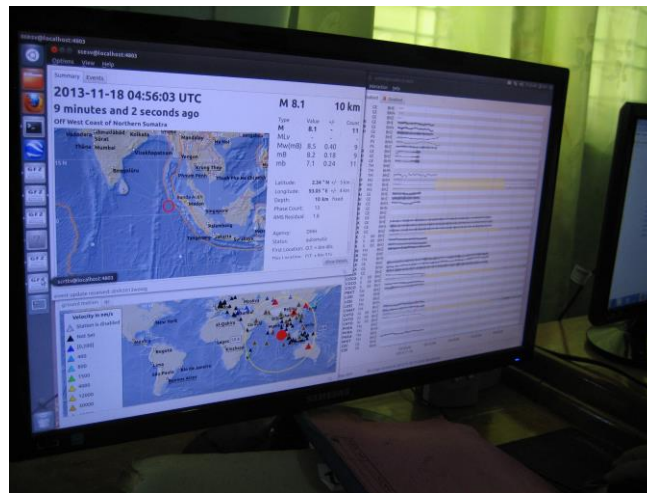


Figure 1. Playback of earthquake event off West Cost of Northern Sumatra by SeisComP3 server

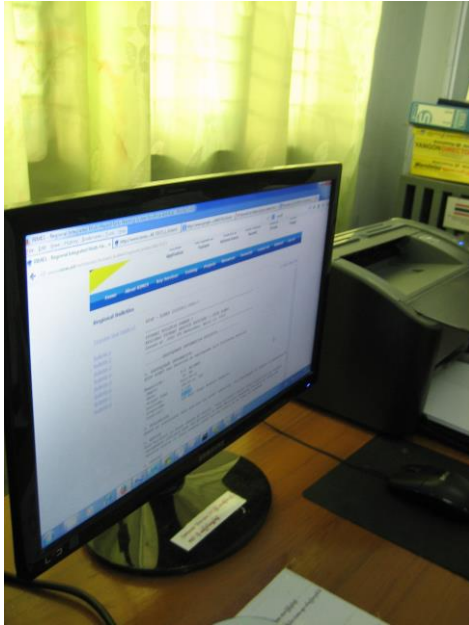


Figure 2. Access to RIMES bulletin for collecting tsunami forecast information

## 5. NEDC Bulletins

During the exercise, NEDC generated series of bulletins according to their current Standard Operating Procedure (SOP), as shown in Table 2.

Table2. Existing SOP

Bulletin No.	Type	Information Source	Action by recipients
1	Earthquake News	Earthquake detection from SeisComp3	-
2	Tsunami Alert	SeisComp3 detecting potential tsunamigenic earthquake $M \geq 7.5$	Local authority and disaster management committee prepare for evacuation
3	Tsunami Warning	Receipt of tsunami forecast from RIMES and RTSPs	Start evacuation and announce on TV
4	Tsunami Warning Cancellation	Receipt of tsunami cancelation from RIMES and RTSPs	Tsunami warning cancelation at local levels



Figure 3. Evaluation of tsunami event and bulletin generation

For internal communication and decision making in DMH, watch standers need to report the event to the people listed in Table 3.

Table 3. List of DMH personnel for tsunami warning decision making

No.	Name	Position	Phone No. (office)	Phone No. (home)	Mobile
1	Dr.HrinNei Thiam	Director General	411031	403404	095014924
2	U Kyaw Moe Oo	Deputy Director General	411422	413437	0949206410
3	Daw Khin Cho Cho Shein	Director	411032	8104036	0949337088
4		Deputy Director	411269		
5	U Kyaw Kyaw Lin	Assistant Director	411269		0943110632
6	Dr. Yin Myo Min Htwe	Assistant Director	411269		09401593377

## **6. Outputs**

The following bulletins were generated from the exercise (translated to English):

### **6.1 Earthquake News**

**The Government of the Republic of the Union of Myanmar  
Ministry of Transport  
Department of Meteorology and Hydrology  
Nay Pyi Taw**

**Date: 11 April, 2012**

#### **EARTHQUAKE NEWS**

(Issued at 11:45 hours M.S.T Today)

A very strong earthquake of magnitude (8.2) Richter Scale with its epicenter outside Myanmar (Northern Sumatra, INDONESIA) about (1050) miles south southwest of Kaba-Aye seismological observatory was recorded at (11)hrs (26)min (02)sec M.S.T on 11<sup>th</sup> April, 2012.

Dr.Hrin Nei Thiam  
Director General

## 6.2 Tsunami Alert

**The Government of the Republic of the Union of Myanmar  
Ministry of Transport  
Department of Meteorology and Hydrology  
Nay Pyi Taw**

**Date: 11 April, 2012**

### **Tsunami Alert**

(Issued at 12:00 hrs M.S.T on 11-4-2012)

A very strong earthquake of magnitude (8.4) Richter Scale with its epicenter outside Myanmar (Northern Sumatra, INDONESIA) about (1050) miles south- southwest of Kaba-Aye seismological observatory was recorded at (11) hrs (26) min (02) sec M.S.T on 11<sup>th</sup> April, 2012.

Local Authority and Disaster Management Committee should prepare to move to safety place. According to numerical simulation, this earthquake can generate possibility of tsunami and it will reach to the Myanmar Coast within next (2) hours from now. Department of Meteorology and Hydrology will issue latest tsunami information up-to-time.

Dr.Hrin Nei Thiam  
Director General

### 6.3 Tsunami Warning

**The Government of the Republic of the Union of Myanmar  
Ministry of Transport  
Department of Meteorology and Hydrology  
Nay Pyi Taw**

**Date: 11 April, 2012**

**Tsunami Warning**

(Issued at 12:30 hrs M.S.T on 11-4-2012)

A very strong earthquake of magnitude (8.4) Richter Scale with its epicenter outside Myanmar (Northern Sumatra, INDONESIA) about (1050) miles south- southwest of Kaba-Aye seismological observatory was recorded at (11) hrs (26) min (02) sec M.S.T on 11<sup>th</sup> April, 2012.

Run to higher ground, far away at least one mile from the water edge, because tsunami waves with height of about (5 – 10) feet will raise Myanmar coast at (13:30) hours M.S.T today, due to the very strong earthquake.

Dr.Hrin Nei Thiam  
Director General

## **6.4 Tsunami Warning Cancellation**

**The Government of the Republic of the Union of Myanmar  
Ministry of Transport  
Department of Meteorology and Hydrology  
Nay Pyi Taw**

**Date: 11 April, 2012**

### **Tsunami Warning Cancellation**

(Issued at 17:30 hours M.S.T on 11.4.2012)

A very strong earthquake of magnitude (8.4) Richter Scale with its epicenter outside Myanmar (Northern Sumatra, INDONESIA) about (1050) miles south- southwest of Kaba-Aye seismological observatory was recorded at (11) hrs (26) min (02) sec M.S.T on 11<sup>th</sup> April, 2012.

Tsunami has passed along the Myanmar Coast due to the very strong earthquake. With the safe return of residents, Department of Meteorology and Hydrology announces that there is no more threat of tsunami.

Dr.Hrin Nei Thiam  
Director General



## **6. Evaluation and Recommendations**

### **6.1 Earthquake Monitoring**

After installation of SeiscomP3, NEDC is able to detect earthquake events and generate earthquake bulletin faster than before. In particular, for all earthquakes of  $M \geq 5.0$ , earthquake parameters detected by NEDC's SeisComP3 were accurate, when compared to the detection by other centers, e.g. GFZ and USGS. However, for small earthquake events in the country ( $3.0 \leq M \leq 5.0$ ), NEDC still needs to use the local analog stations, but could not provide accurate location of the epicenter. If SeisComP3 detects the event, the solution from SeisComp3 is used to complement the earthquake location detected by the analog systems at NEDC. The California Integrated Seismic Network (CISN) software installed at NEDC did not also detect the small earthquake in the country; however, it is still useful to quickly alert for larger earthquake magnitudes.

Before SeisComP3 training in November 2013, watch standers at NEDC did not regularly process earthquake events to generate verified solution. The exercise strongly recommended the routine verification of all earthquake events detected by SeisComP3. Since Internet connection at NEDC is not stable and might corrupt the Seedlink file in SeisComP3, NEDC staffs are recommended to delete the subfolder in Seedlink folder containing the sequence files (\*.seq) then restart SeisComP3.

### **6.2 Sea Level Monitoring**

Sea level monitoring is currently not included in NEDC's SOP; actual sea level information is not included in the bulletin. The tsunami cancellation bulletin for Myanmar coast is generated, once NEDC receives cancellation bulletin from RIMES and RTSPs, which is based on regional tsunami impact and may take a long time to issue after earthquake detection. With the installation of Tide Tool software at NEDC, watch standers could already access near real-time sea level data and decide by themselves to integrate the actual tsunami detection into the tsunami warning bulletin, and decide the timing to issue the cancellation bulletin, specific for Myanmar. Cancellation can be issued faster by NEDC, if the tsunami directivity will not threaten Myanmar coast.

Manual for GTS client server and Tide Tool software maintenance were handed over to NEDC staffs, and one hardcopy set of manuals was handed over to DMH IT Section Head for the regular maintenance of the sea level monitoring servers. Sea level reading and Tide Tool software operation are also recommended to be integrated into the routine SOP exercise.