



***PAKISTAN
METEOROLOGICAL
DEPARTMENT***

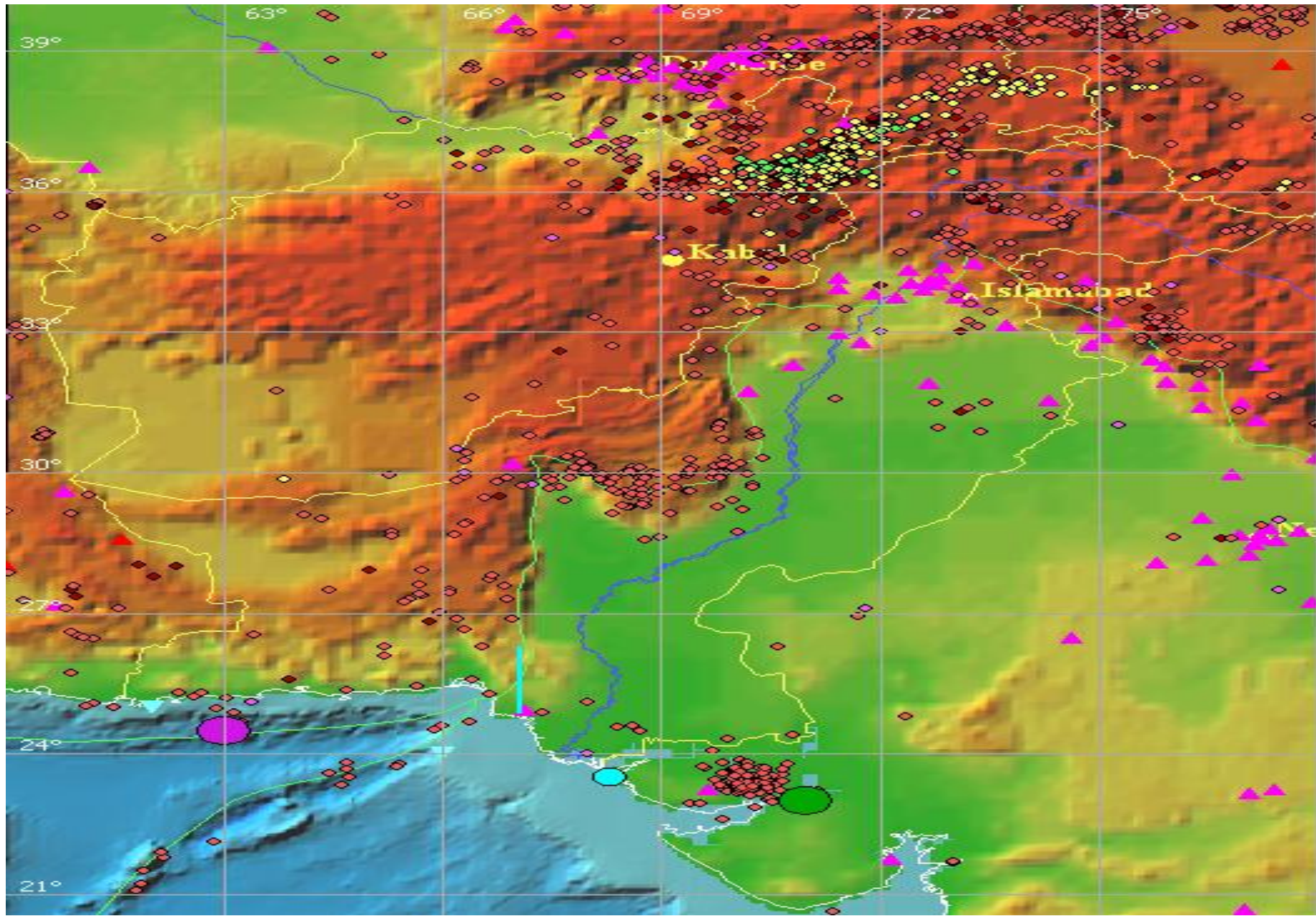
Presented by
AMEER HYDER

PAKISTAN METEOROLOGICAL DEPARTMENT OBJECTIVES & RESPONSIBILITIES

**To ensure timely issue warning of all kind natural Disasters
types of weather/flood forecasts, warnings and advisories to
the National News**

Media and concerned functionaries for:

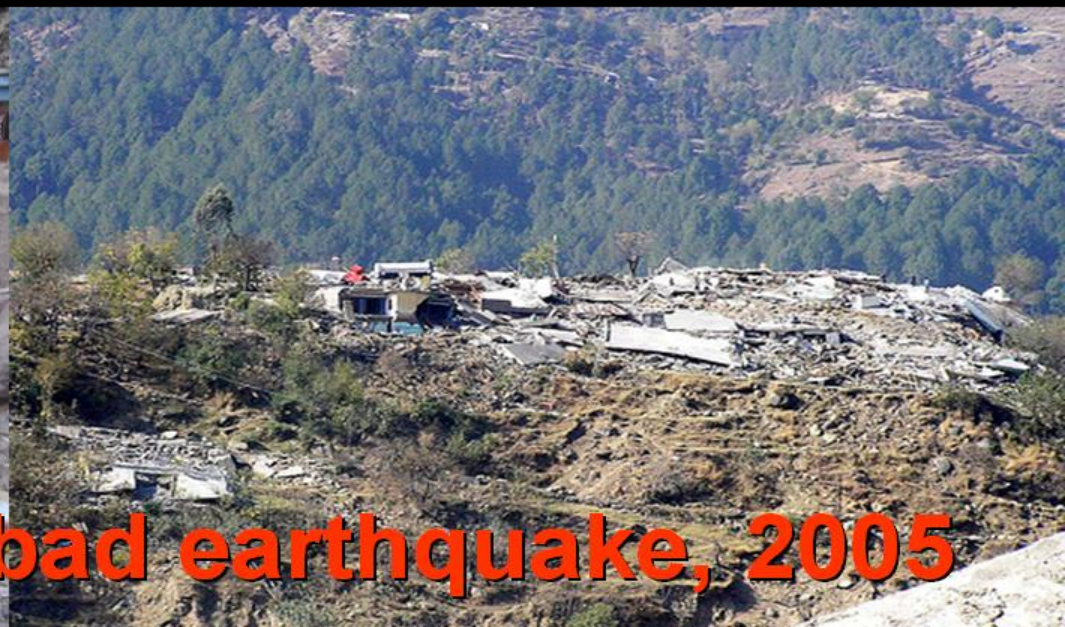
HISTORIC PLACES OF TSUANAMIGENIC EARTHQUAKE



PAKISTAN LIES ON TSUNAMIGENIC BELT

Pakistan coast belt 1100 km in length , is about 50 km away from sebduction zone in arabian sea pron to tsunamigenic earth quakes , already regestered the magnitude 8.3, had generated a destructive tsunami in 1945 and caused huge destruction in the area

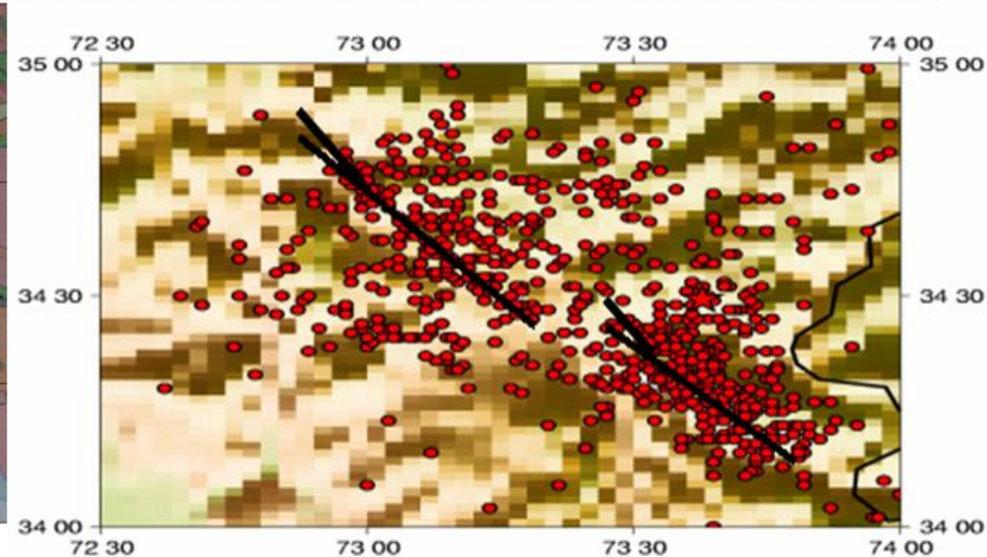
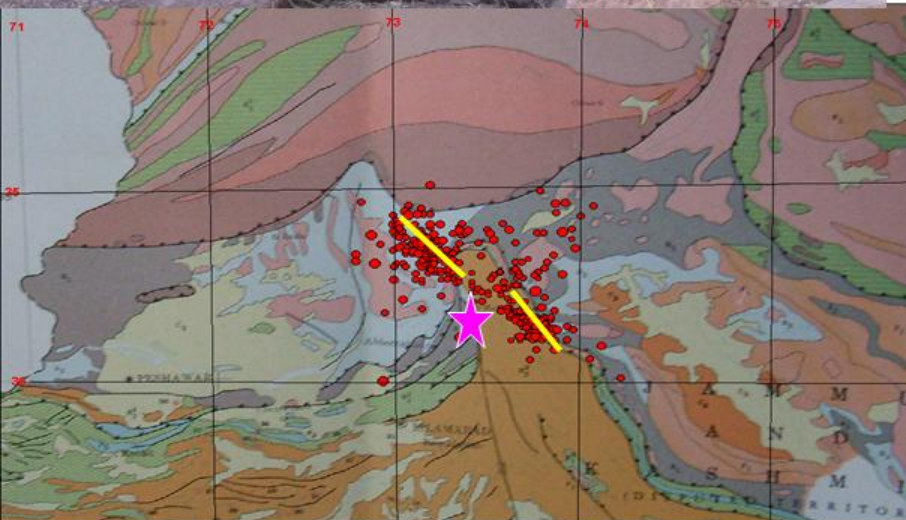
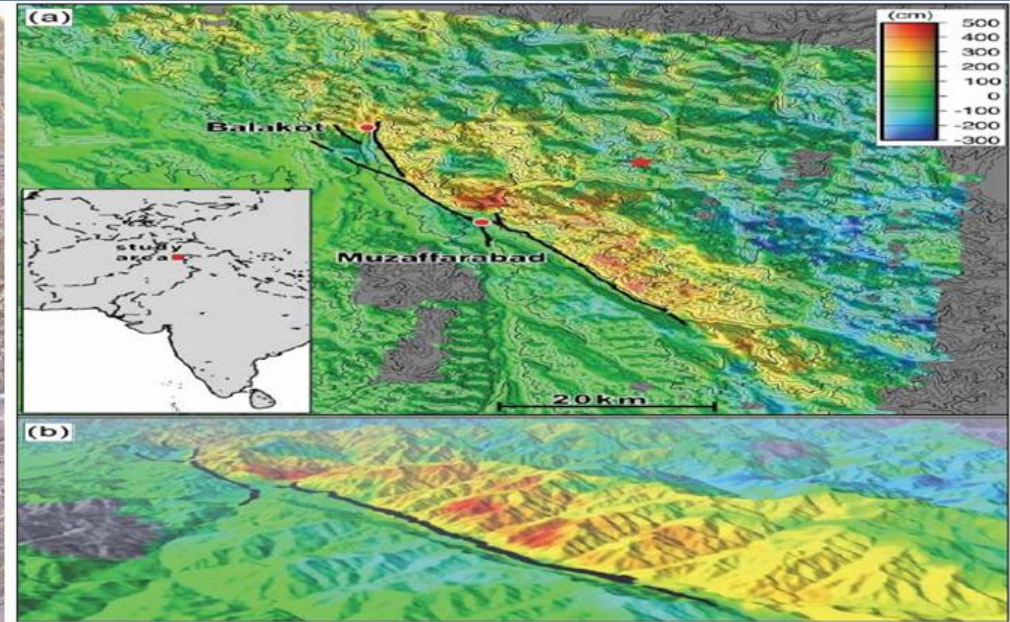




M 7.6 Muzafrabad earthquake, 2005



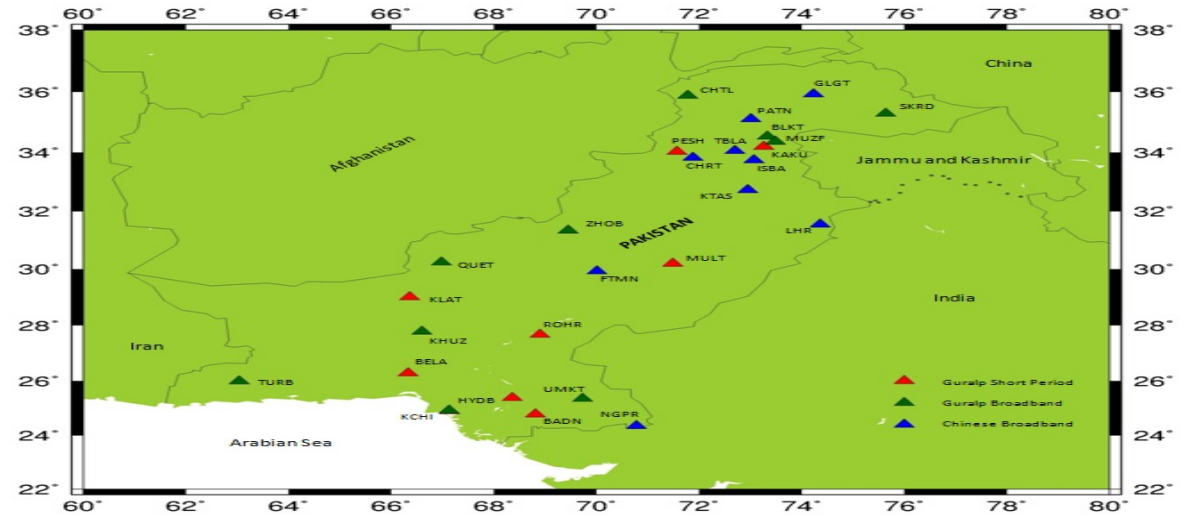
M 7.6 Muzaffarabad earthquake Fault line Trace, 2005



Earthquake Data Acquisition

Local Seismic Network

(Mode of Data Acquisition is internet)



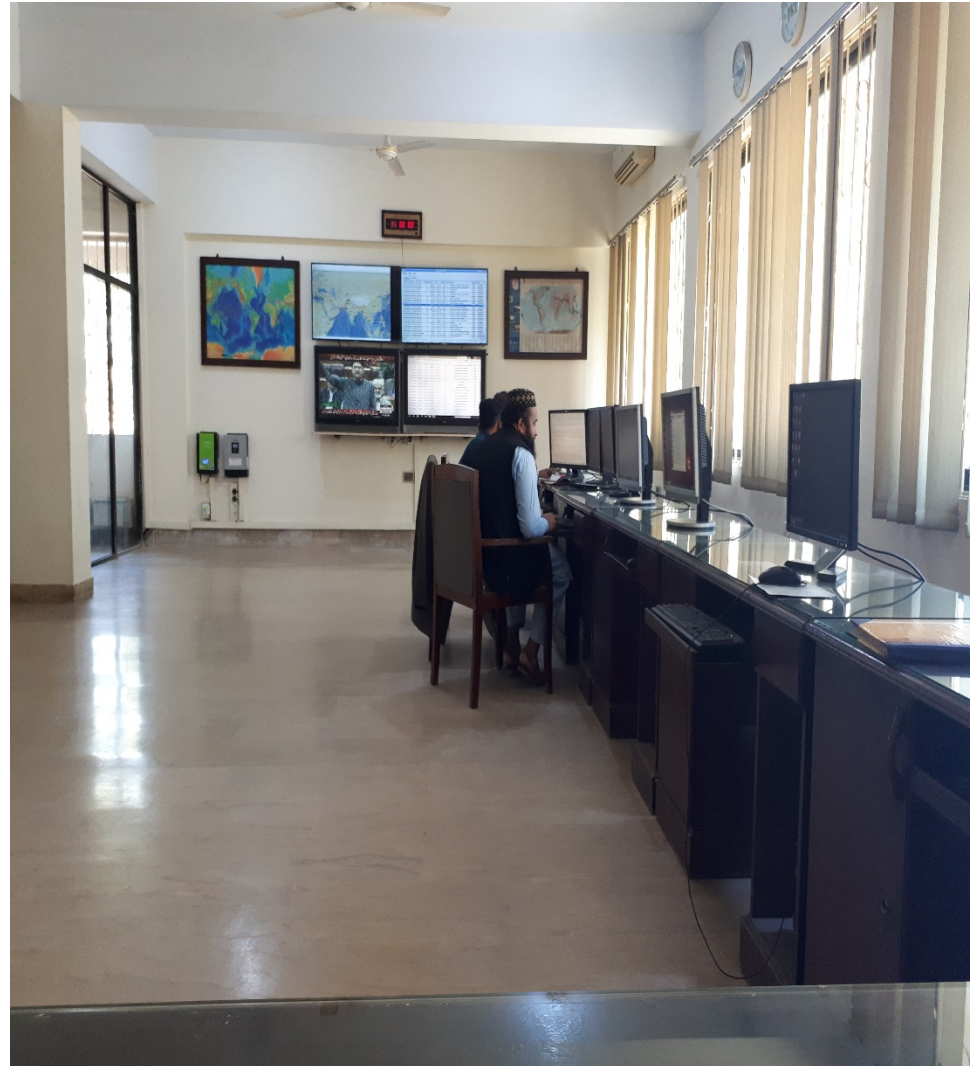
Global Seismic Network

(Mode of Data Acquisition is internet)

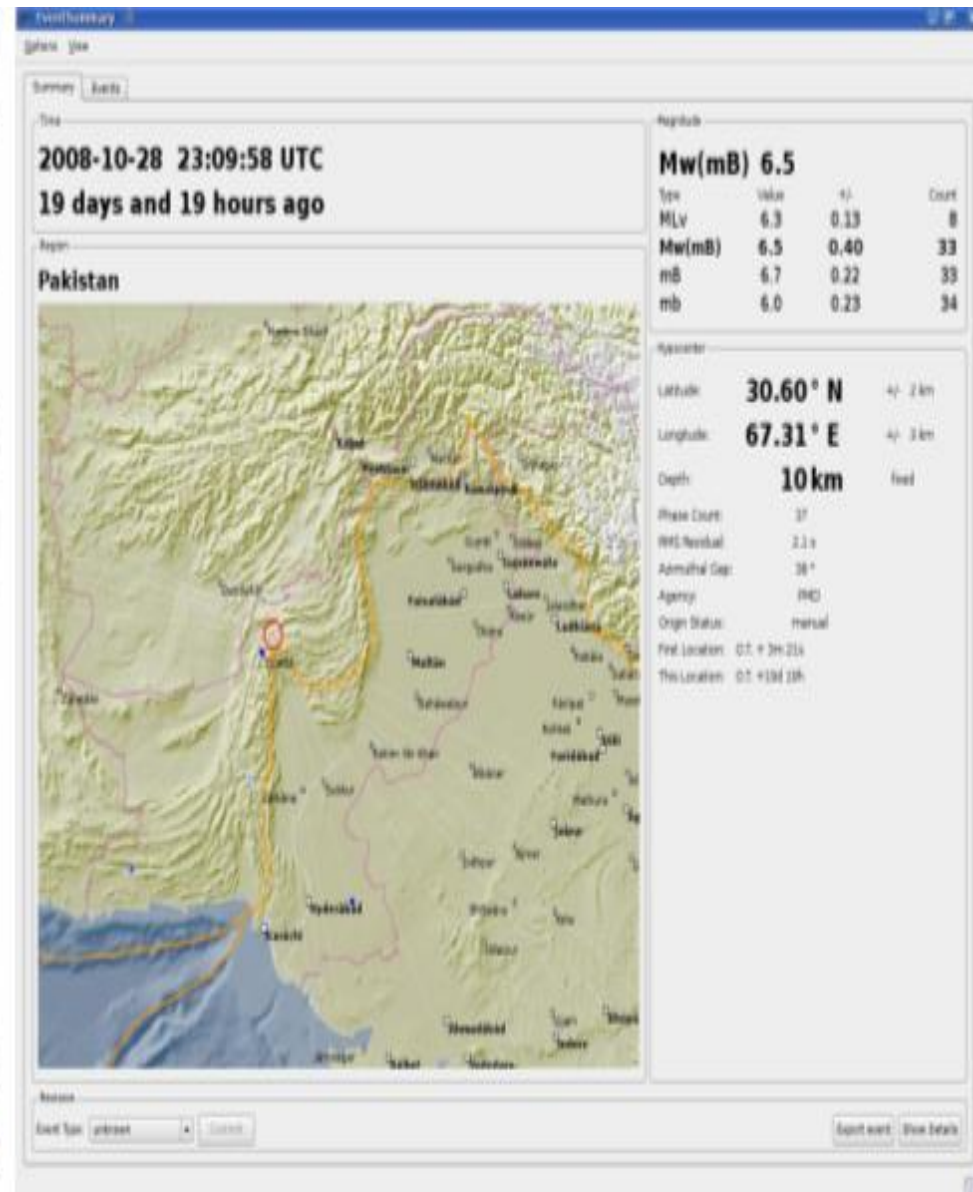
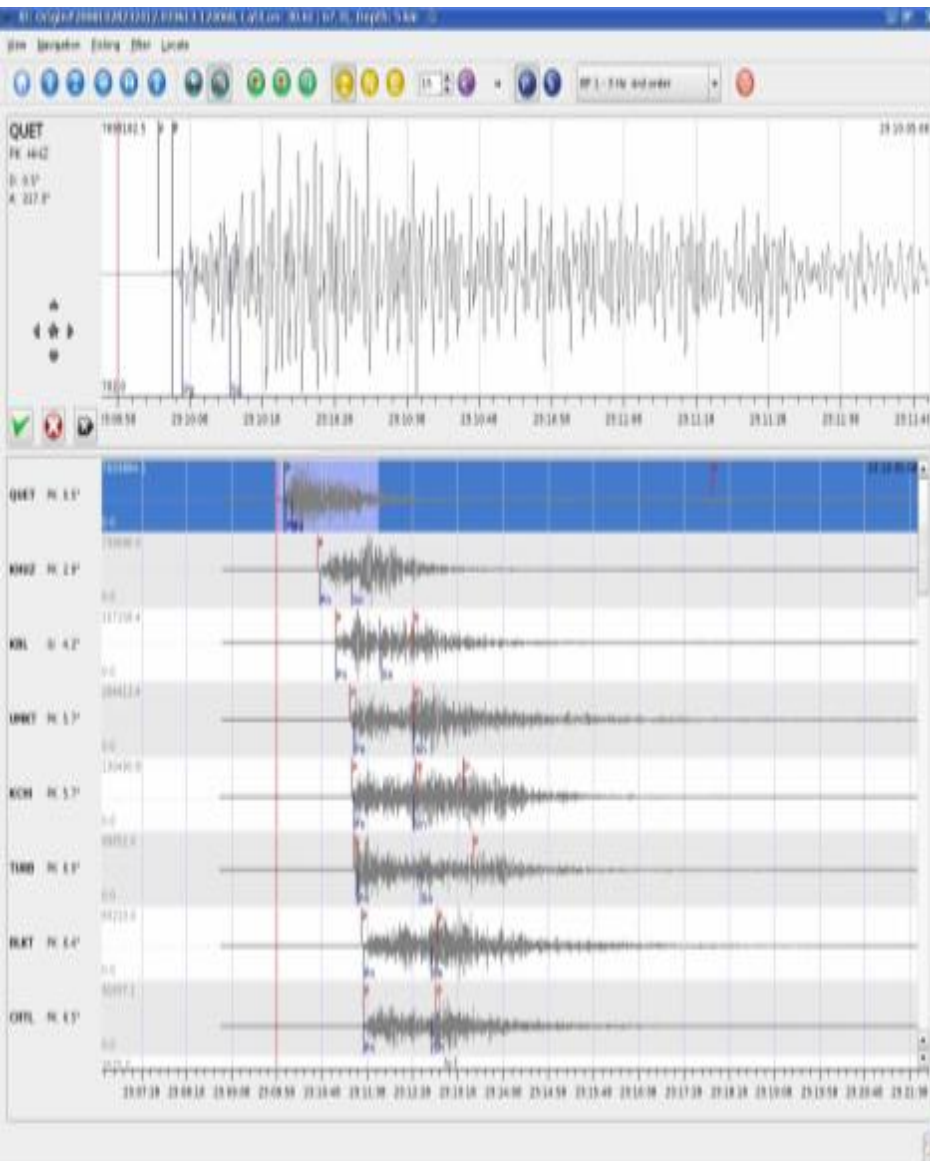


NATIONAL TSUNAMI Center (KARACH)

- **Data processing**
 - Data acquirement & verifying
 - Automatic detection
(phase pick and combination)
 - Auto-location & alarm
 - Interactive processing
 - Archive & catalog
- **Data management**
 - Data storage
 - Data distribution service
 - Database management
 - Online inquire service

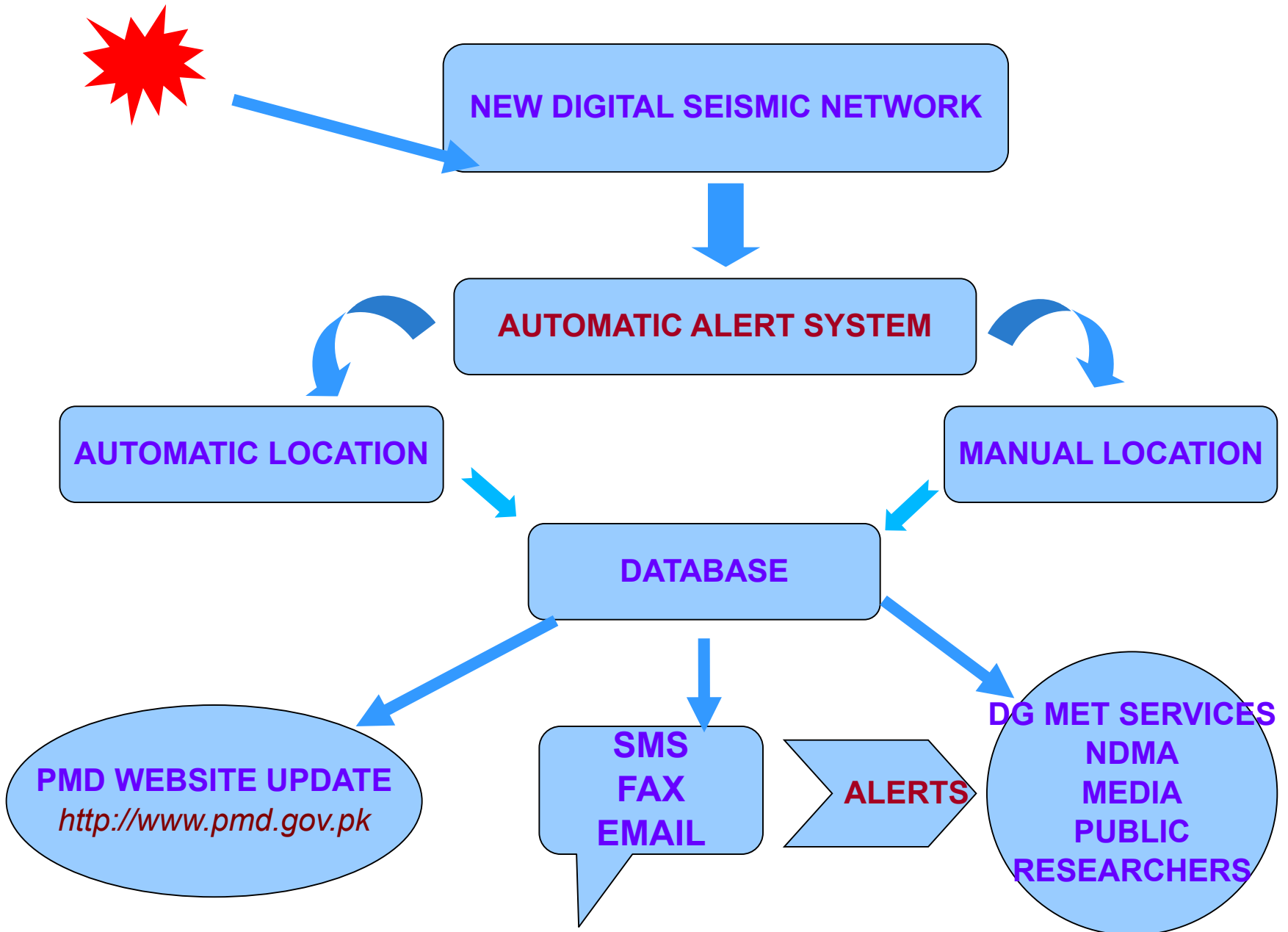


SeiscomP3 Earthquake Analysis Software

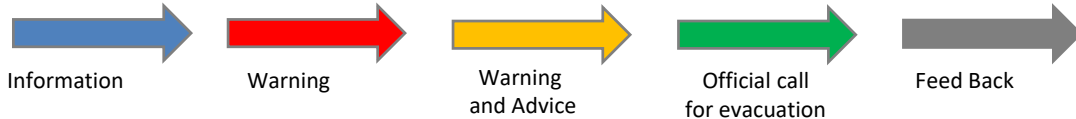
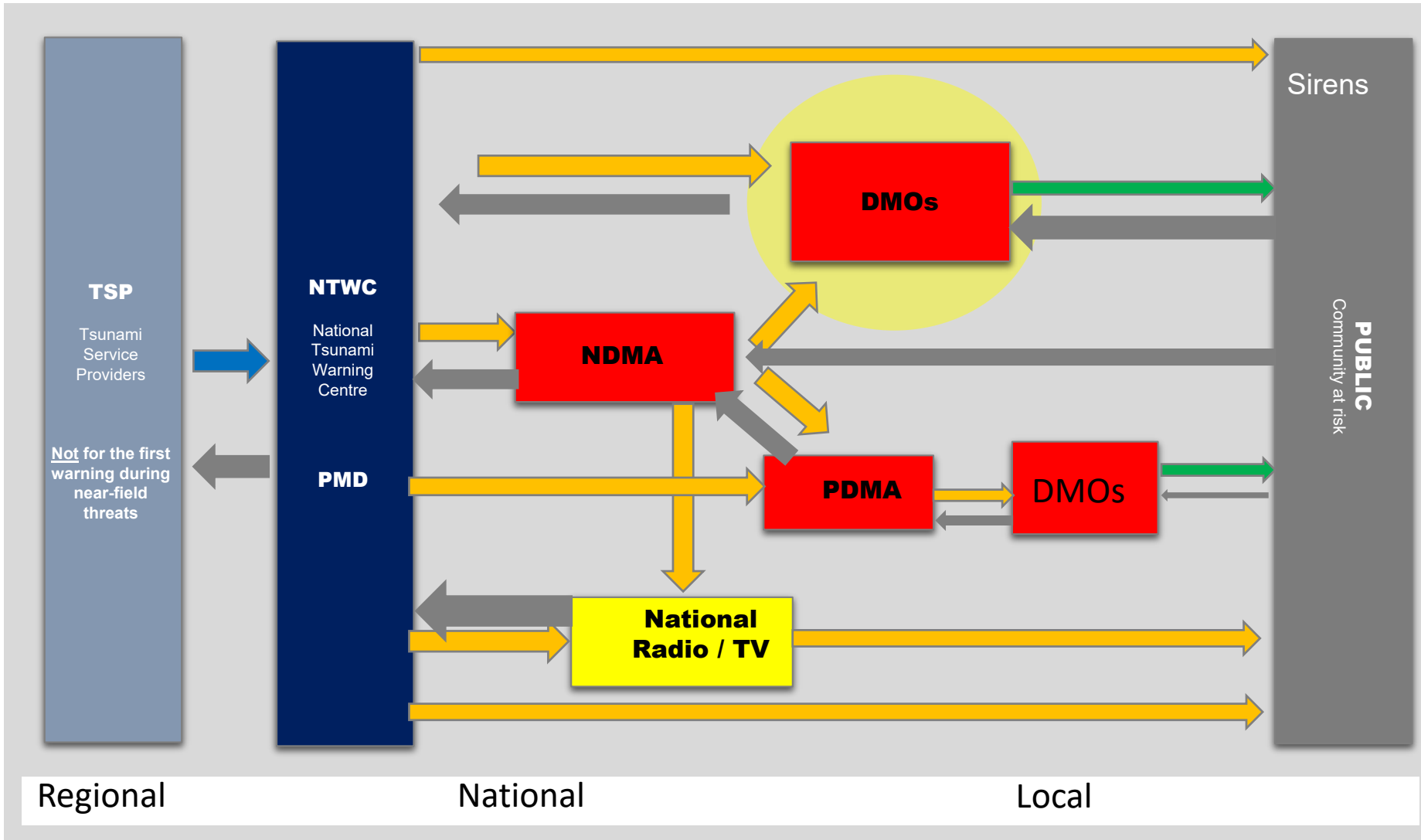


Ziarat earthquake M 6.5 dated 29th Oct. 2008 analysed by SeiscomP3 interface

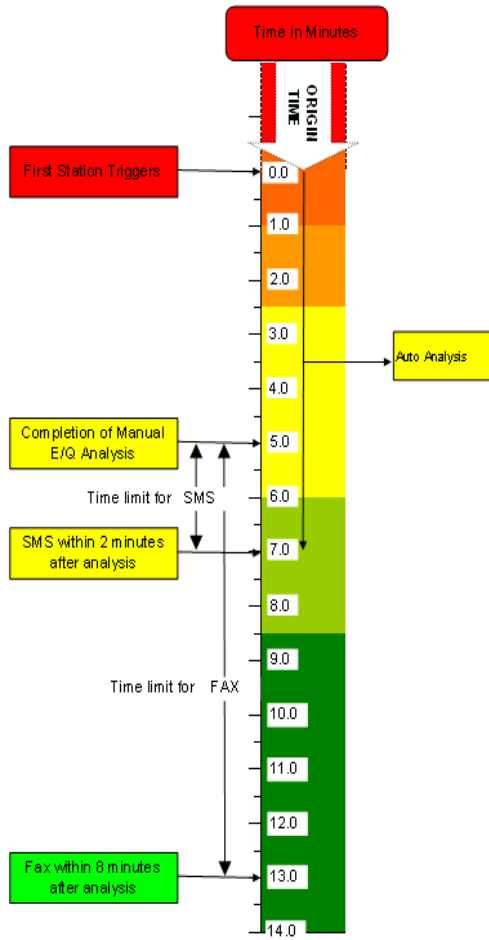
PMD Earthquake Monitoring and Operational System



Timeline message in case of near-field threats (Minutes after EQ)

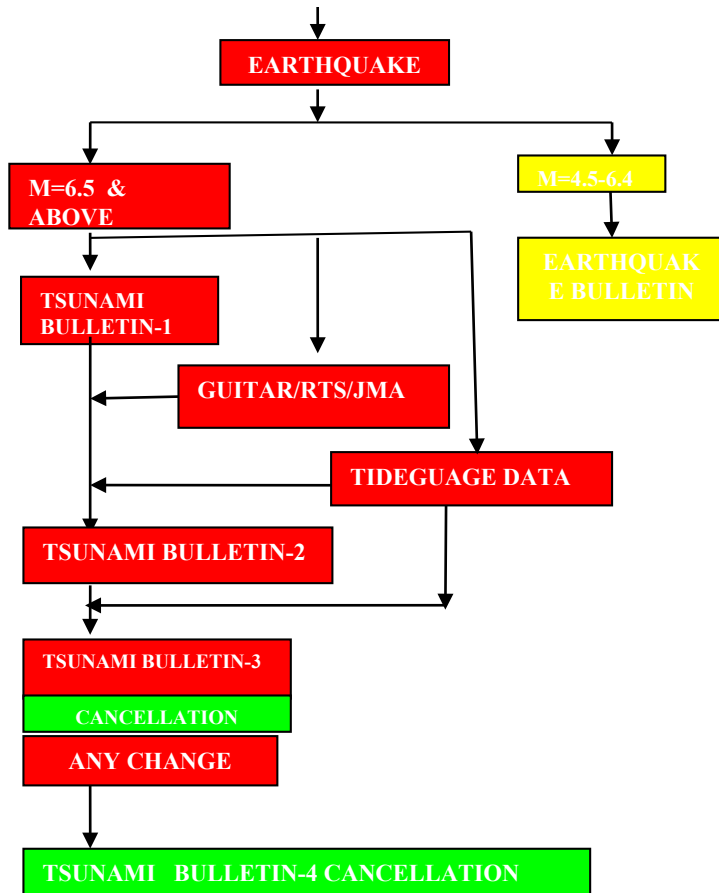


**TIME LINE FOR EARTHQUAKE PROCESSING AND DISSEMINATION OF TSUNAMI BULLETIN
(FOR MAKHRAN SUBDUCTION ZONE)**



Pakistan Warning Levels/Advice		
Wave Height	Level	Advice
≥2m	Warn	Evacuate inland towards higher ground.
0.5-1.9m	Alert	Stay away from beaches, rivers and low lying coastal areas.
0.2-0.5m	Watch	No immediate action required. Be prepared for action on updated information.
<0.2m	No Threat	"All clear.

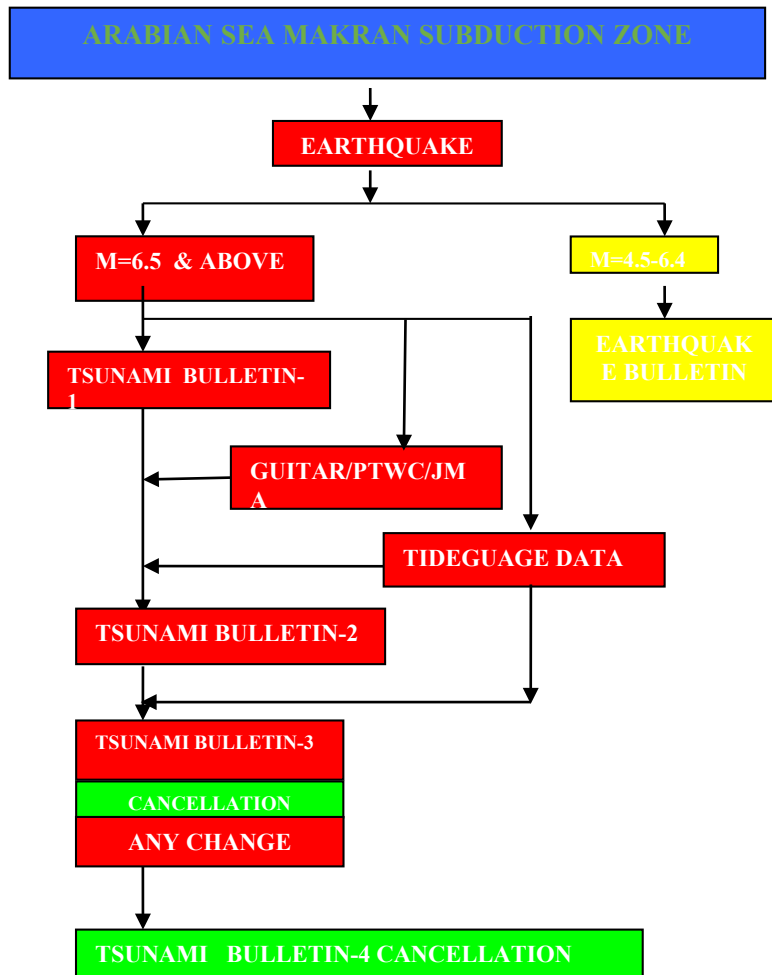
ARABIAN SEA MAKRAN SUBDUCTION ZONE



SOP FOR ISSUANCE OF “TSUNAMI BULLETINS” IN ARABIAN SEA (MAKRAN SUBDUCTION ZONE)

1. For earthquakes having magnitude between **4.5** to **6.4**, only earthquake parameters will be sent to **RESPONSE AUTHORITIES** and **MEDIA** through **SMS** and **FAX**.
2. Maximum four Bulletins will be issued for earthquakes having magnitude **6.5** or above to **RESPONSE AUTHORITIES** and **MEDIA**.
3. **BULLETIN-1**:- This bulletin will contain;
 - i. Earthquake Parameters.
 - ii. Tsunami evaluation based on historical earthquake and tsunami data.
•This bulletin will be issued according to time line of Bulletin-1.(page-9)
4. **BULLETIN-2**:- This bulletin will contain;
 - i. Revised **Earthquake Parameters** (if so).
 - ii. **Estimated arrival times and wave heights** at various locations along Pakistan Coast based on **GUITAR/RTSps of Australia, Indonesia and India**.
 - iii. **Tide gauge data** if generation of tsunami has been confirmed.
•This bulletin will be issued soon after the dissemination process of Bulletin-1 is completed.
•In case the Tsunami generation is confirmed, the first sentence of Evaluation will be deleted.
5. **BULLETIN-3**:- This bulletin will contain;
 - i. Revised **earthquake parameters** (if so).
 - ii. **Tide gauge data** of Pakistan Coast to confirm the generation of tsunami.
 - iii. Any change if tsunami has been confirmed in **Bulletin-2**.
 - iv. This bulletin will serve as cancellation in case a sufficient time has lapsed after the estimated arrival time but no significant change is observed in sea level. In such case it will be the last bulletin.
•This bulletin will be issued when ever tide gauge data confirms the tsunami generation (CONFIRMATION).
6. **BULLETIN-4**:- (**Cancellation**)
 - i. This bulletin will contain earthquake parameters and tsunami evaluation regarding cancellation.
 - ii. This will be the last bulletin and will serve as cancellation.
Important. Supplementary bulletins (SMS/FAX) will be issued in between regular bulletins depending upon the prevailing situation.

SOP FOR ISSUANCE OF “TSUNAMI WATCH” IN INDIAN OCEAN (SUMATRA & SURROUNDINGS) M 7-7.9 (WATCH)



1. No **SMS** or **Fax Bulletin** will be issued for **Earthquake** having magnitude less than **6.0**.
 2. For Earthquakes having magnitude **6-6.9**, only Earthquake parameters will be sent to designated authorities through **SMS**.T
 3. Here will be only two Bulletins for earthquakes having magnitude 7-7.9.
 4. Both the Bulletins i.e. 1 & 2 will be issued to **RESPONSE AUTHORITIES** only for information. However, if generation of tsunami has been confirmed, Bulletin-2 will also be sent to **MEDIA** only through **FAX**.
 5. **BULLETIN-1 (TSUNAMI WATCH)** will be issued for earthquakes having magnitude 7-7.9. This bulletin will contain:
 - i. **Earthquake parameters.**
 - ii. **Evaluation:** - Based on historical data an earthquake of this magnitude may generate local/Regional Tsunami. However, there is no threat for Pakistan.
- BULLETIN-2**
- i. Will be based entirely on PTWC/JMA information.
 - ii. Will contain the revised earthquake parameters (if so) and information whether Tsunami has been generated or not. It will be the last Bulletin for the Indian Ocean.

COMPONENTS OF TSUNAMI EARLY WARNING

- A. Acquisition of Earthquake Data.
- B. Analysis & Decision to issue Tsunami warning
- C. Dissemination of Tsunami Early Warning
- D. Exercises

Issuance of Tsunami Warning (Bulletins)

- Standard Operating Procedure (SOP)
- Contents of Tsunami Bulletins ---
-Earthquake parameters, Evaluation of Tsunami, Modeling results
- Cancellation or Confirmation based on sea level monitoring (Tide gauges network)
- Samples of Tsunami Warning Bulletins .

- (SEVERE TSUNAMI THREAT)
- **TSUNAMI BULLETIN-01**
- Issued at 11:05:00 PST
- National Tsunami Warning Centre (NTWC), Karachi of Pakistan Meteorological Department has recorded an Earthquake with the following preliminary seismological parameters:
- Origin time 10-09-2014 at 11:00:00 PST
- Magnitude: 8.8
- Depth: 10 Km
- Latitude: 24.8° N
- Longitude: 62.2° E
- Location: Off Coast of Pakistan
- **EVALUATION:**
- . Based on the historical data, earthquakes of this size may cause wide-spread inland damages and Destructive Tsunami generation in the Arabian Sea and along coastline of PakistanSd/=
- Duty Seismologist

DESCRIPTION OF MESSAGE (SMS)

E/Q M 8.8 in Arabian sea on 10-09-2014 at 11:00PST. Destructive tsunami may generate. Immediate evacuation is advised along Pak. Coast.

PMD.

E/Q M 9.0 (revised) in Arabian sea on 10-09-2014 at 11:00PST. Destructive tsunami may generate. Immediate evacuation is advised along Pak. Coast.

PMD.

E/Q M 9.0 (revised) in Arabian sea on 10-09-2014 at 11:00PST. Destructive tsunami generation along coast of Pakistan has been confirmed.

PMD.

E/Q M 9.0 (revised) in Arabian sea on 10-09-2014 at 11:00PST. Tsunami Threat has passed. All Clear will be decided by local authorities.

PMD.

Exercises & Tests

IOWave 14 Exercise 10 September,2014 LOG:				
Name of the Reporting Organization:				
Bulletin No.	Time Received (UTC)			Remarks/Comments
	SMS	Fax	Email	
Announcement Message (0600UTC)				

GTS Link for IOTWMS/RTSPs-UNESCO

The screenshot displays the 'eLink MCI Server Application 2.0a' window. The title bar includes 'File', 'Connection', 'System Logs', 'Arrange Data', and 'Exit'. The main header area features the title 'Meteorological Data Communication and Plotting System' and 'MCI Socket Server Application 2.1.1'. Below this, it shows 'Product Code #: EWPK150122' and 'Licensed to: Department of Meteorology, Male' Maldives'. A sidebar on the left contains icons for 'Close', 'Open', 'Files', 'Error', 'Connect', 'Arrange', 'Print Yes', 'Print No', 'Hide', and 'Close'. The main content area has tabs for 'Message List', 'Urgent Messages', 'Connection Log', 'Filename Log', 'System Error Log', 'File List', and 'Arrange Data'. The 'Urgent Messages' tab is active, displaying a message with the following text:

Connection Date :2009-07-06 Message Time :18:15:1206-07-2009 18:15-12
WEIQ23 PHEB 061233
TIBIOX
TSUNAMI BULLETIN NUMBER 001
PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 0350Z 29.APRIL 2009

THIS BULLETIN IS FOR ALL AREAS OF THE INDIAN OCEAN.
... TSUNAMI INFORMATION BULLETIN ...

THIS MESSAGE IS FOR INFORMATION AND TEST PURPOSE ONLY ONLY.

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0350Z 29.APRIL 2009
COORDINATES - 11.2 NORTH 65.1 EAST
LOCATION - SOUTH-EAST ARABIAN SEA
MAGNITUDE - 8.5

EVALUATION

A DESTRUCTIVE WIDESPREAD TSUNAMI THREAT EXIST BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI DATA.

THERE IS A POSSIBILITY OF A WIDE SPREAD TSUNAMI THAT COULD AFFECT THE COASTS LOCATED FIFTEEN HUNDRED KILOMETERS AWAY FROM THE EARTHQUAKE

PRESENTED. AUTHORITIES IN THE REGION NEAR THE EPICENTER SHOULD BE

At the bottom of the window, the status bar shows: 'Sunday 14/03/2010, 09:25:54 GMT | Status: Stop | IP: 192.168.0.241 Port: 0'.

Issuance of Tsunami Warning (Bulletins)

- **Standard Operating Procedure (SOP)**
- **Contents of Tsunami Bulletins ----Earthquake parameters, Evaluation of Tsunami, Modeling results**
- **Cancellation or Confirmation based on sea level monitoring (Tide gauges network)**
- **Samples of Tsunami Warning Bulletins**

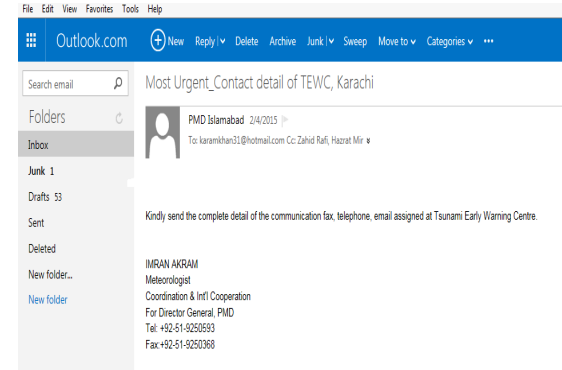
Modes of Early Warning Dissemination



SMS messenger

Pakistan Weather	Satellite/Radar Images
National Forecast, Cities Forecast Weekly, Seasonal Outlook	Pakistan, Asia, Global Satellite Images Radar Network
Aviation Products	Flood Update
Aviation Weather Charts, NMCC Charts Metars, Tafors	Flood Forecasts, Dams Flows, Lai Nullah GIS Maps, Rainfall/Temperature
Drought Monitoring	Farmer's Weather
Current Drought Situation/Monitoring Soil Moisture Analysis/Advisory	Farmers Forecasts, Agromet Bulletins Crop Vegetation Index, Crops Report
Tropical Cyclone/Marine Weather	Earthquake Information
Tides, Wave Height, Wind speed Coastal Areas Forecast, SST	Recent Earthquakes, Seismic Reports Seismic Monitoring Network

PMD Website



Email



FAX



Alarm System
(Proposed)

Tsunami Warning Dissemination Contact List

S.NO.	ORGANIZATION	FOCAL PERSON	MOBILE NO.	OFFICE NO.	FAX NO.	EMAIL/ADDRESS
01	NDMA	LT.COL.RAZA IQBAL	0301-5565737	051-9105035	051-9205086	dirresponse@ndma.gov.com
02	PDMA(Balochistan)	SAIF-UR-REHMAN	0300-3376892	0812-881168	0812-880189	saifpanezai@gmail.com
03	Deputy Commissioner (Lasbella)	CAPT.ALI IJAZ	0345-4500296	0853-610231	0853-610252	alithcavalier@gmail.com
04	Deputy Commissioner (Gwadar)				0864-211362	
05	PDMA(Sindh)	AKHLAQ QURESHI	0300-8281311		021-99251463	8281311@gmail.com
06	Commissioner KARACHI	ANIS AHMED USMANI	0345-2834688	021-99204451	021-99204729	
07	Deputy Commissioner (Badin)	SYED.ATTAULLAH SHAH	0333-2851860		0297861996	majeedbaber@gmail.com
08	Deputy Commissioner (Thatta)				0298-920058 0298-220069	
09	KPT(Operation)	UMAIR	0333-2405650	021-99214555	021-99214555	orokpt@yahoo.com
10	KPT(Hyrographer)				021-99214555	
11	PAK.NAVY	LT.CDR.TANVEER SHAMS HQ.NAVAREA-IX	0321-2435236		021-99201623	hydropk@paknavy.gov.pk hydrpk@gmail.com
12	KANUPP	CONTROL ROOM MUSHTAQ.	0300-8216933		021-99204490 021-99202240	knpc@knpc.gov.pk
13	OPs Room ORO NHQ	NHQ			051-9261551	dno@paknavy.gov.pk
14	Ops RoomHQ	COMLOG	0336-2216416		021-99204910	NIL
15	Ops Room HQ	COMCOAST	0335-1374803		021-99201783	comcoast@paknavy.gov.pk
16	Ops Room HQ	COMKAR	0313-8671697		021-99201795	Oro767@gmail.com
17	OPERATION Room HQ	COM PAK			021-35867737	Shipping912@yahoo.com
18	J.D.E. WELFARE ORG (NGO)		0334-3443313	021-32033345		
19	Commission Karachi	ANIS AHMED USMANI	0345-2834688	021-99204451	021-99204729	NIL
20	Lt.Ahmed	J.M.I.C.C(MANORA)	0342-2977709 0335-8107739		021-99232196	jmio@paknavy.gov.pk
21	PDMA(SINDH(2))	SHAYYAN DY.DIRECTOR	0300-9371186			mshayyanshah@hotmail.com

Tsunami Warning Dissemination Contact List

S.NO.	ORGANIZATION	FOCAL PERSON	MOBILE NO.	OFFICE NO.	FAX NO.	EMAIL/ADDRESS
01	NDMA	LT.COL.RAZA IQBAL	0301-5565737	051-9105035	051-9205086	dirresponse@ndma.gov.com
02	PDMA(Balochistan)	Zahid Saleem	0300-8384489	0812-881168	0812-880189	NIL
03	Deputy Commissioner (Lasbella)	CAPT.ALI IJAZ	0345-4500296	0853-610231	0853-610252	alithcavalier@gmail.com
04	Deputy Commissioner (Gwadar)				0864-211362	
05	PDMA(Sindh)	AKHLAQ QURESHI	0300-8281311		021-99251463	8281311@gmail.com
06	Commissioner KARACHI	ANIS AHMED USMANI	0345-2834688	021-99204451	021-99204729	
07	Deputy Commissioner (Badin)	SYED.ATTAULLAH SHAH	0333-2851860		0297861996	majeedbaber@gmail.com
08	Deputy Commissioner (Thatta)				0298-920058 0298-220069	
09	KPT(Operation)	UMAIR	0333-2405650	021-99214555	021-99214555	orokpt@yahoo.com
10	KPT(Hyrographer)				021-99214555	
11	PAK.NAVY	LT.CDR.TANVEER SHAMS HQ.NAVAREA-IX	0321-2435236		021-99201623	hydropk@paknavy.gov.pk hydrpk@gmail.com
12	KANUPP	CONTROL ROOM MUSHTAQ.	0300-8216933		021-99204490 021-99202240	knpc@knpc.gov.pk
13	OPs Room ORO NHQ	NHQ			051-9261551	dno@paknavy.gov.pk
14	Ops RoomHQ	COMLOG	0336-2216416		021-99204910	NIL
15	Ops Room HQ	COMCOAST	0335-1374803		021-99201783	comcoast@paknavy.gov.pk
16	Ops Room HQ	COMKAR	0313-8671697		021-99201795	Oro767@gmail.com
17	OPERATION Room HQ	COM PAK			021-35867737	Shipping912@yahoo.com
18	J.D.E. WELFARE ORG (NGO)		0334-3443313	021-32033345		
19	Commission Karachi	ANIS AHMED USMANI	0345-2834688	021-99204451	021-99204729	NIL
20	Lt.Ahmed	J.M.I.C.C(MANORA)	0342-2977709 0335-8107739		021-99232196	jmio@paknavy.gov.pk
21	PDMA(SINDH(2))	SHAYYAN DY.DIRECTOR	0300-9371186			mshayyanshah@hotmail.com

Success of TEWS

Depends upon;

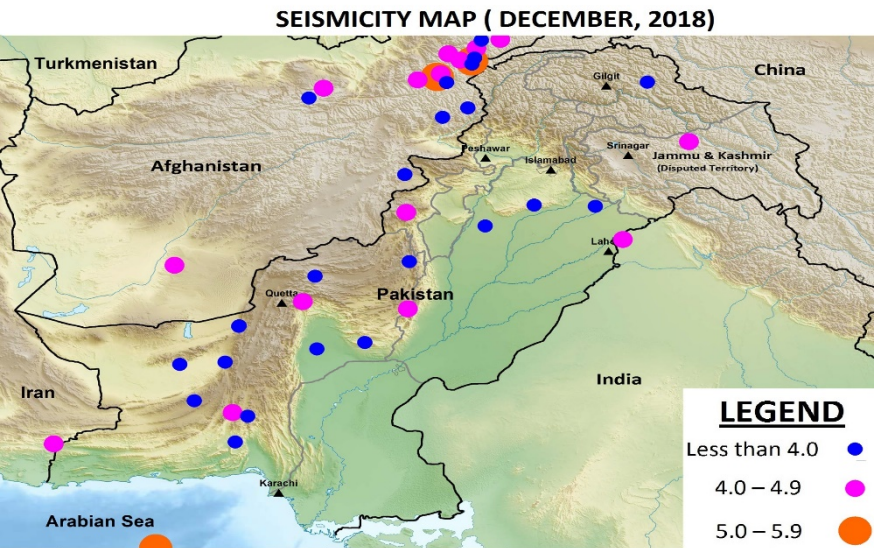
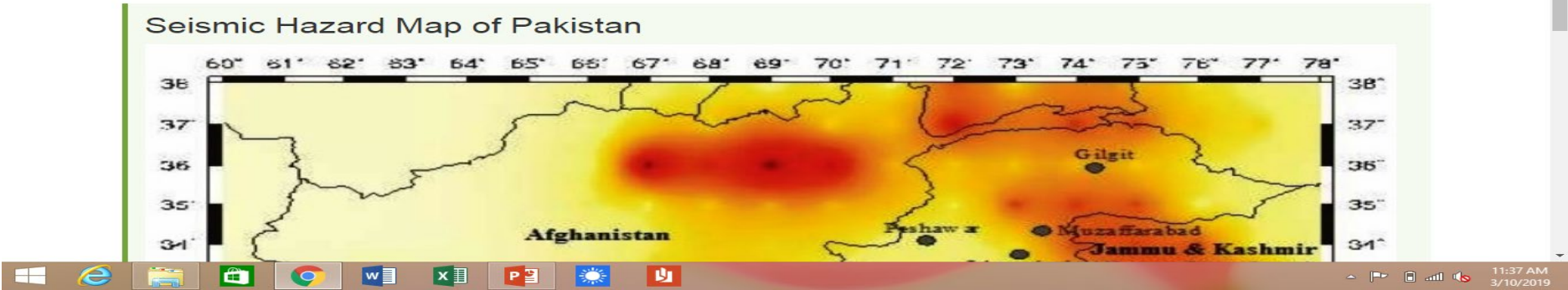
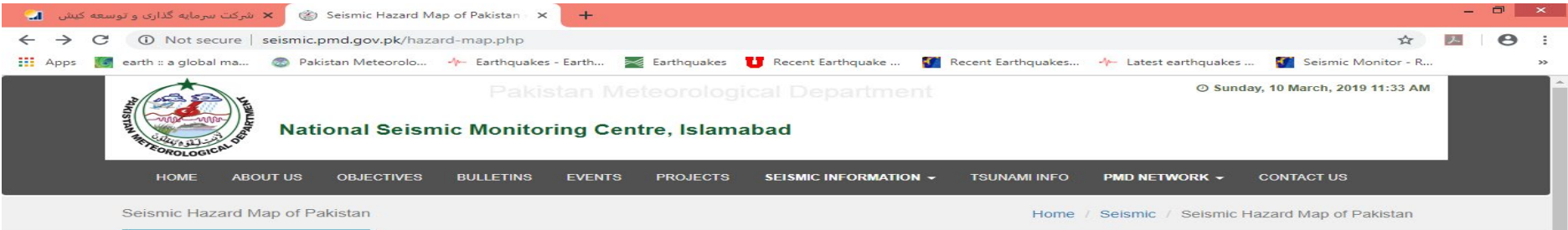
● **Awareness to Public.**

● **When to Evacuate and Where to Evacuate.**

● **Evacuation Sites and their Location.**

PMD official web page for latest earthquake updates

<http://seismic.pmd.gov.pk/events.php>



The screenshot shows the 'Events' page on the PMD website, displaying a list of 6040 earthquake events. The table below shows the first few entries:

Date	Time (utc)	Latitude	Longitude	Magnitude	Depth (km)	Region	Mode	Map
07/03/2019	15:27:28	32.89 S	177.42 W	5.5	10	South of Kermadec Islands	A	-
07/03/2019	15:34:28	29.48 S	72.51 W	5.7	10	Off Coast of Central Chile	A	-
07/03/2019	11:31:38	30.79 N	140.76 E	5.3	10	Southeast of Honshu, Japan	A	-
07/03/2019	10:59:17	23.23 S	174.16 W	5.0	10	Tonga Islands Region	A	-
07/03/2019	10:56:06	38.81 N	69.77 E	4.8	19	Tajikistan	A	📍
07/03/2019	09:46:06	51.89 N	175.29 W	5.1	96	Andreanof Islands, Aleutian Islands	A	-
07/03/2019	06:44:24	28.93 N	68.96 E	4.2	10	Near Dera Bugti, Pakistan	M	-



2009-08-05 - 05:21:38

10 min. and 34 sec. ago

Magnitude 8.3**Off Coast of Pakistan****Depth -**

24.50° N 63.00° E

M 8.3

MLv -

mb -

mB -

Mw(mB) -

Phases: -

RMS Res.: -

Event ID: Event#20090805052138

-

-

-

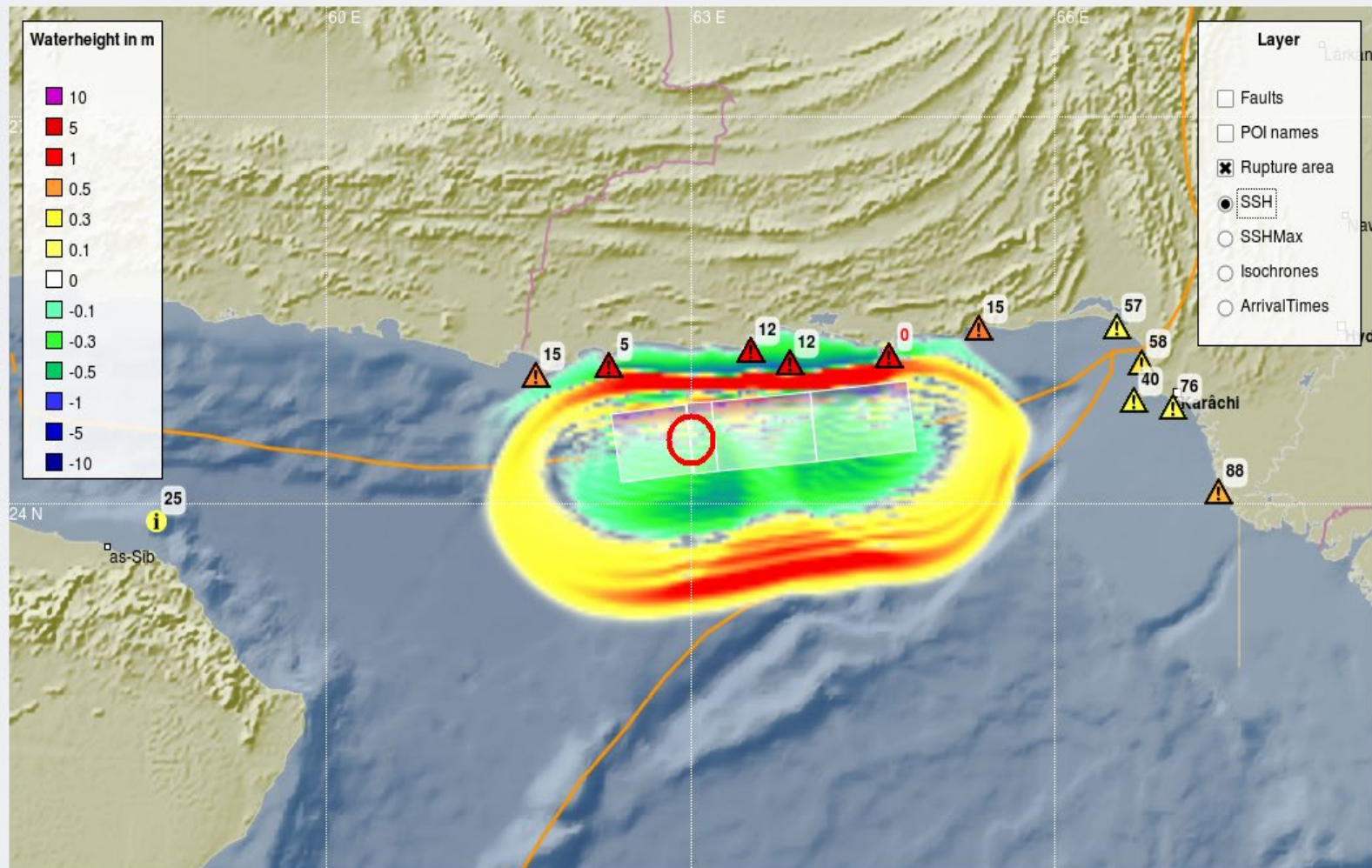
-

-

Map Traces Arrivals Events

2009-08-05 - 05:31:38

34 seconds ago



▼ Event#20090805052445.

24.50,63.00,8.3

000001 LSWAB

Finished 120 mins

000002 LSWAB

Finished 120 mins

Delete

Select



00:10:34



-01:49:25



Preparing Children for Earthquake and Tsunami



Tsunami Evacuation Drill



Thanks