System Dissemination to the Stakeholder Case Study Indonesia Tsunami Early Warning System (InaTEWS)

MUSCAT OMAN, OCTOBER 2013

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METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY INDONESIA
Outline

1. Background
2. Instruments for Earthquake and Tsunami Observation
3. Sequence and Contents of Tsunami Warnings
4. Dissemination of Earthquake Information and Tsunami Early Warnings by the BMKG to the stakeholder
Main Goal

Give the additional of idea when establishing Oman Tsunami Early Warning System, particularly on developing dissemination system SOP and find the best mechanism to send out the information to stakeholder.
As the tsunami hazard preparedness efforts, the government of Indonesia in cooperation with various parties established the Indonesian Tsunami Early Warning System (InaTEWS)

InaTEWS launched by President of the RI at 11 am on 11 November 2008

InaTEWS should issue Tsunami Warning within 5 minutes after earthquake occurrence.
Launching of InaTEWS in November 11, 2008

DG of BMKG

UN. Rep.

President of R. I.
InaTEWS Operational Center
2. Instruments for earthquake and Tsunami observation
Instruments for earthquake observation

SEISMIC STATION
Instruments for tsunami observation
Buoy network
Tide Gauge Network
GPS Network

GPS sensor on tide gauge

GPS sensor station on land
CCTV Network
Processing and analysis
SeisComP3 software
Decision Support System (DSS)
TSUNAMI WARNING SEGMENTATION
(not disseminated)
Inatews Design
(up stream perspective)
3. Sequence and Contents of Tsunami Warnings
### Warning Sequence

#### Earthquake

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T0</strong></td>
<td>Earthquake</td>
<td></td>
</tr>
</tbody>
</table>
| **T1** | First Warning                 | **Warning 1**
EQ parameter & tsunami potential and if available estimation of the threat:
- Major Warning
- Warning
- Advisory
- No threat |
|       | Estimation of the threat      |                                                                             |
| **T3** | Update Estimation of the threat | **Warning 2**
Update EQ parameter, warning levels and estimated times of arrival (ETA) |

**Seismic Tsunami Scenarios**
### Warning Sequence (2)

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Action</th>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4 10-60</td>
<td>First Observation</td>
<td>Warning 3.1 - Updated EQ parameter, tsunami observation and updated warning levels</td>
</tr>
<tr>
<td>T5</td>
<td>Second Observation</td>
<td>Warning 3.2</td>
</tr>
<tr>
<td>T6</td>
<td>Third Observation</td>
<td>Warning 3.3</td>
</tr>
<tr>
<td>T7 0</td>
<td>End of threat</td>
<td>Warning 4</td>
</tr>
</tbody>
</table>

*Source: Tide gauge, Buoy, GPS*
## Advice to local governments

<table>
<thead>
<tr>
<th>No.</th>
<th>Warning Level</th>
<th>Advice to Local Government by BMKG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AWAS (Major Warning)</td>
<td>Provincial/District/City Governments that are at “Major Warning” level are expected to pay attention to this warning and immediately guide their communities for full evacuation.</td>
</tr>
<tr>
<td>2</td>
<td>SIAGA (Warning)</td>
<td>Provincial/District/City Governments that are at “Warning” level are expected to pay attention to this warning and immediately guide their communities for evacuation.</td>
</tr>
<tr>
<td>3</td>
<td>WASPADA (Advisory)</td>
<td>Provincial/District/City Governments that are at “Advisory” level are expected to pay attention to this warning and immediately guide their communities to move away from beaches and river banks.</td>
</tr>
</tbody>
</table>
Format of InaTEWS tsunami early warning messages

- Short text format
- Long text format via email, fax and GTS:
  - Header
  - Information content
    - First, the earthquake parameters
    - Second, tsunami observation data if already available
    - Third, the warning level, estimated tsunami arrival time, and affected locations.
  - Advice, contains recommendations to local governments regarding the appropriate response.
Format of InaTEWS tsunami early warning messages (2)

Graphical format for website and WRS at interface institutions and the media. Contains information regarding EQ parameter tsunami threat, affected areas, warning levels and estimated time of arrival. A map indicating the EQ location and shakemap.
Example of Short-text format via SMS

• EQ Mag: 5.0RS, 02-Oct-13
  22:21:42 UTC, Loc:
  6.96S, 129.90E (Banda Sea), Dep:
  133 Km :: BMKG

• Warning Tsunami in
  BENGKULU, LAMPUNG, NAD, SUMBAR, SUMUT, EQ Mag: 8.8, 11-Apr-12
  10:43:06 UTC,
  Loc: 0.78N, 92.15E, Dep: 10Km :: BMKG
Example of Short-text format via SMS (2)

• Updating Warning Tsunami in NAD, SUMUT, SUMBAR, BENGKULU, LAMPUNG, EQ Mag:8.1, 11-Apr-12 10:43:11 UTC, Loc:0.82N, 92.42E, Dep:24Km::BMKG

• Updating Tsunami by EQ Mag:8.1, 11-APR-2012 08:38:35 UTC, has detected in SABANG (10:00UTC) 0.06m, MEULABOH (10:04UTC) 0.8m::BMKG
Example of Short-text format via SMS (3)

- Tsunami Warning threat is over: by Earthquake: mag 8.1, 11-Apr-12 10:43:11 UTC ::::BMKG

<table>
<thead>
<tr>
<th>Province</th>
<th>Location</th>
<th>Warning Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>BENANGKUL</td>
<td>Bengkulu-Selatan</td>
<td>MAJOR WARNING</td>
</tr>
<tr>
<td>BENANGKUL</td>
<td>Bengkulu-Utara Bagian Utara</td>
<td>MAJOR WARNING</td>
</tr>
<tr>
<td>BENANGKUL</td>
<td>Bengkulu-Utara Pulau Enggano</td>
<td>MAJOR WARNING</td>
</tr>
<tr>
<td>BENANGKUL</td>
<td>Kaur</td>
<td>MAJOR WARNING</td>
</tr>
<tr>
<td>BENANGKUL</td>
<td>Kota Bengkulu Pantai Banjare</td>
<td>MAJOR WARNING</td>
</tr>
</tbody>
</table>
Example of Warning 2 using long-text format via e-mail, fax, GTS

UPDATING OF EARTHQUAKE PARAMETERS:

Magnitude : 8.5 RS  
Date : 11-Apr-2012  
Origin Time: 08:38:33 UTC  
Latitude : 2.40 N  
Longitude : 92.99 E  
Depth : 10 Km  

Location : Off West Coast of Northern Sumatra  
Remarks : 398 km SOUTHWEST of Meulaboh  
433 km SOUTHWEST of Banda Aceh  
464 km SOUTHWEST of Sabang  
465 km SOUTHWEST of Sigli  
515 km SOUTHWEST of Bireun  

Evaluation:

THERE IS THE POSSIBILITY OF A TSUNAMI IN THE FOLLOWING AREAS:

<table>
<thead>
<tr>
<th>Province</th>
<th>Warning Segment</th>
<th>Warning Level</th>
<th>ETA [UTC]</th>
<th>Date [YYYY-MM-DD]</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD</td>
<td>Simeulue Pulau Simeulue</td>
<td>MAJOR WARNING</td>
<td>09:00:13</td>
<td>2012-04-11</td>
</tr>
<tr>
<td>SUMUT</td>
<td>Nias Bagian Barat</td>
<td>MAJOR WARNING</td>
<td>09:16:58</td>
<td>2012-04-11</td>
</tr>
<tr>
<td>SUMUT</td>
<td>Nias-Selatan Pulau Nias</td>
<td>MAJOR WARNING</td>
<td>09:22:03</td>
<td>2012-04-11</td>
</tr>
<tr>
<td>SUMUT</td>
<td>Nias-Selatan Pulau Tanahmasa</td>
<td>WARNING</td>
<td>09:22:48</td>
<td>2012-04-11</td>
</tr>
</tbody>
</table>
Example of Warning 3 using long-text format via e-mail, fax, GTS

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Time[UTC] [HH:NN]</th>
<th>Date [YYYY-MM-DD]</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>SABANG</td>
<td>05.80</td>
<td>95.00</td>
<td>10:00</td>
<td>2012-04-11</td>
<td>0.06 meter</td>
</tr>
<tr>
<td>MEULABOH</td>
<td>04.32</td>
<td>96.22</td>
<td>10:04</td>
<td>2012-04-11</td>
<td>0.8 meter</td>
</tr>
</tbody>
</table>

**Evaluation:**

Based on sea level observations, tsunami has detected in the following areas:

- Off West Coast of Northern Sumatra
- 396 km SOUTHWEST of Meulaboh
- 435 km SOUTHWEST of Banda Aceh
- 465 km SOUTHWEST of Sigli
- 467 km SOUTHWEST of Sabang
- 514 km SOUTHWEST of Bireun
The Tsunami threat caused by the earthquake:
Magnitude: 7.1 RS
Date: 03-April-2011 20:06:39 UTC
is over.

This is the final message issued by the Indonesia Tsunami Early Warning System, unless new information becomes available.

Do not reply to this email, please address any inquiry to: info_inatews@bmg.go.id
Example of Graphical Interface Institutions
Example Graphical Format for Media TV (Warning 1)
Example Graphical Format for Media TV (Warning 4)

PERINGATAN DINI TSUNAMI
Yang Disebabkan Oleh GEMPA:

kekuatan : 7.1 SR
tanggal : 04-Apr-11 03:06:39 WIB

DINYATAKAN:

BERAKHIR

Untuk Seluruh Wilayah INDONESIA

Sumber Informasi: InaTEWS BMKG
**Example Format Google Public Alert**

- **Event:** Earthquake
- **Sent:** 2013-03-12T23:59:00+00:00
- **Expires:** 2013-03-20T16:59:00-07:00
- **Area:** Near North Coast of Irian Jaya
- **Sender:** [http://inatews.bmkg.go.id/new/new_eq.php](http://inatews.bmkg.go.id/new/new_eq.php)
Example Format Graphic for email

InaTEWS EarthQuake Information -- Info Gempa Mag:5.3 SR, 23-Sep-13 22:12:55 WIB, Lok:9.92 LS,115.97 BT (138 km BaratDaya LOMBOKTENGAH-NTB), Kedlmn:10 Km

INFO GEMPABUMI
Tangg: 23-Sep-13 22:12:55 WIB

MAGNITUDO
5,3 SR

Lokasi:
9,92 LS - 115,97 BT
Keterangan:
* 138 km BaratDaya LOMBOKTENGAH-NTB
* 138 km Tenggara KUNGGUNG-BALI
* 149 km BaratDaya MATARAM-NTB
* 145 km BaratDaya MATARAM-NTB
* 1102 km Tenggara JAKARTA, INDONESIA

Kedalam: 10 Km

Sumber Informasi: InaTEWS BMKG

TIDAK BERPO TENSI
TSUNAMI
InaTEWS EarthQuake Shakemap -- Info Gempa Mag:5.1 SR, 29-Sep-13 07:19:59 WIB, Lok:2.32 LS,119.23 BT (17 km BaratDaya MAMUJU-SULBAR), Kedlmn:10 Km ::BMKG

---Preliminary Shakemap Information---

For detail shakemap information please refer to url http://inatews.bmkg.go.id/shakemap/20130929072442/products.html
Example facebook format
Example facebook format (2)
Example Twitter format
Example Twitter format (2)
Info Gempabumi Dirasakan Torkini
Terjadi pada Tanggal 29-Sep-2013, Jam: 07:19:59 WIB

![Gempa 4.6 magnitude](https://example.com/image.jpg)

Info Gempabumi Terkini
Magnitudo: 5.1 SR, 17 km Barat Daya MAMUJU-SULBAR, 29-Sep-2013 07:19:59 WIB
4. Dissemination of Earthquake Information and Tsunami Early Warnings by the BMKG to the Stakeholders

The BMKG sends earthquake information and tsunami warnings to the public via local governments, interface institutions, and the media, using various communication channels.
Important question

• Why use multi channel communication to send out information to stake holder?
• What is the best mechanism to send the information?
BMKG Stakeholders

- Police/Military
- Local Government
- BNPB
- BPBD
- BMKG Regional
- Media tv/radio
- Hotel
- Private company
- etc
Warning distribution system

National Tsunami Warning Centre (NTWC) at BMKG in Jakarta
Modes of Warning and Information Dissemination

- Web
- Fax
- Email
- SMS
- WRS via DVB or Internet

TV / Radio

Siren

Local Government
BPBD/PUSDALOP

BNPB
Police and Military

Legend:
→ Warning from BMKG
→ Guidance from Local Government
-- Temporary link until handed over to Local Government

Community at risk
Communication network for information dissemination

In Timely Manner

Devices (6 in 1)
- SMS Server
- Email Server
- Web Server
- Fax Server
- WRS via Internet or DVB
- GTS Server

Interface Institutions
- POLRI Headquarters
- TNI Headquarters
- TV Station/radio
- Airport/Port/Hotel
- BMKG Regional
- BNPB
- BPBD

Public Warning Devices
- Siren
- TV/Radio
- SMS/telephon
- Internet/Email/Website
- Police siren/GMDSS
- Mosque's speaker, bedug

BMKG

PUBLIC
• Earthquake information and tsunami warnings are sent to users who have registered their mobile numbers in the BMKG database.

• There are about 7000 registered users until September 2013.
SMS DIAGRAM (2)

- Short Number SMS Server (BMKG)
- SMS Server (1st Long Number)
- SMS Server (2nd Long Number)
- SMS Provider (TELKOMSEL & Indosat)
- Registered Users

SMS Push Services
Email

• The BMKG’s warning dissemination system produces a warning message using a long-text format and sends it to registered e-mail addresses.

• Anyone can subscribe to the BMKG e-mail service. Currently about 500 email users is registered to receive information from InaTEWS
• Long-text format messages for earthquakes and tsunami threats are also distributed via facsimile.

• The target group is much smaller than those receiving SMS and e-mails, comprising only those people involved in disaster management and decision-making at national and local levels.
Fax DIAGRAM

Registered Fax
021 6546316
022 6626662
034 6366366

Dissemination Engine

Fax Server
Internet

- The BMKG website: www.bmkg.go.id and inatews.bmkg.go.id
- BMKG provides information on earthquakes and tsunami into public via Social Networks such as Facebook, www.facebook.com/infoBMKG (300,000 face booker) and Twitter www.twitter.com/infoBMKG (750,000 follower).
Warning Receiver System – WRS

• The WRS is software specially designed by the BMKG for tsunami early warnings.

• A WRS service is used to distribute earthquake information and warning messages to registered WRS clients (the media, local government, the BNPB, police, army, emergency operation centres, other national institutions, private companies, etc.).
Computer based application system for receiving warning and capable to retransmit

- Comp Client at recipients
- Communication:
  - VSAT (SCPC, VSAT IP)
  - Internet
  - DVB
WRS Clients Network

(245 WRS clients until September 2013)
WRS Clients Features

VPN / Internet / DVB

Interface Institution

WRS (5in1) Clients

Local SMS Forwarder
Local FAX Forwarder
Local WEB GIS
Local Alarm
Local Info BMKG
Global Telecommunications System
GTS

• This is not a public server.
• The main function of a GTS server is to send information to, and communicate with, other members of the World Meteorological Organization (WMO).
• The BMKG is a member of the WMO.
TV and Radio

- The main national television stations are directly connected to the BMKG Warning Centre and they broadcast earthquake information as running text and “Stop Press”.
- In Indonesia, the government obliges all television and radio stations to broadcast tsunami or other hazard-related early warnings.
TV and Radio (2)

• Upon reception of the broadcasting request, the respective media stations will activate a high tone alarm (1kHz) combined with a text message on TV or an announcement, if transmitted by radio.
WRS TV and Radio DIAGRAM
DATA AND INFORMATION FLOW of InaTEWS

UP STREAM

COMM: IMARSAT

BPPT
NC-Buoys

1 2 BUOY 23

SEISMO 160

NC – SEISMIC

1 2 ACCELERO 500

NC – ACCELEOR

NC: National Centre

CN – InaTEWS (BMKG)

BMKG

DSS

Tsunami DTB / Modeling

B I G

NC – Tide Gauges

NC – GPS

DOWN STREAM

INSTITUTIONS INTERFACE:

- BNPB
- MINISTRY OF HOME AFFAIRS
- NATIONAL POLICE, MILITARY
- PRIVATE COMPANY
- MINISTRY OF COMMUNICATION AND INFORMATION TECHNOLOGY
- LOCAL GOVERNMENT
- REGENCY LOCAL GOVERNMENT

ELECTRONIC MEDIA

TV, RADIO, MEDIA ON LINE

LOC.GOV

PROV. GOV
DISTRICT GOV
CITY GOV

USER CELLPHONE

SOCIAL COMMUNITY NETWORK

INTERNET PROVIDER

GSM PROVIDER

RESIDENT / COASTAL COMMUNITIES

DISSEMINATION FACILITIES

Sirens
Thank You

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