Version-2

Indian Ocean Tsunami Warning System

INDONESIA TSUNAMI EARLY WARNING SYSTEM

(InaTEWS)

RTSP SERVICES USER GUIDE

for

National Tsunami Warning Centre

April 2011

Contents

I. Introduction

During the ICG meeting in Mombassa, Kenya 28 February – 2 March 2007, the National Tsunami Warning Centre (NTWC) of Indonesia proposed to provide alert services to the member states of IOTWS as one of Regional Tsunami Watch Provider (RTSPs) along with India, Australia, Malaysia, Thailand and Iran. We have been working together under the coordination of IOC/ICG-UNESCO in the group of IOTWS starting with the arrangement of requirements, interoperability schedule of work and finally looking at the implementation. While we worked at the implementation, PTWC and JMA voluntarily provided the service to all NTWCs in Indian Ocean Region as an Interim Advisory Service (IAS). In that period of time, RTSPs shadow the operation of IAS and provided service level 1 (earthquake information) until RTSPs are ready to provide full services of level 1 and 2.

The progress of implementation has been reported by RTSPs in every meeting, mainly in ICG meetings. The agreement has been met at ICG meeting that in the year 2011, RTSPs of Australia, India and Indonesia are ready to provide service level 2. However, all RTSPs are requested to provide a guideline of RTSP products for NTWC as a reference to NTWC decision making in case of a tsunami threat.

RTSP of Indonesia is operated by BMKG (the Agency for Meteorology Climatology and Geophysics) the leading institution and in charge of operating InaTEWS (Indonesia Tsunami early Warning System) in cooperation with BAKOSURTANAL and BPPT. The monitoring systems consist of seismic, tide gauge, GPS and Buoy networks, operated by BMKG, BAKOSURTANAL (National Coordinating Agency for Survey and Mapping) and BPPT (Agency for Assessment and Application of Technology), respectively. All data are transmitted in real-time or near real-time to BMKG which is operating of InaTEWS for the purpose of forecasting tsunami hazard analysis and warning dissemination.

This guideline provides information on the operation of InaTEWS as RTSP, the function of each monitoring system and detailed information on the contents of tsunami messages.

II. InaTEWS Components

The main components of InaTEWS are:

2.1 Monitoring and Processing system

2.1.1 Seismic

2.1.2 Global positioning system (GPS)

2.1.3 Tide gauge

2.1.4 Tsunami modelling and simulation

2.1.5 Decision Support System.

2.2 Dissemination System

2.1 Monitoring and Processing system

2.1.1. Seismic Monitoring and Processing system

To observe seismic activities in Indonesia region, the InaTEWS is operating around 158 broadband seismographs (BBS out of 160 BBS planned) and also deploys about 180 accelerographs out of 500 accelerographs planned which are distributed around Indonesian archipelago. The development of BBS and SMA networks involved three donor countries and one international organization, namely: Germany, Japan, China and CTBTO. The accelerometer network is co-located with the broadband seismograph network stations.

Seismic data from seismic stations around Indonesia is transmitted real-time to the national earthquake centre and to ten regional earthquake centres. Data streams are sent via satellite communication such as VSAT. Then, the data is processed to obtain earthquake parameters.

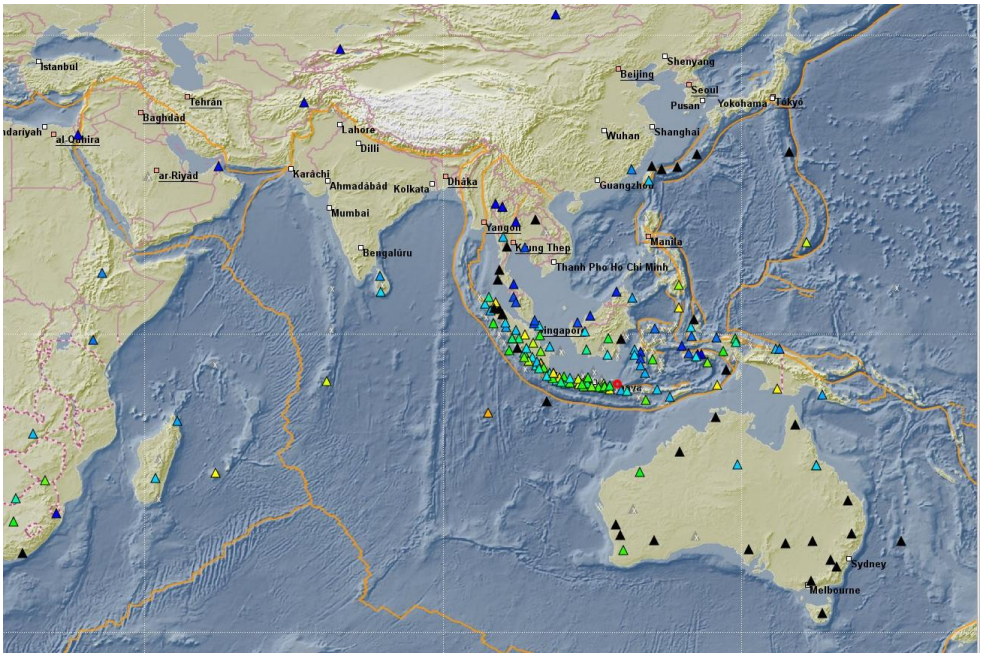

Figure 1: Map of the Indonesian Seismic Network

SeisComP3 has been designed as a high standard automatic earthquake data acquisition system and near-real-time data processing tool for earthquake detection, location and visualization, as well as dissemination of event alerts. Hypocenter parameters and magnitude are available within 5 minutes after origin time and are the first reliable information for tsunami potential. Time available to issue a warning to coastal communities after a large earthquake in the Sunda Trench Region has generated a tsunami is extremely short, about 20 – 40 minutes. During the development additional functionalities were implemented to fulfill the requirements of 24/7 early warning control centers. Today, SeisComP3 provides the following main features:

- Fully automated data processing and event detection
- User interactions for review and correction via real time GUIs
- System monitoring and control via RTGUIs
- Prevention of operating errors by simplistic GUI design and semiautomatic workflow
- Modular design by process communication via messaging (SPREAD >TCP/IP)
- Unified software design and implementation (C++ / Qt)

Furthermore, requirements for early warning purposes have made it necessary to adopt guidelines for the design including, the implementation of critical functions as stand alone module to guarantee independence from other functions (e.g. event picker, magnitude calculation, interactive analysis)

SeisComP3 offers easy implementation of custom modules, independence of hard- and software, the ability to exchange data between different real-time systems and distribution of modules on several systems. SeisComP3 is a rapid, robust and reliable earthquake data processing and analysis system.

The preferred magnitude ID is assigned by priority. The priority from high to low is listed as follows:

- Mw(mB)
- ML
- MLv
- mb

For each magnitude, a minimum of 3 station-magnitudes are required to permit pre-selection. For the Mw(mB) magnitude a minimum, of 4 station-magnitudes is required.

This order is pretty straightforward. Things become more difficult things below magnitude 6. Below magnitude 6, Mw(mB) does not have the highest priority, but mb, given certain preconditions. These are:

- Number of station-magnitudes of Mw(mB) < 30 or Mw(mB) < 6
- Number of station-magnitudes of Mw(mB) <= half the number of station-magnitudes of mb
- The average between Mw(mB) and mb is smaller than 6 : (Mw(mB) / 2 < 6

Are all these constraints fulfilled, then Mw(mB) is assigned the priority 0. The 'preferred magnitude' will be the magnitude with the highest priority, as explained above.

2.1.2. Global Positioning System (GPS) Monitoring and Processing system

National GPS network is also operated by BAKOSURTANAL for mapping purposes. The national commitment of Indonesia supports the operation of GPS for tsunami purposes. Therefore, since 2005, BAKOSURTANAL has upgraded the system to fulfil the requirement for TEWS operation.

The observation of crustal deformation also plays an important role in order to identify earthquakes mechanisms triggering tsunami occurrences. Some GPS stations are online with the warning centre of InaTEWS for monitoring deformation and an indication of tsunami generation.

GPS technologies offer a high potential to support tsunami early warning systems, especially for near-field cases. GPS stations detect ground motions associated with large earthquakes providing direct information on co-seismic deformation caused by the earthquake and its relevance to the tsunami potential of the earthquake. For the first time, InaTEWS integrates GPS-based methods as part of an operational tsunami early warning system. GPS sensor networks are located at land-based stations further away from the coast, sometimes co-located with seismic stations and in coastal areas co-located with tide gauges. Near real-time processing allows monitoring and display of results and delivers first co-seismic deformation vectors only 4-6 minutes after the earthquake.

The GPS processing system provides the following features:

- Real-time data acquisition and processing
- Data quality control
- Data recording
- Real-time data exchange
- Network status monitoring

- Automatic calculation of deformation vectors for each station

This information is used in the decision process for proper selection of pre-calculated tsunami simulations. GPS station data is available at the national warning center, processed and visualized at the Ground Tracking System terminal and available for DSS.

2.1.3 Tide gauge Monitoring and Processing system

BAKOSURTANAL upgraded the system to fulfil the requirement for InaTEWS operation. Currently, within the operation of InaTEWS, the data of 90 tide gauge stations are to the warning centre of InaTEWS. Some of the tide gauge stations are available through public domain provided by IOC-UNESCO website http://www.ioc-sealevelmonitoring.org/map.php. Currently, about 30 tide gauges are transmitting data in realtime to BMKG and BAKOSURTANAL.
Sea level data from tide gauges or so-called DART systems play an indispensable role in the warning process for verification of the tsunami threat and improving the situation assessment. The sea level data processing and display system at the warning centre allows for:

- Real-time data acquisition and processing
- Data quality control
- Data recording
- Data display
- Network status monitoring
- Automatic calculation of arrival times and wave hights

The processing system automatically provides de-tiding of the incoming data stream for each station (if the characteristics of the station like location and surroundings are known) and detection of significant sea level changes which might be due to a tsunami. Processed data are submitted to the Decision Support System to serve as one criteria for simulation selection from the Tsunami data base.

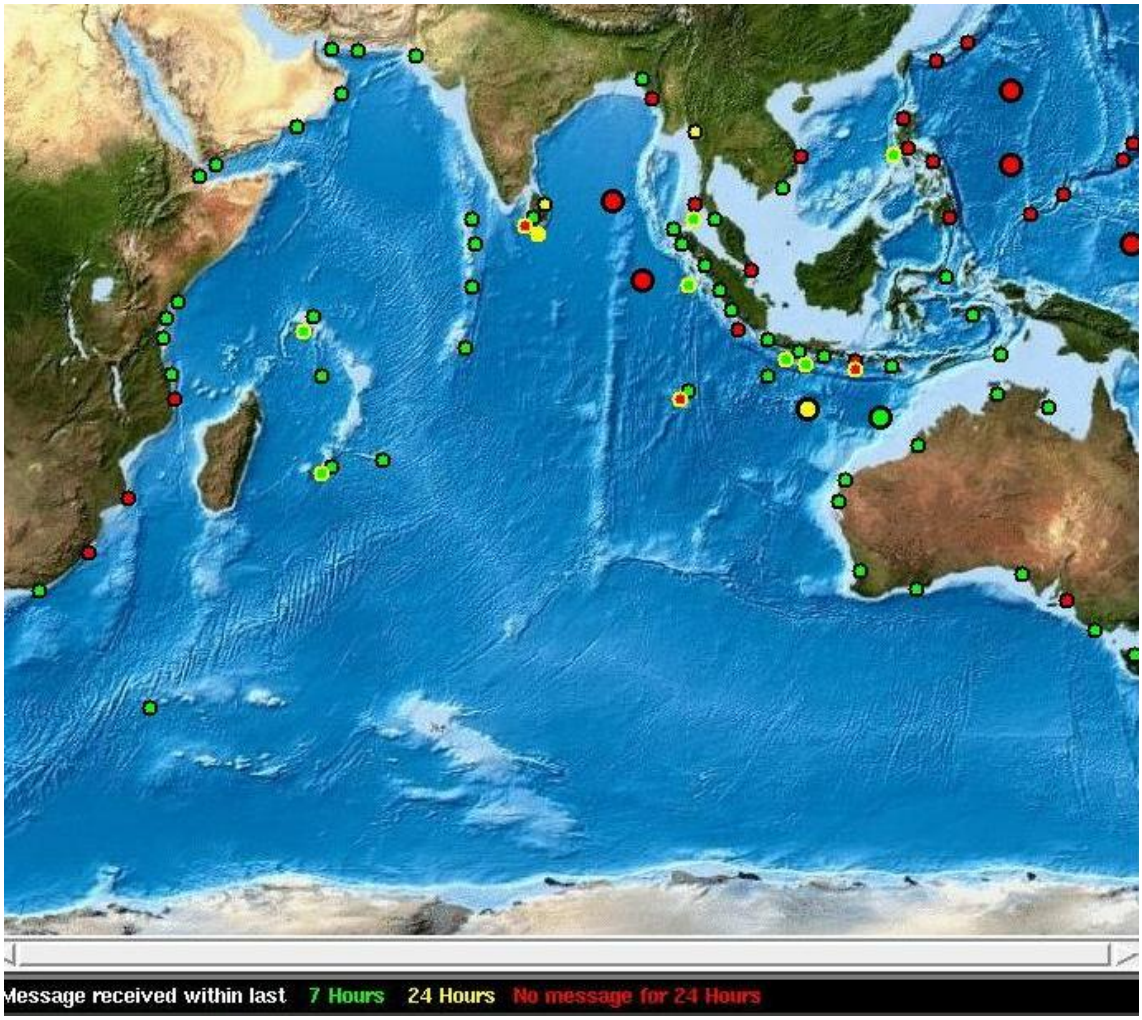

Figure 2: Map of the Regional Tide Gauge Network

2.1.4. Tsunami Modeling and Simulation System

The tsunami simulation system is the component of the warning system to create early situation scenarios, as no continuous global observation exists to monitor the ocean surface. Basis of the tsunami simulation system is the modelling software TsunAWI which includes advanced tsunami source and realistic near-field tsunami modelling as well as GPS-based real-time source inversion modelling. A 3-D model of the interface between the subducted oceanic and continental plates utilizes geophysical and geological data and is subdivided into 2250 rectangular patches with dimensions of about 40 x 15km. Green's function approach in layered media is employed to pre-calculate 3D surface deformation according to unit slope at each patch. These unit sources are then combined to predict tsunamigenic see floor uplift for arbitrary

complicated rupture. TsunAWI then uses an unstructured and adaptive mesh based on bathymetry for finite element tsunami simulation. This software incorporates wave propagation and detailed inundation modelling in a seamless and accurate way. The unstructured mesh is refined to very high resolution of approximately 100m in coastal areas of interest, while it stays relatively coarse in the deep ocean.

A new method for evaluating a limited number of sensor data in a very short time has been developed allowing for a precise situation perspective for near field tsunamis. A large number of pre-computed scenarios (based on earthquake locations and magnitudes) are stored in a database and form the range of assumed tsunami events. In addition for each scenario the respective response functions (deformation vectors) of all ingested GPS stations and the mareograms of all sea level stations are pre-computed and stored for further simulation matching.

Once an event has been detected, incoming sensor measurements are then compared with the pre-calculated scenario and sensor response data. Distinct values such as epicenter location, magnitude, estimated wave height, estimated wave arrival time, and the deformation of the earth's crust at given GPS stations are matched in such a manor to minimize uncertainties. Scenarios with the best overall match give a situation description.

Apart from the warning process the simulation results contribute to the development of inundation (hazard) and risk maps for planning and hazard mitigation to identify vulnerable communities and infrastructures.

2.1. 5. Decision Support System

In Indonesia, large tsunami can be generated at any time along a coastline measuring several thousand kilometers and reaching the coast in about 20 – 40 minutes inflicting loss of lives and destruction. Therefore, issuing rapid warning is crucial for the coastal population. As real-time data from the sensor networks provides an assessment of a threatening situation, the overall display of incoming data is a mandatory requirement for the decision making process.

At the national warning center, it has to be determined within minutes, which region is under threat and to what degree the tsunami will have an impact, resulting in an immediate warning to the population and the local governments. The Decision Support System (DSS) visualizes aggregated incoming data from the sensor processing for evaluation and performs a situation analysis making use of pre-calculated tsunami scenarios that have been selected in the simulation system based on the sensor data. Thus the DSS permits a rapid decision making process and to recommend practical actions. If a decision has been made, the DSS produces individual warning messages and alerts to the regions under an imminent tsunami threat simultaneously issuing emails, facsimile transmissions, SMS and other text messages via all available communication channels and public broadcasting networks to enable potentially affected people to be efficiently informed so that evacuation measures can be initiated.

User interface and process workflows have been designed for decision making under uncertainty and time pressure. Therefore, extensive compilations of geodata, the systems' databases hold pre-processed risk information and scenarios readily available. Interfaces to sensor and dissemination systems are based on standards, which ensure an interoperable and open system. This is important for the generation and dissemination of Indian Ocean Regional Watch Bulletins shared with Indian Ocean rim countries through their national tsunami warning centers.

Geodata sets are essential components of the early warning process as tsunami modeling and scenarios for generating risk maps and evaluation plans are based on them. Data on bathymetry, topography (of the coastal areas) is crucial for tsunami and risk modeling. Administrative, socio-economic, statistical, infrastructure and land-use data are required for risk mapping and form an integral part of DSS inventory.

2.2 Dissemination System

InaTEWS Multi mode of communication system is used for disseminating the tsunami warning included: SMS, email, fax, web, WRS, DVB, and GTS.

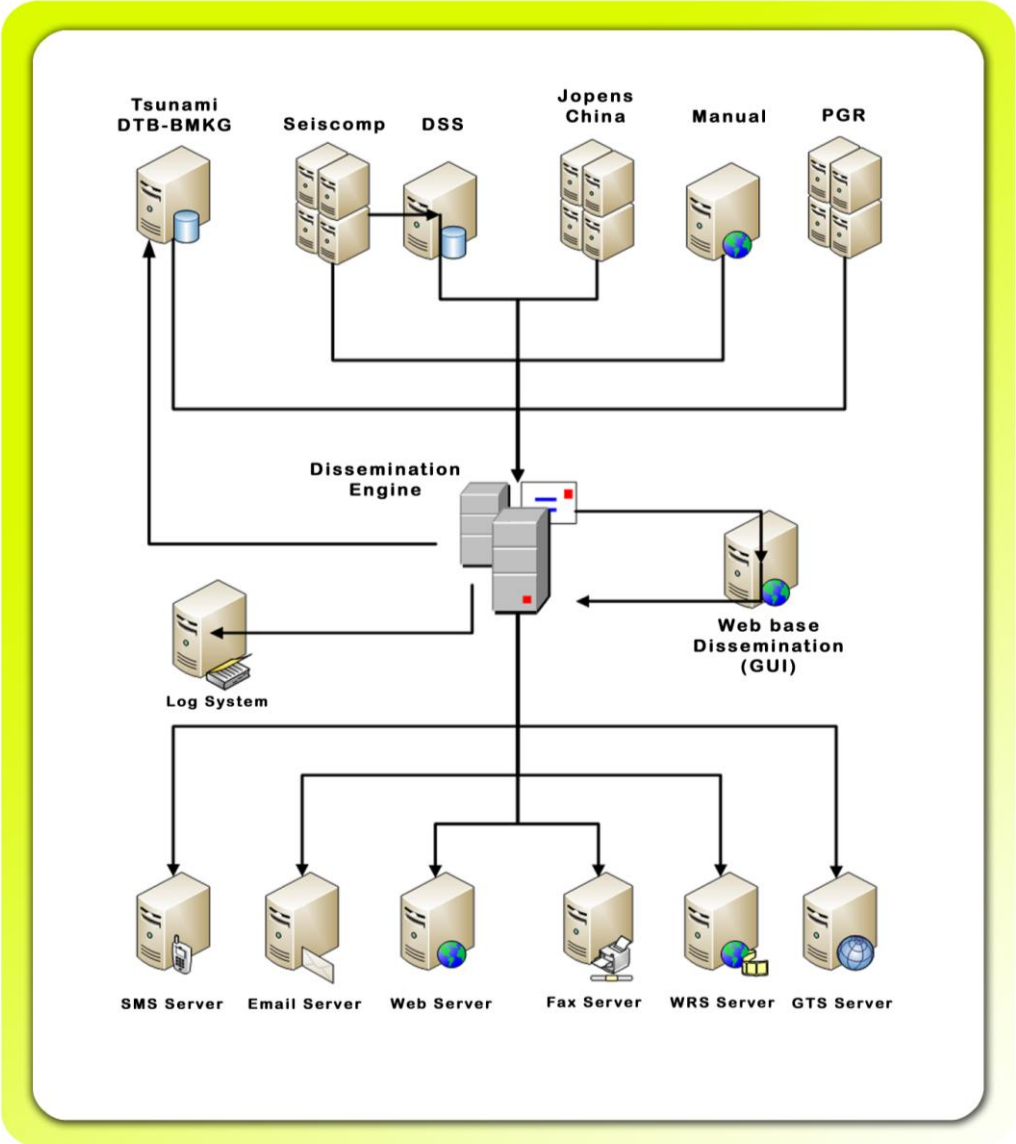

Figure 3: Diagram of multi mode InaTEWS dissemination system

III. RTSP-Indonesia Service

3.1 Tsunami Threat Threshold

A Tsunami threat is defined to exist if a section of coast is forecast to receive a positive amplitude tsunami wave of 50 cm or more at the offshore water depth of 1 meter.

3.2 Marine Threat Zone and Coastal Forecast Points

The tsunami information provided by RTSPs is structured around a set of geographic zones which have been defined to cover all of the coasts of the Indian Ocean called Marine Threat Zones. The Marine Threat Zones are each generally represented by buffer area that are 50 km wide starting from points that have 30 meter depth near coast to seaward. This buffer zone were divided into segments along the coast and the length of segments were based on administrative boundaries. Indonesia has been applied this warning zone for national tsunami warning purposes that is called Warning Segments. Although the definition of Warning Segments and Marine Thread Zone is a little bit different but the both are geographical representation of threat areas to which warning will be addressed.

A number of Coastal Forecast Points (CFPs) have been defined between coastal line and Marine Threat Zones. Those are grid points that have value of 1 – 5 meters depth. Deep ocean model and shallow water model were accommodated by using various grid size and unstructured mesh in TsunAWI model. This method allowing stable calculation even in shallow water so that grid points that have depth value such as 10 m – 1 m could be considered as Coastal Forecast Points. The effect is Coastal Forecast Points closer to coastal line and outside The Marine Thread Zone.

The RTSP Bulletins provide tsunami information, such as Estimated Time Arrival (ETA) and Estimated Tsunami High (ETH) for each zone which is forecast to be under threat.

The Marine Threat Zones used by the IOTWS RTSPs are shown in detail at Figure 4:

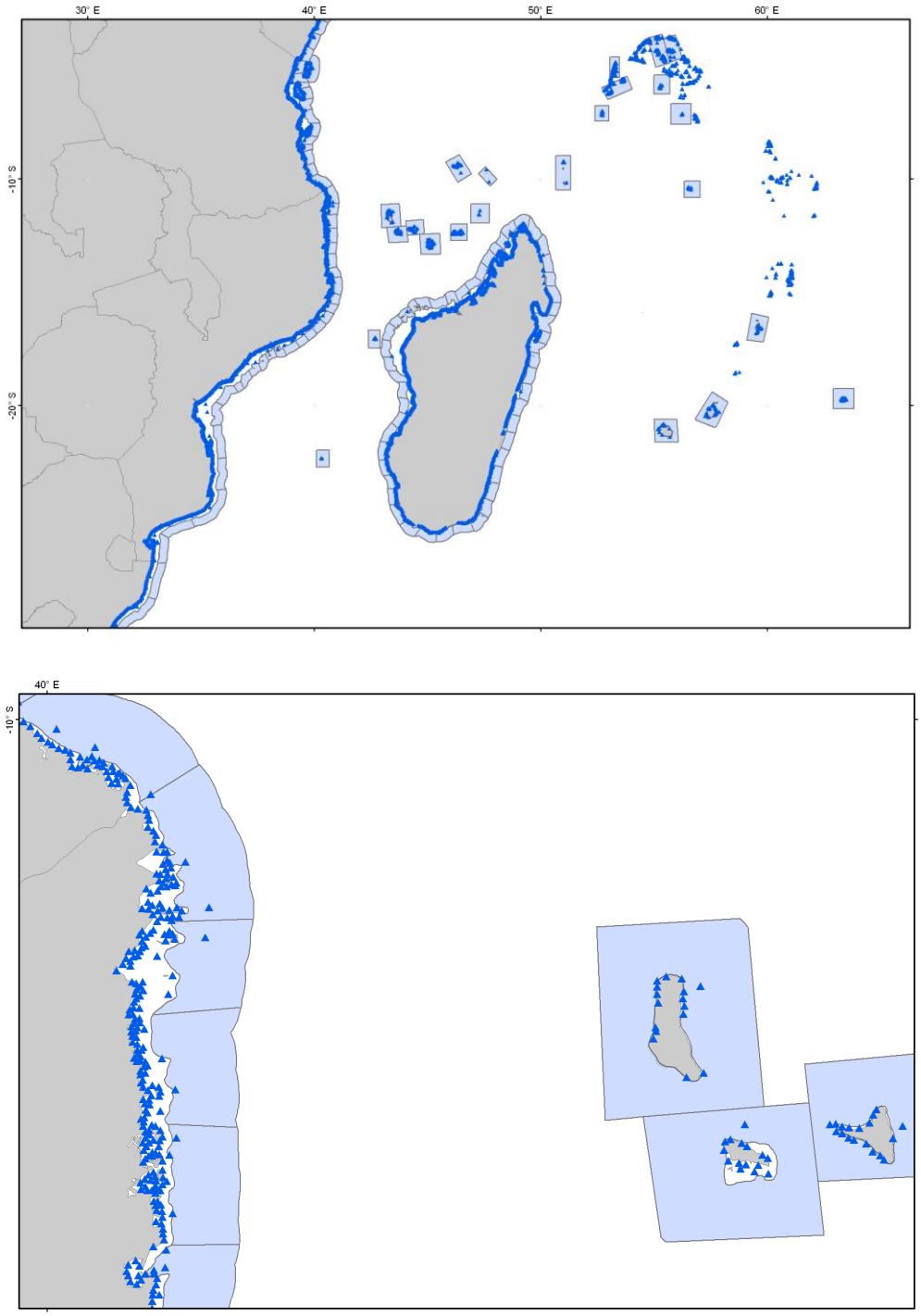

Fig. 4: Marine Threat Zone and Coastal Forecast Points (deep blue) zoomed in Coastal Forecast Points (CFPs) are outside area of Marine Threat Zones (MTZs). Because TsunAWI allowing stable calculation on shallow water. Near small islands the CFPs are inside MTZs because bathymetri surrounding the island are commonly deep (>30 meters).

3.3 RTSP Dissemination Diagram

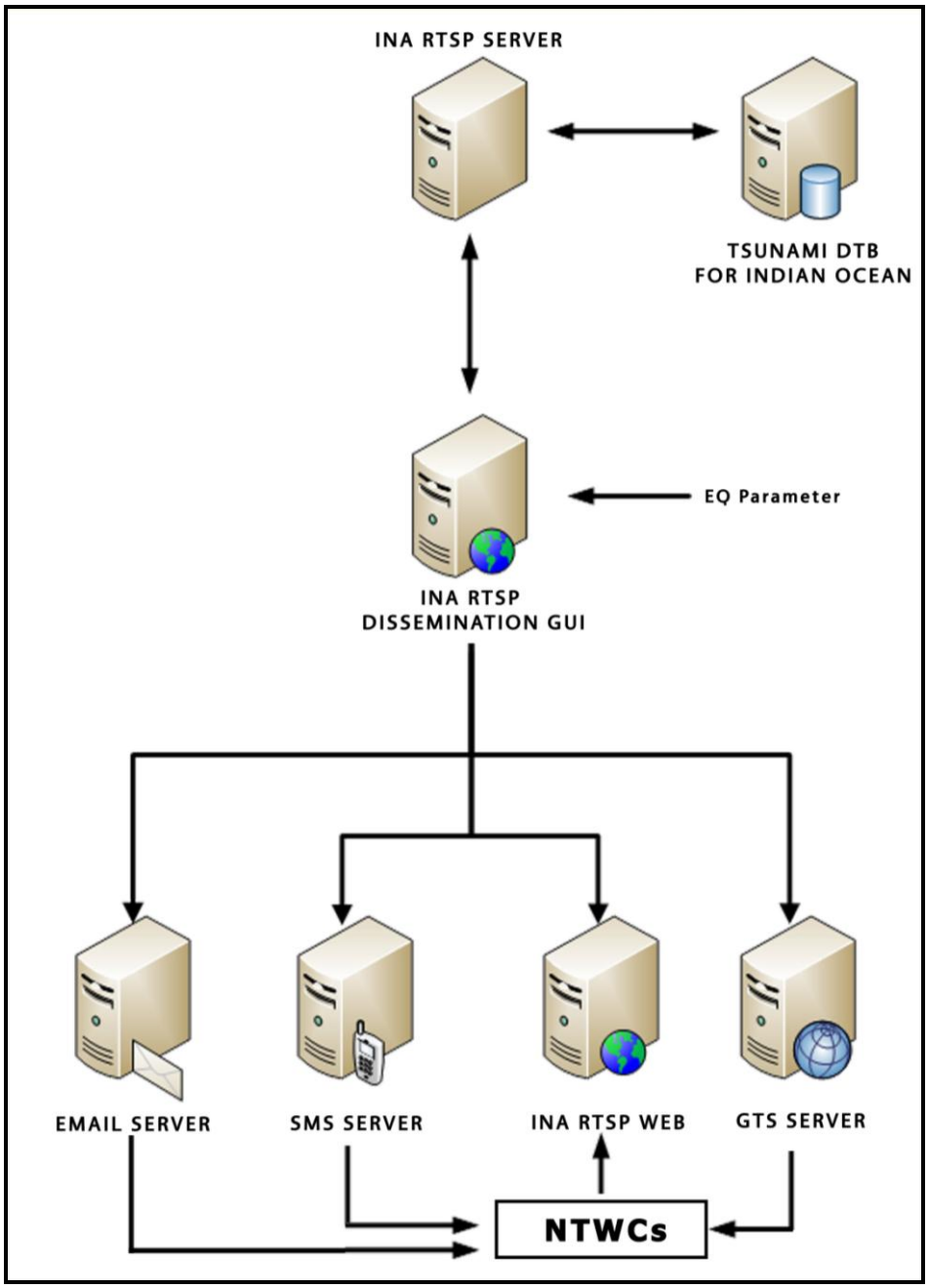

Figure 4.1 InaRTSP Dissemination Diagram

3.4 RTSP Bulletin for NTWCs

RTSP-Indonesia will issue bulletin when an earthquake of magnitude 6.5 or greater (Mwp) is detected under the sea in ASEAN countries, Nicobar Islands and Papua New Guinea (PNG) , or Pacific Ocean.

The ICG-IOTEWS has agreed that all RTSPs will provide the following four types of Bulletin for National Tsunami warning Centres:

- Bulletins providing details of undersea earthquakes of magnitude 6.5 or greater (Mwp) (referred to as Bulletin type 1)
- Bulletins providing an initial forecast of tsunami threat, including details such as ETA and ETH for each coastal forecast zones under the threat (referred to as Bulletin type 2).
- Bulletins providing update forecasts of tsunami threat, plus information on observed sea-level anomalies (referred to as Bulletin type 3)
- Bulletins providing information on the finalization of the tsunami threat (referred to as Bulletin type 4)

The specific information contained in each type of bulletin comprises of:

Bulletin type 1 – Earthquake Bulletin: providing details on earthquakes of magnitude 6.5 or greater (Mwp), which have the potential to generate tsunamis. These bulletins contain the earthquake parameters:

- Origin time,
- Epicentre (location),
- Depth, and
- Magnitude.

The bulletin may also provide initial advice as to weather or not the earthquake has the potential to generate a tsunami, based only on earthquake magnitude, epicentre, and depth, pending more detailed tsunami forecasts based on scenario modelling.

Earthquake bulletin will be the first notification of a possible tsunami event for NTWCs which should then monitor RTSP secure websites for further threat information.

Bulletin type 2 – Tsunami Forecast: providing an initial forecast of tsunami threat, including details such as ETA and ETH for each coastal zone under threat. This type of bulletin contains either:

- Advice that there is no threat to any coastal zone in the Indian Ocean; or
- Details of the forecast tsunami threat to coastal zones, based on tsunami modelling.

When there is a forecast for a tsunami threat these bulletins contain tsunami model forecasts for each coastal zone of:

- Maximum wave amplitude at the coast at water depth 1 m,
- Time of arrival of first tsunami wave (t_1),

These bulletins will be issued whenever an earthquake of magnitude 6.5 or greater (Mwp) is detected under the sea in the ASEAN countries, Nicobar Islands and PNG, or magnitude 8.0 or greater (Mwp) under the sea in the Pacific Ocean. They may also be re-issued if the earthquake source information is updated, or if subsequent new earthquake occurs.

Updated Tsunami Forecast Bulletins will be issued every 15 minutes, if confirmation sea-level observations become available, then tsunami forecast and observation bulletins (type 3) will be issued immediately instead.

Bulletins type 3 – Tsunami Forecast and Observations: providing the same information as the Tsunami Forecast Bulletins, with the following additional information on observed sea-level anomalies:

- Location,
- Amplitude, and
- Time

Updates will also be issued immediately if sea-level observations indicate that new coastal zones are under tsunami threat.

Bulletins type 4 –Tsunami Service Finalization: providing information on the finalization of advice on the tsunami threat.

3.5. RTSP Public Bulletins

The above products for NTWCs are not intended for public dissemination. Public products from RTSPs will be limited to earthquake parameters and summaries of warnings issued by NTWCs around the Indian Ocean during tsunami event.

These summaries will be collated from information provided by NTWCs, and will be made available on an Indian Ocean warning summary webpage.

Public information on tsunami events in the Indian Ocean will be restricted to earthquake details, sea-level observation and a summary of national warning status (as advised by NTWCs to RTSP_indonesia). This information will be available at: http://rtsp.bmkg.go.id , click on InaRTSP Public Bulletin icon

3.6 Service Delivery

The RTSP products are delivered through a number of communications media, as follows:

- Notification messages are sent to NTWCs when RTSP bulletins are issued, via WMO Global Telecommunication System (GTS), e-mail, SMS and fax. The notification messages do not contain bulletin content, since the information is not intended for public dissemination,
- Notification messages distributed through the GTS require identifiers in a specific format. For tsunami messages in the Indian Ocean the defined identifier is WEIO22.
- RTSP bulletins with detailed threat information will be distributed to NTWCs and will be available on password-protected websites maintained by each RTSP.
- Maps and other graphical representation of RTSP information may be made available to NTWCs on password-protected websites maintained by each RTSP. Examples of RTSP-Indonesia's web pages for NTWC use are shown in Appendix 3.
- Anymore detailed country-specific information or products must be arranged through bilateral agreement between the country requiring the service and an individual RTSP.

APPENDIX 1: DEFINITIONS

CFP - Coastal Forecast Points, used by RTSPs to define coastal zones under threat

ETA - Estimated Time Arrival

ETH - Estimated Tsunami High

GFZ - GeoForschungs Zentrum, Center for Geosaince of Germany

InaTEWS - Indonesia Tsunami Early Warning system

IOC - UNESCO Intergovernmental Oceanographic Commission

IOTWS – UNESCO IOC Indian Ocean Tsunami Warning System

MTZ - Marine Threat Zones, used by RTSPs to identify sections of coast under threat

NTWC - National Tsunami Warning Centre

RTSP - Regional Tsunami Service Provider

SeiscomP - Seismic Communication Processing developed by GFZ Potsdam

TsunAWI - Tsunami model developed by Alfred Wegner Institute, Germany

APPENDIX 2: BULLETIN NOTIFICATION EXAMPLES

RTSP-InaTEWS-20110316-0605-001

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TSUNAMI BULLETIN NOTIFICATION NUMBER 1

issued by the

REGIONAL TSUNAMI SERVICE PROVIDER - RTSP INDONESIA (BMKG)

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issued at 0605 UTC Wednesday 16 March 2011

TO : INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWCs)
FROM: RTSP INDONESIA

NOTIFICATION:
RTSP INDONESIA HAS JUST ISSUED TSUNAMI BULLETIN NUMBER 1 FOR THE INDIAN OCEAN, BASED ON THE FOLLOWING EARTHQUAKE EVENT:

EARTHQUAKE INFORMATION (preliminary)

Magnitude:	9.0 Mwp
Date:	16 Mar 2011
Origin Time:	0600 UTC
Latitude:	7.20N
Longitude:	92.90E

TO VIEW THE BULLETIN GO TO THE RTSP INDONESIA WEBSITE AT:
http://rtsp.bmkg.go.id

NOTE: THIS IS A RESTRICTED-ACCESS WEBSITE CONTAINING TECHNICAL DATA FOR NATIONAL TSUNAMI WARNING CENTRES ONLY. IT IS NOT FOR GENERAL PUBLIC ACCESS. GENERAL PUBLIC INFORMATION FOR THIS EVENT IS AVAILABLE FROM:
Indonesia Tsunami Early Warning System (InaTEWS)
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)

Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 65867045
Fax: +62 (21) 6546316
P.O. Box 3540 Jakarta
Email:inartsp@bmkg.go.id
Email:monitrtwp@bmkg.go.id
Website : http://inatews.bmkg.go.id or http://www.bmkg.go.id

END OF NOTIFICATION MESSAGE

APPENDIX 3: WEB PAGE EXAMPLES

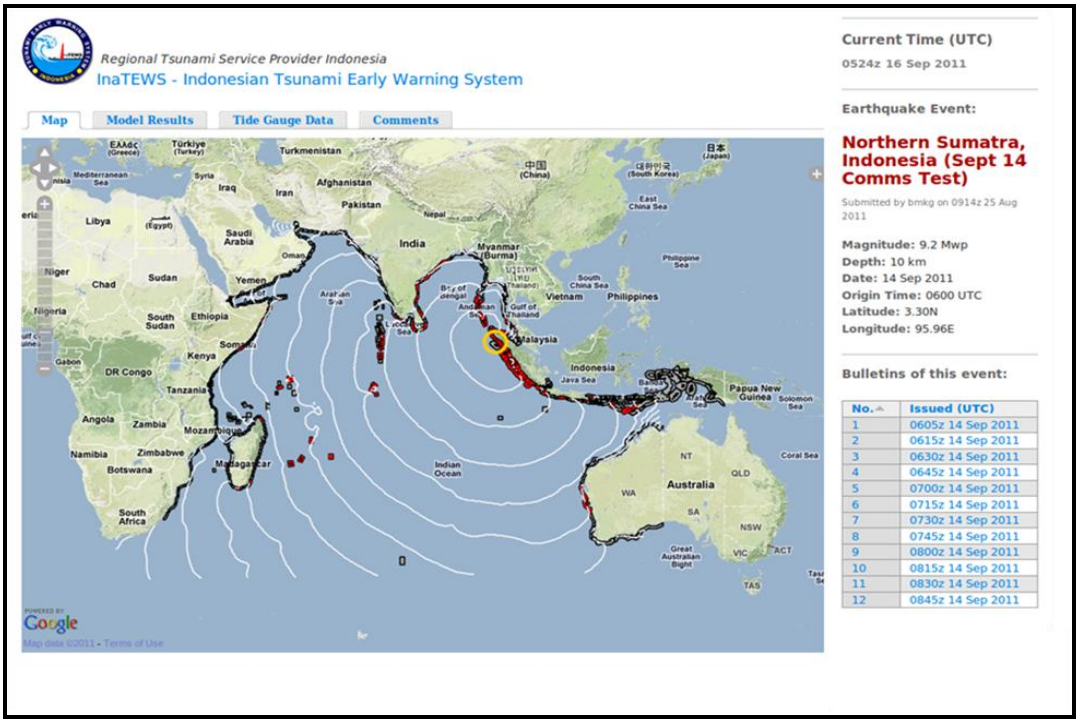

Figure 5: RTSP-Indonesia web page showing threat zone and travel time isochron

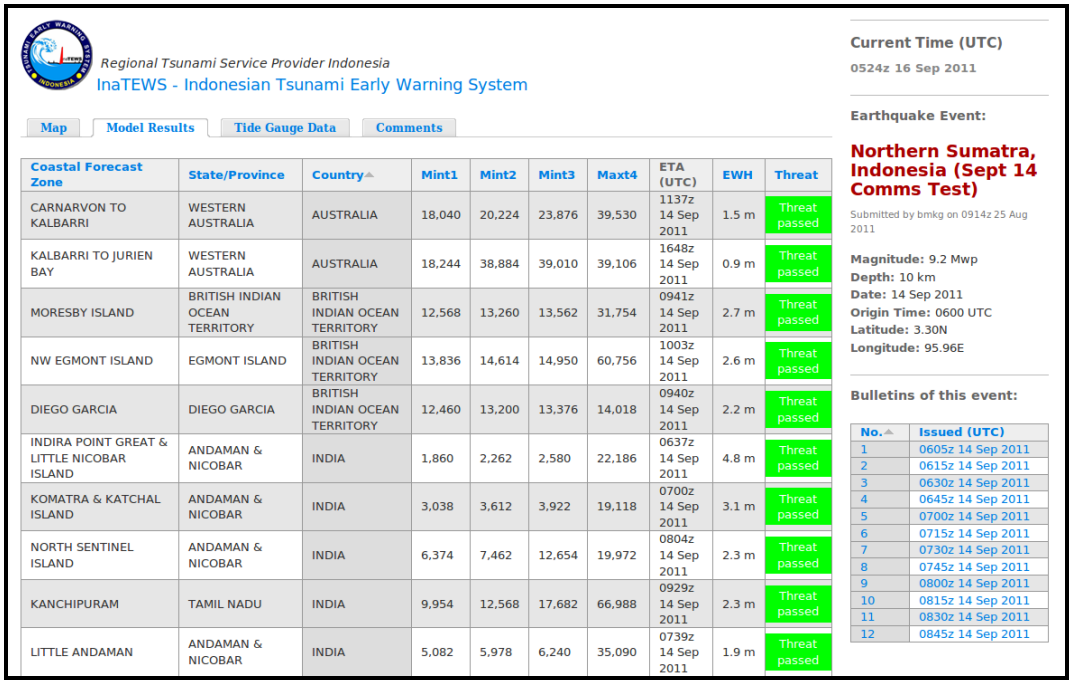

Figure 6: RTSP-Indonesia web page showing model results

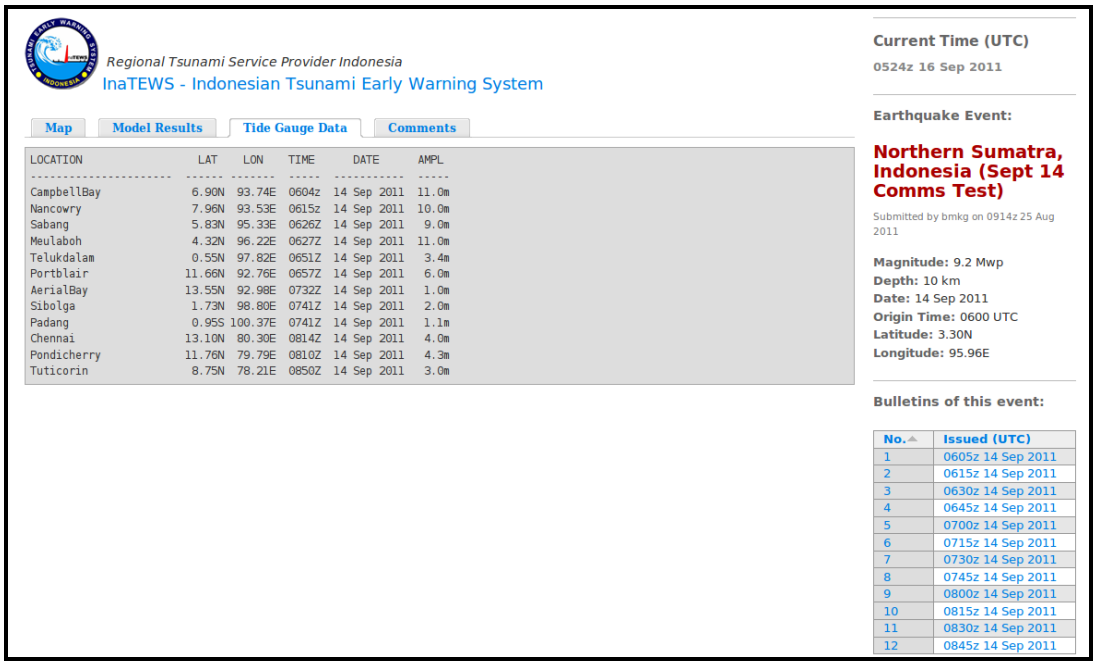

Figure 7: RTSP-Indonesia web page showing observation data

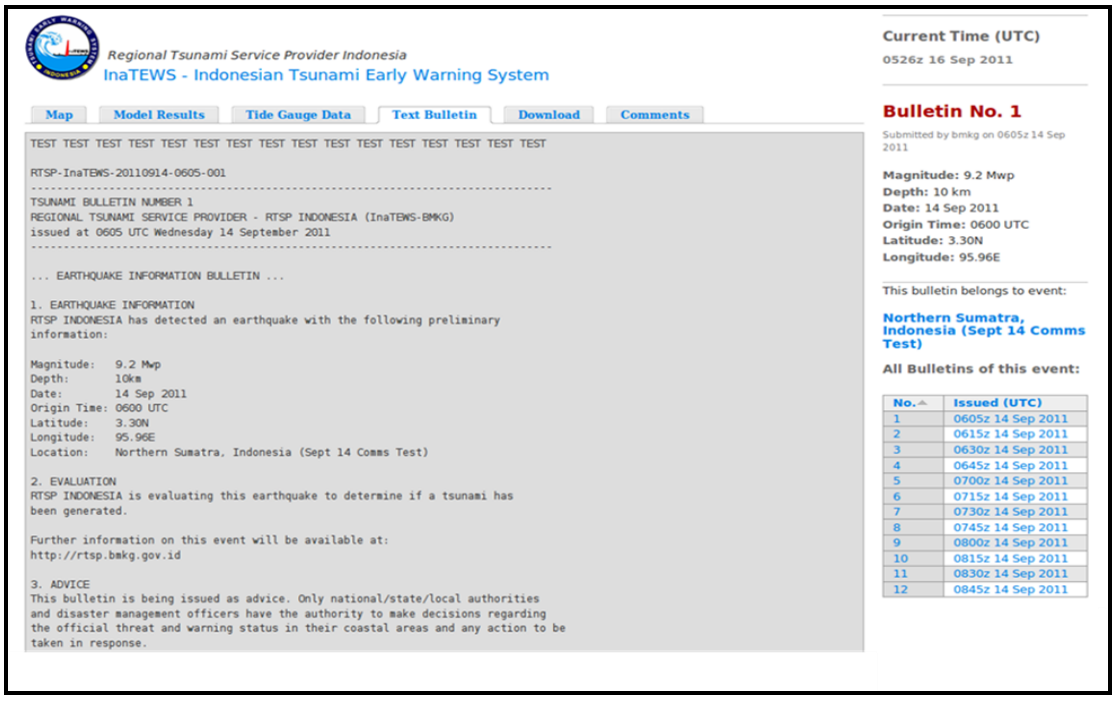

Figure 8: RTSP-Indonesia web page showing detail of text bulletin

APPENDIX 4: BULLETIN CONTENT EXAMPLES

Bulletin type 1 – Earthquake Bulletins

Notes:

1. Earthquake Bulletins will be issued whenever an earthquake of magnitude 7.5 or greater is detected under the sea in the ASEAN countries, Nicobar Islands and PNG or magnitude 8.0 or greater is detected under the sea in the Pacific Ocean.
2. In addition to earthquake details, Earthquake Bulletin may include an initial statement on tsunamigenic potential based only earthquake magnitude, location and depth, pending more detailed tsunami forecast based on scenario modelling.

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RTSP-InaTEWS-20111012-0100-001
--------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 1
REGIONAL TSUNAMI SERVICE PROVIDER - RTSP INDONESIA (InaTEWS-BMKG)
issued at 0105 UTC Wednesday 12 October 2011
--------------------------------------------------------------------------

... EARTHQUAKE INFORMATION BULLETIN ...

1. EARTHQUAKE INFORMATION


RTSP INDONESIA has detected an earthquake with the following preliminary
information:

Magnitude:   8.8 Mwp
Depth:       10km
Date:        12 Oct 2011
Origin Time: 0100 UTC
Latitude:    3.30N
Longitude:   95.96E
Location:    Northern Sumatra, Indonesia

2. EVALUATION
RTSP INDONESIA is evaluating this earthquake to determine if a tsunami has
been generated.

Further information on this event will be available at:
http://rtsp.bmkg.gov.id

3. ADVICE
This bulletin is being issued as advice. Only national/state/local
authorities
and disaster management officers have the authority to make decisions
regarding
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the official threat and warning status in their coastal areas and any
action to be
taken in response.

4. UPDATES
Additional bulletins will be issued by RTSP INDONESIA for this event as
more
information becomes available.

Other RTSPs may issue additional information at:
RTSP AUSTRALIA:  http://reg.bom.gov.au/tsunami/rtsp/
RTSP INDIA:      http://www.incois.gov.in/Incois/tsunami/COMM_login.jsp

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the
more
conservative information should be used for safety.

5. CONTACT INFORMATION
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
Email: inartsp@bmkg.go.id or monitrtwp@bmkg.go.id
P.O. Box 3540 Jakarta
Website : http://www.bmkg.go.id or http://inatews.bmkg.go.id

END OF BULLETIN
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```

Bulletin type 2 – Tsunami Forecast Bulletin

Notes:

1. This type of bulletin contains either:
   - Details of forecast tsunami threat to coastal zones, based on tsunami modelling,
   - Advice that where is no threat to any coastal zone in the Indian Ocean following further analysis of the available information by RTSP
2. These bulletins will be issued whenever an earthquake of magnitude 7.5 or greater (Mwp) is detected under the sea in ASEAN countries, Nicobar Islands and PNG, or magnitude 8.0 or greater under the sea in Pacific Ocean.
3. Update tsunami forecast bulletin will be issued hourly, if confirmation sea level under the sea observation become available then tsunami forecast and observation bulletin will be issued instead,

RTSP-InaTEWS-20111012-0100-002

TSUNAMI BULLETIN NUMBER 2
REGIONAL TSUNAMI SERVICE PROVIDER - RTSP INDONESIA (InaTEWS-BMKG)
issued at 0110 UTC Wednesday 12 October 2011

... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)

RTSP INDONESIA has detected an earthquake with the following details:

Magnitude: 8.8 Mwp
Depth: 10km
Date: 12 Oct 2011
Origin Time: 0100 UTC
Latitude: 3.30N
Longitude: 95.96E
Location: Northern Sumatra, Indonesia

2. EVALUATION
Earthquakes of this size are capable of generating tsunamis. However, so far
there is no confirmation about the triggering of a tsunami.

An investigation is under way to determine if a tsunami has been triggered. This RTSP will monitor sea level gauges and report if any tsunami wave activity
has occurred.

Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN
The list below shows the forecast arrival time of the first wave estimated to
exceed 0.5m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the
earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, and
the initial wave may not be the largest. A tsunami is a series of waves and the
time between successive waves can be five minutes to one hour.

The threat is deemed to have passed two hours after the forecast time for last
exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

AUSTRALIA		
CARNARVON TO KALBARRI	0637z 12 Oct 2011	1.5 m
KALBARRI TO JURIEN BAY	1148z 12 Oct 2011	0.9 m
BRITISH INDIAN OCEAN TERRITORY		
DIEGO GARCIA	0440z 12 Oct 2011	2.2 m
MORESBY ISLAND	0441z 12 Oct 2011	2.7 m
NW EGMONT ISLAND	0503z 12 Oct 2011	2.6 m
INDIA		
INDIRA POINT GREAT & LITTLE NICO	0137z 12 Oct 2011	4.8 m
KOMATRA & KATCHAL ISLAND	0200z 12 Oct 2011	3.1 m
NICOBAR	0215z 12 Oct 2011	1.7 m
LITTLE ANDAMAN	0239z 12 Oct 2011	1.9 m
NORTH SENTINEL ISLAND	0304z 12 Oct 2011	2.3 m
PORT BLAIR	0307z 12 Oct 2011	1.8 m
KANCHIPURAM	0429z 12 Oct 2011	2.3 m
EAST & WEST GODAVARI	0438z 12 Oct 2011	1.5 m
KANYAKUMARI	0458z 12 Oct 2011	1.6 m
GANJAM	0500z 12 Oct 2011	1.3 m
FLAT ISLAND	0501z 12 Oct 2011	1.2 m
CUDDALORE; PONDICHERRY; VILLUPUR	0539z 12 Oct 2011	1.4 m
NELLORE	0620z 12 Oct 2011	1.2 m
SRIKAKULAM	0733z 12 Oct 2011	1.3 m
PRAKASAM; GUNTUR	0735z 12 Oct 2011	1.1 m
KOLLAM	0743z 12 Oct 2011	1.2 m
PURI	0751z 12 Oct 2011	1.7 m
VISAKHAPATNAM; VIZIANAGARAM	1116z 12 Oct 2011	1.5 m
INDONESIA		
SUMUT NIAS T	0111z 12 Oct 2011	3.4 m
NAD ACEH-SINGKIL	0112z 12 Oct 2011	4.6 m
NAD ACEH-BARAT-DAYA	0113z 12 Oct 2011	9.1 m
SUMUT NIAS-SELATAN P.NIAS	0115z 12 Oct 2011	3.9 m
NAD ACEH-SELATAN U	0115z 12 Oct 2011	6.9 m
NAD ACEH-SINGKIL KEP.BANYAK	0117z 12 Oct 2011	3.5 m
NAD ACEH-SELATAN S	0119z 12 Oct 2011	7.7 m
NAD ACEH-JAYA	0120z 12 Oct 2011	12.5 m
SUMUT NIAS B	0121z 12 Oct 2011	4.2 m
SUMUT NIAS-SELATAN P.TANAHMASA	0121z 12 Oct 2011	4.6 m
NAD ACEH-BESAR B	0121z 12 Oct 2011	9.2 m
NAD NAGAN-RAYA	0127z 12 Oct 2011	11.0 m
NAD ACEH-BARAT	0127z 12 Oct 2011	13.1 m
NAD KOTA-BANDA-ACEH	0127z 12 Oct 2011	4.0 m
SUMUT NIAS-SELATAN P.TANABALA	0129z 12 Oct 2011	5.4 m
NAD ACEH-BESAR P.BREUEH	0129z 12 Oct 2011	4.2 m
NAD ACEH-BESAR P.PENASI	0133z 12 Oct 2011	4.0 m
SUMBAR KEPULAUAN-MENTAWAI P.SIBE	0137z 12 Oct 2011	3.5 m
SUMUT TAPANULI-TENGAH U	0138z 12 Oct 2011	3.6 m
SUMUT TAPANULI-TENGAH KEP.MURSAL	0138z 12 Oct 2011	2.9 m
NAD KOTA-SABANG P.WEH	0143z 12 Oct 2011	3.0 m
SUMUT MANDAILING-NATAL U	0146z 12 Oct 2011	4.2 m
SUMUT NIAS-SELATAN P.PINI	0148z 12 Oct 2011	3.2 m
SUMBAR KEPULAUAN-MENTAWAI P.SIPO	0154z 12 Oct 2011	1.9 m
SUMUT TAPANULI-TENGAH S	0201z 12 Oct 2011	3.2 m
SUMBAR KEPULAUAN-MENTAWAI KEP.PA	0201z 12 Oct 2011	2.7 m
NAD ACEH-BESAR U	0203z 12 Oct 2011	3.3 m
NAD PIDIE	0203z 12 Oct 2011	1.2 m
SUMUT TAPANULI-SELATAN	0204z 12 Oct 2011	2.2 m
SUMUT KOTA-SIBOLGA	0217z 12 Oct 2011	3.4 m

NAD BIREUEN	0218z 12 Oct 2011	1.4 m
NAD ACEH-UTARA B	0226z 12 Oct 2011	0.8 m
NAD KOTA-LHOKSEUMAWE	0241z 12 Oct 2011	0.8 m
NAD ACEH-UTARA T	0242z 12 Oct 2011	1.5 m
SUMUT MANDAILING-NATAL S	0243z 12 Oct 2011	3.6 m
NAD ACEH-TIMUR	0253z 12 Oct 2011	1.0 m
SUMBAR PASAMAN-BARAT	0256z 12 Oct 2011	2.6 m
BENGKULU SELUMA	0305z 12 Oct 2011	2.5 m
BENGKULU KAUR	0306z 12 Oct 2011	1.6 m
BENGKULU BENGKULU-UTARA U	0309z 12 Oct 2011	1.6 m
BENGKULU BENGKULU-SELATAN	0309z 12 Oct 2011	2.5 m
BENGKULU MUKOMUKO	0309z 12 Oct 2011	2.3 m
SUMBAR KEPULAUAN-MENTAWAI P.SIBE	0309z 12 Oct 2011	1.1 m
BENGKULU KOTA-BENGKULU PANTAI-PA	0310z 12 Oct 2011	1.5 m
LAMPUNG LAMPUNG-BARAT PESISIR-UT	0310z 12 Oct 2011	1.2 m
LAMPUNG LAMPUNG-BARAT PESISIR-SE	0312z 12 Oct 2011	3.8 m
BENGKULU BENGKULU-UTARA S	0313z 12 Oct 2011	2.0 m
LAMPUNG TANGGAMUS B	0326z 12 Oct 2011	2.2 m
BENGKULU BENGKULU-UTARA P.ENGGAN	0334z 12 Oct 2011	1.1 m
BANTEN PANDEGLANG S	0339z 12 Oct 2011	1.9 m
SUMBAR KOTA-PADANG U	0340z 12 Oct 2011	2.0 m
SUMBAR PADANG-PARIAMAN S	0340z 12 Oct 2011	1.5 m
SUMBAR KOTA-PARIAMAN	0342z 12 Oct 2011	1.5 m
SUMBAR PADANG-PARIAMAN U	0342z 12 Oct 2011	1.6 m
SUMBAR KOTA-PADANG S	0342z 12 Oct 2011	2.0 m
LAMPUNG TANGGAMUS T	0344z 12 Oct 2011	2.8 m
SUMBAR AGAM	0345z 12 Oct 2011	1.7 m
SUMBAR PESISIR-SELATAN U	0346z 12 Oct 2011	2.5 m
BANTEN PANDEGLANG U	0408z 12 Oct 2011	1.8 m
LAMPUNG LAMPUNG-SELATAN KALIANDA	0411z 12 Oct 2011	1.8 m
SUMBAR PESISIR-SELATAN S	0415z 12 Oct 2011	2.4 m
JABAR SUKABUMI PELABUHAN-RATU	0429z 12 Oct 2011	1.5 m
LAMPUNG KOTA-BANDAR-LAMPUNG PANT	0430z 12 Oct 2011	1.6 m
LAMPUNG TANGGAMUS P.TABUAN	0510z 12 Oct 2011	0.9 m
JABAR CIAMIS	0518z 12 Oct 2011	1.8 m
JATENG KEBUMEN	0532z 12 Oct 2011	1.3 m
JATIM TRENGGALEK	0542z 12 Oct 2011	1.4 m
JATENG CILACAP	0559z 12 Oct 2011	2.2 m
JATIM JEMBER	0609z 12 Oct 2011	0.8 m
JATIM JEMBER P.NUSABARUNG	0609z 12 Oct 2011	0.9 m
BANTEN SERANG B	0619z 12 Oct 2011	0.8 m
JATIM BANYUWANGI T	0703z 12 Oct 2011	1.5 m
BALI JEMBRANA	0703z 12 Oct 2011	1.5 m
BALI BULELENG B	0708z 12 Oct 2011	1.2 m
BANTEN LEBAK	0709z 12 Oct 2011	1.3 m
LAMPUNG LAMPUNG-SELATAN B	0713z 12 Oct 2011	1.3 m
LAMPUNG LAMPUNG-SELATAN KEP.SEBU	0719z 12 Oct 2011	0.6 m
NTT KUPANG	1505z 12 Oct 2011	0.9 m
JATIM TULUNGAGUNG	1506z 12 Oct 2011	0.8 m
JATENG PURWOREJO	1604z 12 Oct 2011	0.9 m
NTT SUMBA B	1619z 12 Oct 2011	1.1 m
MADAGASCAR		
AMPONDRABE	0946z 12 Oct 2011	1.1 m
TOLANARO	1031z 12 Oct 2011	1.0 m
BELOHA	1035z 12 Oct 2011	1.1 m
MALAYSIA		
PULAU LANGKAWI	0443z 12 Oct 2011	1.1 m
BAGAN AYER ITAM	0537z 12 Oct 2011	0.7 m

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MALDIVES
GAN                                0424z 12 Oct 2011   0.7 m
DIYAGLI                            0424z 12 Oct 2011   0.8 m
KOLUFURI                           0426z 12 Oct 2011   0.9 m
MALE                               0426z 12 Oct 2011   1.7 m

MAURITIUS
LA FERME                           0648z 12 Oct 2011   4.5 m
CARGADOS CARAJOS                   0721z 12 Oct 2011   2.6 m
GRANDE REVIERE SUD EST             0742z 12 Oct 2011   1.3 m

MYANMAR
KAINGHAUNG ISLAND                  0527z 12 Oct 2011   1.2 m

REUNION
SAINT - JOSEPH                     0846z 12 Oct 2011   0.9 m

SEYCHELLES
FREGATE ISLAND                     0811z 12 Oct 2011   1.0 m
TAKAMAKA                           0830z 12 Oct 2011   1.1 m
ILE DESROCHES                      1117z 12 Oct 2011   0.6 m

SOMALIA
EYL                                0843z 12 Oct 2011   1.4 m
UARSCIECH                          1109z 12 Oct 2011   1.4 m
MUQDISHO                           1113z 12 Oct 2011   0.8 m
HAFUN                              1153z 12 Oct 2011   1.4 m

SRI LANKA
AMPARA                             0317z 12 Oct 2011   1.7 m
TRINCOMALEE                        0322z 12 Oct 2011   2.2 m
HAMBANTOTA                         0325z 12 Oct 2011   2.0 m
MULLAITIVU                         0329z 12 Oct 2011   1.3 m
KILINOCHCHI                        0338z 12 Oct 2011   1.0 m
GALLE                              0437z 12 Oct 2011   1.6 m
COLOMBO DISTRICT; KALUTARA         0516z 12 Oct 2011   1.3 m
GAMPAHA                            1335z 12 Oct 2011   1.2 m

THAILAND
KO RACHA                           0311z 12 Oct 2011   1.5 m
PHUKET                             0315z 12 Oct 2011   1.5 m

4. ADVICE
This bulletin is being issued as advice. Only national/state/local
authorities
and disaster management officers have the authority to make decisions
regarding
the official threat and warning status in their coastal areas and any
action to be
taken in response.

5. UPDATES
Additional bulletins will be issued by RTSP INDONESIA for this event as
more
information becomes available.

Other RTSPs may issue additional information at:
RTSP AUSTRALIA:  http://reg.bom.gov.au/tsunami/rtsp/
RTSP INDIA:      http://www.incois.gov.in/Incois/tsunami/COMM_login.jsp
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In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the
more
conservative information should be used for safety.


6. CONTACT INFORMATION
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 05220
Tel.: +62 (21) 4246321/6546311
Fax: +62 (21) 6546311/4246703
Email: inartsp@bmkg.go.id or monitrtwp@bmkg.go.id
P.O. Box 3540 Jakarta
Website : http://www.bmkg.go.id or http://inatews.bmkg.go.id

END OF BULLETIN
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Bulletin type 3 – Tsunami Forecast and observations Bulletin

Notes:

1. This type of bulletin is similar to tsunami forecast bulletins (bulletin type 2), but includes information on observed sea level anomalies due to tsunami.
2. Update tsunami forecast and observations bulletins will be issued hourly, update will also be issued immediately if sea-level observations indicate that new coastal zones are under tsunami threat.

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RTSP-InaTEWS-20111012-0100-003
--------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 3
REGIONAL TSUNAMI SERVICE PROVIDER - RTSP INDONESIA (InaTEWS-BMKG)
issued at 0145 UTC Wednesday 12 October 2011
--------------------------------------------------------------------------

... CONFIRMED TSUNAMI THREAT IN THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)


RTSP INDONESIA has detected an earthquake with the following details:

Magnitude:   9.2 Mwp
Depth:       10km
Date:        12 Oct 2011
Origin Time: 0100 UTC
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Latitude: 3.30N
Longitude: 95.96E
Location: Northern Sumatra, Indonesia

2. EVALUATION
Sea level observations have confirmed that a TSUNAMI WAS GENERATED.
Maximum wave amplitudes observed so far:

LOCATION	LAT	LON	TIME	DATE	AMPL
CampbellBay	6.90N	93.74E	0104z	12 Oct 2011	11.0m
Nancowry	7.96N	93.53E	0115z	12 Oct 2011	10.0m

Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN
The list below shows the forecast arrival time of the first wave estimated to
exceed 0.5m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the
earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, and
the initial wave may not be the largest. A tsunami is a series of waves and the
time between successive waves can be five minutes to one hour.

The threat is deemed to have passed two hours after the forecast time for last
exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

AUSTRALIA		
CARNARVON TO KALBARRI	0637z 12 Oct 2011	1.5 m
KALBARRI TO JURIEN BAY	1148z 12 Oct 2011	0.9 m
BRITISH INDIAN OCEAN TERRITORY		
DIEGO GARCIA	0440z 12 Oct 2011	2.2 m
MORESBY ISLAND	0441z 12 Oct 2011	2.7 m
NW EGMONT ISLAND	0503z 12 Oct 2011	2.6 m
INDIA		
INDIRA POINT GREAT & LITTLE NICO	0137z 12 Oct 2011	4.8 m
KOMATRA & KATCHAL ISLAND	0200z 12 Oct 2011	3.1 m
NICOBAR	0215z 12 Oct 2011	1.7 m
LITTLE ANDAMAN	0239z 12 Oct 2011	1.9 m
NORTH SENTINEL ISLAND	0304z 12 Oct 2011	2.3 m
PORT BLAIR	0307z 12 Oct 2011	1.8 m
KANCHIPURAM	0429z 12 Oct 2011	2.3 m
EAST & WEST GODAVARI	0438z 12 Oct 2011	1.5 m
KANYAKUMARI	0458z 12 Oct 2011	1.6 m
GANJAM	0500z 12 Oct 2011	1.3 m

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FLAT ISLAND                          0501z 12 Oct 2011   1.2 m
CUDDALORE; PONDICHERRY; VILLUPUR     0539z 12 Oct 2011   1.4 m
NELLORE                              0620z 12 Oct 2011   1.2 m
SRIKAKULAM                           0733z 12 Oct 2011   1.3 m
PRAKASAM; GUNTUR                     0735z 12 Oct 2011   1.1 m
KOLLAM                               0743z 12 Oct 2011   1.2 m
PURI                                 0751z 12 Oct 2011   1.7 m
VISAKHAPATNAM; VIZIANAGARAM          1116z 12 Oct 2011   1.5 m

INDONESIA
SUMUT NIAS T                         0111z 12 Oct 2011   3.4 m
NAD ACEH-SINGKIL                     0112z 12 Oct 2011   4.6 m
NAD ACEH-BARAT-DAYA                  0113z 12 Oct 2011   9.1 m
SUMUT NIAS-SELATAN P.NIAS            0115z 12 Oct 2011   3.9 m
NAD ACEH-SELATAN U                   0115z 12 Oct 2011   6.9 m
NAD ACEH-SINGKIL KEP.BANYAK          0117z 12 Oct 2011   3.5 m
NAD ACEH-SELATAN S                   0119z 12 Oct 2011   7.7 m
NAD ACEH-JAYA                        0120z 12 Oct 2011  12.5 m
SUMUT NIAS B                         0121z 12 Oct 2011   4.2 m
SUMUT NIAS-SELATAN P.TANAHMASA       0121z 12 Oct 2011   4.6 m
NAD ACEH-BESAR B                     0121z 12 Oct 2011   9.2 m
NAD NAGAN-RAYA                       0127z 12 Oct 2011  11.0 m
NAD ACEH-BARAT                       0127z 12 Oct 2011  13.1 m
NAD KOTA-BANDA-ACEH                  0127z 12 Oct 2011   4.0 m
SUMUT NIAS-SELATAN P.TANABALA        0129z 12 Oct 2011   5.4 m
NAD ACEH-BESAR P.BREUEH              0129z 12 Oct 2011   4.2 m
NAD ACEH-BESAR P.PENASI              0133z 12 Oct 2011   4.0 m
SUMBAR KEPULAUAN-MENTAWAI P.SIBE     0137z 12 Oct 2011   3.5 m
SUMUT TAPANULI-TENGAH U              0138z 12 Oct 2011   3.6 m
SUMUT TAPANULI-TENGAH KEP.MURSAL     0138z 12 Oct 2011   2.9 m
NAD KOTA-SABANG P.WEH                0143z 12 Oct 2011   3.0 m
SUMUT MANDAILING-NATAL U             0146z 12 Oct 2011   4.2 m
SUMUT NIAS-SELATAN P.PINI            0148z 12 Oct 2011   3.2 m
SUMBAR KEPULAUAN-MENTAWAI P.SIPO     0154z 12 Oct 2011   1.9 m
SUMUT TAPANULI-TENGAH S              0201z 12 Oct 2011   3.2 m
SUMBAR KEPULAUAN-MENTAWAI KEP.PA     0201z 12 Oct 2011   2.7 m
NAD ACEH-BESAR U                     0203z 12 Oct 2011   3.3 m
NAD PIDIE                            0203z 12 Oct 2011   1.2 m
SUMUT TAPANULI-SELATAN               0204z 12 Oct 2011   2.2 m
SUMUT KOTA-SIBOLGA                   0217z 12 Oct 2011   3.4 m
NAD BIREUEN                          0218z 12 Oct 2011   1.4 m
NAD ACEH-UTARA B                     0226z 12 Oct 2011   0.8 m
NAD KOTA-LHOKSEUMAWE                 0241z 12 Oct 2011   0.8 m
NAD ACEH-UTARA T                     0242z 12 Oct 2011   1.5 m
SUMUT MANDAILING-NATAL S             0243z 12 Oct 2011   3.6 m
NAD ACEH-TIMUR                       0253z 12 Oct 2011   1.0 m
SUMBAR PASAMAN-BARAT                 0256z 12 Oct 2011   2.6 m
BENGKULU SELUMA                      0305z 12 Oct 2011   2.5 m
BENGKULU KAUR                        0306z 12 Oct 2011   1.6 m
BENGKULU BENGKULU-UTARA U            0309z 12 Oct 2011   1.6 m
BENGKULU BENGKULU-SELATAN            0309z 12 Oct 2011   2.5 m
BENGKULU MUKOMUKO                    0309z 12 Oct 2011   2.3 m
SUMBAR KEPULAUAN-MENTAWAI P.SIBE     0309z 12 Oct 2011   1.1 m
BENGKULU KOTA-BENGKULU PANTAI-PA     0310z 12 Oct 2011   1.5 m
LAMPUNG LAMPUNG-BARAT PESISIR-UT     0310z 12 Oct 2011   1.2 m
LAMPUNG LAMPUNG-BARAT PESISIR-SE     0312z 12 Oct 2011   3.8 m
BENGKULU BENGKULU-UTARA S            0313z 12 Oct 2011   2.0 m
LAMPUNG TANGGAMUS B                  0326z 12 Oct 2011   2.2 m
BENGKULU BENGKULU-UTARA P.ENGGAN     0334z 12 Oct 2011   1.1 m
BANTEN PANDEGLANG S                  0339z 12 Oct 2011   1.9 m
SUMBAR KOTA-PADANG U                 0340z 12 Oct 2011   2.0 m
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SUMBAR PADANG-PARIAMAN S	0340z 12 Oct 2011	1.5 m
SUMBAR KOTA-PARIAMAN	0342z 12 Oct 2011	1.5 m
SUMBAR PADANG-PARIAMAN U	0342z 12 Oct 2011	1.6 m
SUMBAR KOTA-PADANG S	0342z 12 Oct 2011	2.0 m
LAMPUNG TANGGAMUS T	0344z 12 Oct 2011	2.8 m
SUMBAR AGAM	0345z 12 Oct 2011	1.7 m
SUMBAR PESISIR-SELATAN U	0346z 12 Oct 2011	2.5 m
BANTEN PANDEGLANG U	0408z 12 Oct 2011	1.8 m
LAMPUNG LAMPUNG-SELATAN KALIANDA	0411z 12 Oct 2011	1.8 m
SUMBAR PESISIR-SELATAN S	0415z 12 Oct 2011	2.4 m
JABAR SUKABUMI PELABUHAN-RATU	0429z 12 Oct 2011	1.5 m
LAMPUNG KOTA-BANDAR-LAMPUNG PANT	0430z 12 Oct 2011	1.6 m
LAMPUNG TANGGAMUS P.TABUAN	0510z 12 Oct 2011	0.9 m
JABAR CIAMIS	0518z 12 Oct 2011	1.8 m
JATENG KEBUMEN	0532z 12 Oct 2011	1.3 m
JATIM TRENGGALEK	0542z 12 Oct 2011	1.4 m
JATENG CILACAP	0559z 12 Oct 2011	2.2 m
JATIM JEMBER	0609z 12 Oct 2011	0.8 m
JATIM JEMBER P.NUSABARUNG	0609z 12 Oct 2011	0.9 m
BANTEN SERANG B	0619z 12 Oct 2011	0.8 m
JATIM BANYUWANGI T	0703z 12 Oct 2011	1.5 m
BALI JEMBRANA	0703z 12 Oct 2011	1.5 m
BALI BULELENG B	0708z 12 Oct 2011	1.2 m
BANTEN LEBAK	0709z 12 Oct 2011	1.3 m
LAMPUNG LAMPUNG-SELATAN B	0713z 12 Oct 2011	1.3 m
LAMPUNG LAMPUNG-SELATAN KEP.SEBU	0719z 12 Oct 2011	0.6 m
NTT KUPANG	1505z 12 Oct 2011	0.9 m
JATIM TULUNGAGUNG	1506z 12 Oct 2011	0.8 m
JATENG PURWOREJO	1604z 12 Oct 2011	0.9 m
NTT SUMBA B	1619z 12 Oct 2011	1.1 m
MADAGASCAR		
AMPONDRABE	0946z 12 Oct 2011	1.1 m
TOLANARO	1031z 12 Oct 2011	1.0 m
BELOHA	1035z 12 Oct 2011	1.1 m
MALAYSIA		
PULAU LANGKAWI	0443z 12 Oct 2011	1.1 m
BAGAN AYER ITAM	0537z 12 Oct 2011	0.7 m
MALDIVES		
GAN	0424z 12 Oct 2011	0.7 m
DIYAGLI	0424z 12 Oct 2011	0.8 m
KOLUFURI	0426z 12 Oct 2011	0.9 m
MALE	0426z 12 Oct 2011	1.7 m
MAURITIUS		
LA FERME	0648z 12 Oct 2011	4.5 m
CARGADOS CARAJOS	0721z 12 Oct 2011	2.6 m
GRANDE REVIERE SUD EST	0742z 12 Oct 2011	1.3 m
MYANMAR		
KAINGHAUNG ISLAND	0527z 12 Oct 2011	1.2 m
REUNION		
SAINT - JOSEPH	0846z 12 Oct 2011	0.9 m
SEYCHELLES		
FREGATE ISLAND	0811z 12 Oct 2011	1.0 m
TAKAMAKA	0830z 12 Oct 2011	1.1 m
ILE DESROCHES	1117z 12 Oct 2011	0.6 m

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SOMALIA
EYL                                0843z 12 Oct 2011   1.4 m
UARSCIECH                          1109z 12 Oct 2011   1.4 m
MUQDISHO                           1113z 12 Oct 2011   0.8 m
HAFUN                              1153z 12 Oct 2011   1.4 m

SRI LANKA
AMPARA                             0317z 12 Oct 2011   1.7 m
TRINCOMALEE                        0322z 12 Oct 2011   2.2 m
HAMBANTOTA                         0325z 12 Oct 2011   2.0 m
MULLAITIVU                         0329z 12 Oct 2011   1.3 m
KILINOCHCHI                        0338z 12 Oct 2011   1.0 m
GALLE                              0437z 12 Oct 2011   1.6 m
COLOMBO DISTRICT; KALUTARA         0516z 12 Oct 2011   1.3 m
GAMPAHA                            1335z 12 Oct 2011   1.2 m

THAILAND
KO RACHA                           0311z 12 Oct 2011   1.5 m
PHUKET                             0315z 12 Oct 2011   1.5 m

4. ADVICE
This bulletin is being issued as advice. Only national/state/local
authorities
and disaster management officers have the authority to make decisions
regarding
the official threat and warning status in their coastal areas and any
action to be
taken in response.

5. UPDATES
Additional bulletins will be issued by RTSP INDONESIA for this event as
more
information becomes available.

Other RTSPs may issue additional information at:
RTSP AUSTRALIA:  http://reg.bom.gov.au/tsunami/rtsp/
RTSP INDIA:      http://www.incois.gov.in/Incois/tsunami/COMM_login.jsp

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the
more
conservative information should be used for safety.

6. CONTACT INFORMATION
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
Email: inartsp@bmkg.go.id or monitrtwp@bmkg.go.id
P.O. Box 3540 Jakarta
Website : http://www.bmkg.go.id or http://inatews.bmkg.go.id

END OF BULLETIN
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Bulletin type 4 – Tsunami Service Finalization Bulletin

Notes:

1. RTSP-Indonesia will finalize the issuing of bulletins for an event by issuing a tsunami service finalization bulletin.
2. This type of bulletin will be issued 2 hours after the last forecast arrival time in any Indian Ocean coastal zone of tsunami wave of aplitude 50 cm or greater (t4 plus 2 hours)

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 RTSP-InaTEWS-20111012-0100-012
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TSUNAMI BULLETIN NUMBER 12
REGIONAL TSUNAMI SERVICE PROVIDER - RTSP INDONESIA (InaTEWS-BMKG)
issued at 1300 UTC Wednesday 12 October 2011
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... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)


RTSP INDONESIA has detected an earthquake with the following details:

Magnitude:   9.2 Mwp
Depth:       10km
Date:        12 Oct 2011
Origin Time: 0100 UTC
Latitude:    3.30N
Longitude:   95.96E
Location:    Northern Sumatra, Indonesia (Sept 14 Comms Test)

2. EVALUATION
Data from sea-level gauges confirmed that a tsunami was generated.

The expected period of significant tsunami waves is now over for all
threatened
Indian Ocean countries, based on RTSP INDONESIA modelling.

Because local conditions can cause a wide variation in tsunami wave action,
CANCELLATION of national warnings and ALL CLEAR determination must be made
by
national/state/local authorities. Please be aware that dangerous currents
can
continue for several hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS
Listed below are maximum wave amplitudes recorded at the specified
locations.
Note that wave amplitude is measured relative to normal sea level; it is
NOT
the crest-to-trough wave height.

LOCATION                  LAT    LON    TIME      DATE      AMPL
----------------------  ------ -------  -----  -----------  -----
CampbellBay              6.90N  93.74E  0104z  12 Oct 2011  11.0m
```

Nancowry	7.96N	93.53E	0115z	12 Oct 2011	10.0m
Sabang	5.83N	95.33E	0126Z	12 Oct 2011	9.0m
Meulaboh	4.32N	96.22E	0127Z	12 Oct 2011	11.0m
Telukdalam	0.55N	97.82E	0151Z	12 Oct 2011	3.4m
Portblair	11.66N	92.76E	0157Z	12 Oct 2011	6.0m
AerialBay	13.55N	92.98E	0232Z	12 Oct 2011	1.0m
Sibolga	1.73N	98.80E	0241Z	12 Oct 2011	2.0m
Padang	0.95S	100.37E	0241Z	12 Oct 2011	1.1m
Chennai	13.10N	80.30E	0314Z	12 Oct 2011	4.0m
Pondicherry	11.76N	79.79E	0310Z	12 Oct 2011	4.3m
Tuticorin	8.75N	78.21E	0350Z	12 Oct 2011	3.0m

4. ADVICE
This bulletin is being issued as advice. Only national/state/local authorities
and disaster management officers have the authority to make decisions regarding
the official threat and warning status in their coastal areas and any action to be
taken in response.

5. UPDATES
No further bulletins will be issued by RTSP INDONESIA for this event unless additrional information becomes available.

Other RTSPs may issue additional information at:
RTSP AUSTRALIA: http://reg.bom.gov.au/tsunami/rtsp/
RTSP INDIA: http://www.incois.gov.in/Incois/tsunami/COMM_login.jsp

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more
conservative information should be used for safety.

6. CONTACT INFORMATION
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
Email: inartsp@bmkg.go.id or monitrtwp@bmkg.go.id
P.O. Box 3540 Jakarta
Website : http://www.bmkg.go.id or http://inatews.bmkg.go.id

END OF BULLETIN

APPENDIX 5: COMMUNICATIONS

Notification Messages:

RTSP-Indonesia will issue notification message to National Tsunami Warning Centre whenever a Bulletin is issued. Notification message will be disseminated via the WMO Global Telecommunication System (GTS), email, fax and sms.

NTWCs should advise RSTP-Indonesia of their preference mode of delivery and address details.

Notification message are intended to alert NTWCs to the availability of RTSP Bulletin, and will not contain tsunami forecast details.

Web:

The full of all Bulletins, plus some map and graphical product will be available to NTWCs on password-protected website:

http://rtsp.bmkg.go.id

The password for this site is provided to National Tsunami Warning Focal Points.

E-mail:

NTWCs can contact RTSP-Indonesia via e-mail at:

inartsp@bmkg.go.id and monitrtwp@bmkg.go.id.