

**UNESCO-IOC**  
**Strengthening Tsunami Warning and Emergency**  
**Responses: Training workshop**  
**on**  
**The Development of Standard Operating Procedures**  
**23-27 November 2009, Karachi, Pakistan**

**November 23, 2009 (Day 1)**

Strengthening Tsunami Warning and Emergency Responses: Training Workshop on the Development of Standard Operating Procedures was held at National Seismic Monitoring & Tsunami Early Warning Centre (NSM & TEWC), Pakistan Meteorological Department (PMD), Meteorological Complex, University Road, Karachi during the period 23-27 November, 2009. The Training workshop was the last of series of Standard Operating Procedures (SOPs) workshop. The Inaugural



*Participants of UNESCO-IOC-PMD 3rd SOPs  
Training Workshop*

Ceremony Schedule is enclosed as Appendix - I. While the Schedule of Training Workshop is enclosed as Appendix – II. Thirty participants from Pakistan Meteorological Department and Other Stakeholders viz. National Disaster Management Authority (NDMA), Pakistan Navy (PN), Maritime Security Agency (MSA), National Institute of Oceanography (NIO), Red Crescent Pakistan (RCP) & Karachi Port Trust (KPT) officials participated in the workshop. The list of participants is attached as Appendix – III.

The Inaugural speech was made by Dr. Mirza Arshad Ali Beg, the Ex-Director General, Pakistan Council of Scientific and Industrial Research (PCSIR). He identified the tectonic movements and its impact on coastal belt of Pakistan by his experience as well as his study. He also reviewed the consequences of these tectonic movements in the generation of earthquake and tsunami on whole coastal belt of Pakistan.

Mr. Muhammad Riaz, Chief Meteorologist, (PMD) welcomed the participants and elaborated the importance on development of common Standard Operating Procedures (SOP) for Pakistan. Speech made by him, reflected the efforts of the team of NSM & TEWC, Karachi in tsunami warning dissemination in minimum time in the light of Standard Operating Procedure framed by PMD. He thanked all the stakeholder viz. NDMA, PDMA & DDMA's and other organizations like UNESCO and Pakistani media.

Mr. Tony Elliott, from IOC, UNESCO, reviewed the past two SOPs Workshop and gave an overview of the present (third) SOP Training Workshop. He explained why the Tsunami is called a hazard and how Tsunami Early Warning may be disseminated on end-to-end basis through the co-ordination among various stakeholders. He indicated the goal of the workshop to strengthen the Tsunami Early Warning/Emergency Response and share the best template and guide in Pakistan SOPs.

Mr. Masahiro Yamamoto, dilated upon the Standard Operating Procedures of Tsunami Warning Centres. He described the relation between the agreed steps used in coordinating for Tsunami Early Warning. Based on Tsunami Travel Time and the proposed action required in SOP timeline. He suggested the procedure for warning dissemination on the basis of SOP. He emphasised to build awareness and preparedness at the national and community level is essential.

Mr Ardito Kodijat, Programme Officer, continued the topic of Mr. Masahiro Yamamoto and told that prompt action and right decision should be taken with great care should be taken. He proposed that the drills and excises, among the stakeholder which would help in developing the SOP for the country. He indicated and bifurcated the emergency responsibilities among National, Provincial and District Disaster Management Authorities.

Mr. Muhammad Riaz, Chief Meteorologist briefed the progress of Current SOP for Pakistan Tsunami Warning Centre. He enlightened the SOPs for issuance of updated Earthquake/Tsunami, Bulletin on the basis of tide guage data and cancellation of the bulletin. He informed that NSM & TEWC has developed separate SOPs on the basis of area and severity. He also told that NSM & TEWC has prepared stakeholders list for warning dissemination based on the criteria of area and severity.

In the second session of the day, the participants visited NSM & TEW Centre to monitor the activities in the real working environment. They saw for themselves the working capacity and limitation of NWM & TEWC. The visit of the NSM & TEWC came to an end with the Q & A session.

Later, the participants were divided into two groups viz TWC and TER. A discussion on Pakistan TWC SOPs for event analysis-Earthquake monitoring and tsunami threat evaluation from earthquakes having different magnitude and epicenters were also discussed among Mr. Masahiro Yamamoto and PMD Officials as a group onTWC. Similarly, tsunami threat evaluation of tsunamies from sea level, was also discussed within the group.

In the group TER, Mr. Ardito Kodijat, Programme Officer presented a scenario of end-to-end tsunami early warning system (TEWS) and identified the stakeholders therein. He pointed out relationship between International Agency, Pacific Tsunami Warning Centre (PTWC), National agency (NSM & TEWC), Media and Public general masses through some authorized agency. He briefed the roles and responsibilities of national, provincial and district disaster management authorities. He also elaborated the roles and responsibilities of emergency services, media public and underlined the importance of SOPs. He quoted examples from the SOP of Indonesian Warning Chain.

Mr. Ardito Kodijat continued to explain how the DDMA can help in the successful tsunami emergency response on historical and scientific basis. He described the development of end-to-end tsunami early warning, mitigation system implementation strategy and how to identify DDMA as leading agencies at all levels of the government. He advised to setup a coordinating committee among stakeholders at government level and to adopt policies and legislation clauses. He proposed to have a multi hazard plan on 24/7 basis at national level and have a tsunami emergency response specifically. He also suggested to develop a rapid 24/7 communication dissemination and evacuation up to the ends of vulnerable areas and elevate preparedness and increase awareness with the help of drills and exercises.

### **November 24, 2009 (Day 2)**

Mr. Tony Elliott reviewed the activities of the previous day and briefed the agenda for the second day. Mr. Masahiro Yamamoto shared the Tsunami Warning message templates, formats and contents of Japan Meteorological Agency (JMA). He briefed outline of JMA Tsunami Warning Operation. He showed timeline of Emergency Operation triggered by Seismic Intensity Information. He informed that the JMA disseminates the earthquake intensity and tsunami Warning within five minutes. First this information is disseminated to Prime Minister's Official Residence, Emergency Assembly Team where Cabinet Office starts estimation of damages, Japan Coast Guard also investigation of damages besides Fire and Disaster Management Agency and Metropolitan Police Department. NHK broadcasts the announcement on Radio and TV. He showed examples of Warning message from level-0 to level-3 and warning cancellation criteria.



*Group involved in mock exercise*

Mr. Tony Elliott briefed about how TWC SOPs can be used as Tsunami Warning Decision Support Tools. He demonstrated different Tsunami Warning Decision Support softwares. The real-time Earthquake Display and Alert System (CISN) software is internet based and is a passive automatic receiver. The software is multi-platform and is capable to broadcast earthquake alert (via SMS and email). It has GIS layers and tsunami warning messages. The TideTool – Interactive Sea Level Monitoring is an operational Tool for Tsunami Warning Centres. The software decodes displays and manipulates sea level data. IOC also maintain Sea Level Monitoring faculty on its web-site by providing satellite transmitted data, the GTS messages, displays of expand time series and Global Historical Databases. The TSUDig is a global historical DB tool. It has offline GIS information. The Tsunami Travel Time (TTT) Calculation and map display tool calculates and displays tsunami wave travel time. He showed how a national TWC can make their SOP effective by the help of Tsunami Warning Decision Support Tools.

Mr. Ardito Kodijat explained the potential roles of the media in warning dissemination. He explained how media plays a vital role in the warning chain. He interlinked the international agencies, NITWC, Media and public and briefed how reduce the impact of disaster and also explained the role of media. Media is a useful

tool to convey vital information and can play an important role during emergency response and rehabilitation, besides preparedness, risk reduction and mitigation. He advised to have a timeline and flowchart for TEW. He also advised to have a spreadsheet timeline template for emergency response. As a case study, Tonga, New Zealand earthquake of 4 May, 2006 of earthquake 8.1 was studied. Its consequences were discussed and corrective actions with threshold table at different coast in tabular form were shown.

A tsunami preparedness exercise was conducted in TER working group. District Disaster Management Authority (DDMA) decision making process was conducted as an example with the help of flow chart and diagram. Near field tsunami Makran case was discussed for DDMA decision making process. The flow charts, for near field and for far field Tsunamis were demonstrated for Makran. The ECO and ERTs activations and warning dissemination were also discussed. He suggested that the flow chart does not fulfill in addition SOP on DDMA level is required.

### **November 25, 2009 (Day 3)**

Mr. Tony Elliott reviewed the activities of previous day and briefed the agenda for the third day. Mr. Masahiro Yamamoto illustrated how the operational team and rotational plan on daily, weekly, monthly and yearly basis can be designed. He illustrated formation of team and responsibility of team leader and members. He suggested half an hour overlap in shift timing for briefing on handing-over and taking over of the shift. He showed JMA shift schedule as an example. He proposed that earthquake/ seismic activity, system operation and other reports may be included in briefing during changing of shift. He illustrated this brief pictorially. He also illustrated how to maintain log book, system trouble report, check list and daily training for TWC. He exemplified a day time scheduled with assigned duties. He suggested a review and check for previous day data. He told review tools viz.; Epicenter distribution; background seismicity; hypocenter information; Cross section; hypocenter and station distribution; S-phase, P-phase; mantle wedge; review hypocenter in case of inside the mantle wedge; O-C residual results; correction if required and take a final decision. He told that JMA publishes its weekly earthquake report on every Friday. He proposed that Monthly and Yearly reviews may consist of Drill, monthly meeting, training of new Staff, station parameters setting and trigger with the help of examples. He briefed how to find the appropriate threshold value.

Mr. Ardito Kodijat discussed with the TER-group members on improving Pakistan TER SOPs, its time line and action plan in detail and suggested some useful tips in this regards.

### **November 26, 2009 (Day 4)**

Mr. Tony Elliott reviewed the activities of previous day and briefed the agenda for the fourth day. Mr. Masahiro Yamamoto discussed limitations and challenges of tsunami emergency response operation. He defined Stations Parameters Tuning procedures, making trigger group, trigger tuning and how to find appropriate threshold value. He suggested first half of the general shift as a review starting time. He pointed out the measures to resolve these issues. He informed JMA tsunami evacuation basic rules and important and positive role of press conferences. He suggested rapid revision and cancellation of warning by centroid Moment Tensor (CMT) Solution. He illustrated flowchart after rupture analysis. He illustrated application of March 2005 earthquake

at west of Fukuoka Pref. from earthquake occurrence to calculation. The graph was displayed for aftershocks activity of major inland earthquakes in Japan. He showed updating of Database for tsunami warning and tsunami forecasting method. He emphasised Karachi and Islamabad cooperation like Tokyo and Osaka DMO are doing.

### **November 27, 2009 (Day 5)**

A tsunami exercise was conducted among participants for Pakistan. The exercise was evaluated during which, Participants offered comments on problems and improvements of the exercise.

In the afternoon Project summary was discussed. Participants offered their views on strategies, approaches, step for achieving end-to-end tsunami warning system and recommendations for moving forward for the under consideration SOP. Two groups namely Karachi-TWC and Islamabad-TWC made their presentation on SOP. At the end certificate distribution ceremony was held.



*Exercise conducted by Mr. Masahiro Yamamoto for TEW-group at Training Workshop*

**SCHEDULE FOR THE INAUGURAL CEREMONY**

<u>Date and Time (PST)</u>	<u>Place and Programme</u>
Monday, November 23, 2009	NSM & TEWC Hall, Met. Complex, Karachi
0830 – 0850 PST	Registration of Participants/Observers
0900 – 0905 PST	Guests and Participants take their Seats
0910 PST	Arrival of Chief Guest
0910 PST	Recitation from the Holy Quran
0915-0930 PST	Opening Remarks by the Chief Meteorologist
0930-1000 PST	-A bit about Phenomenon by Mr. Ardito / Chief Met., PMD
1000-1030 PST	Tsunami – A brief History a small Documentary on 2004 Tsunami and the Destruction phenomena
1030-1100 PST	Refreshments

## PROGRAMME FOR THE SOPs TRAINING WORKSHOP

Day-1

Session	Start Time	End Time	Topic	Speaker
1-TWC-TER			23 NOVEMBER 2009, DAY 1:	
			MORNING - TWC and TER MEET TOGETHER	
	8:30	9:00	Registration	Pakistan
1.1	9:00	9:15	Opening Remarks	IOC, Pakistan
1.2	9:15	9:25	Mission 1 and 2 Review; Mission 3 Training Workshop Overview	Elliott
1.3	9:25	9:30	Logistics and other administrative items	IOC, Pakistan
			Tsunami SOPs - Overview and Progress	
1.4	9:30	10:00	Tsunami Warning Centres Standard Operating Procedures - Review	Yamamoto
1.5	10:00	10:30	Tsunami Emergency Response Standard Operating Procedures - Review	Kodijat
	10:30	11:00	COFFEE / TEA BREAK - Group Photo	
1.6	11:00	11:45	Pakistan Tsunami Warning Centre: Current SOP progress	Pakistan
1.7	11:45	12:30	Pakistan Tsunami Emergency Response: Current SOP progress	Pakistan
	12:30	13:30	LUNCH	
			AFTERNOON	
			TWC and TER MEET TOGETHER	
1.8	13:30	14:15	Pakistan Earthquake and Tsunami Warning Centre Tour	Pakistan Meteorological
1.9	14:15	15:00	Mission 2 Action and Recommendations - The Way Forward, Day 5 Tsunami Exercise Planning	Elliott, All
	15:00	15:30	COFFEE / TEA BREAK	
			TWC and TER MEET SEPARATELY	
1-TWC			TWC AGENDA - Pakistan TWC SOPs - Earthquake and Sea Level	
1.10	15:30	16:15	Pakistan TWC SOPs for event analysis: Earthquake monitoring and tsunami threat evaluation from earthquakes	Pakistan Meteorological Dept, Yamamoto
1.11	16:15	17:00	Pakistan TWC SOPs for event analysis: Sea Level monitoring and tsunami threat evaluation from sea level information	Pakistan Meteorological Dept, Yamamoto
1-TER			TER AGENDA - End-to-end Warning	
1.10	15:30	16:00	End-to-end Tsunami Warning - Stakeholders, Roles and Responsibilities, Standard Operating Procedures, and their linkages	Kodijat
1.11	16:00	16:30	10 Steps to Enable a Successful Tsunami Emergency Response	Kodijat
1.12	16:30	17:00	Evacuations: Alerting and Moving People, Inundation maps, Evacuation Routes and Signage, Safe return	Kodijat

Day-2

Session	Start Time	End Time	Topic	Speaker
2-TWC			24 NOVEMBER 2009, DAY 2:	
			MORNING - Pakistan TWC SOPs - Model scenarios, Messages	
2.1	9:00	9:15	Day 1 Review and Day 2 Agenda	Elliott
2.2	9:15	10:00	Pakistan TWC SOPs for event analysis: Tsunami Threat evaluation from pre-calculated scenarios	Pakistan Meteorological Dept, Yamamoto
2.2	10:00	10:30	Tsunami Warning Center Messages - templates, formats and content	Yamamoto
	10:30	11:00	COFFEE /TEA BREAK	
2.3	11:00	12:30	Pakistan TWC SOPs for messages, alert dissemination and public information flow, including the media	Pakistan Meteorological Dept, Yamamoto
	12:30	13:30	LUNCH	
			AFTERNOON - Decision Support Tools	
2.4	13:30	14:15	TWC SOPs using Tsunami Warning Decision Support Tools - Using CISN, Tide Tool / IOC SL Monitor web site, TsuDig and TTT	Elliott
2.5	14:15	15:00	Using earthquake and tsunami message monitoring software (CISN)	Elliott, Yamamoto
	15:00	15:30	COFFEE /TEA BREAK	
2.6	15:30	16:15	Using Tsunami Travel Time Calculation Software (TTT) and Tsunami Historical Database Software (TsuDig), Pakistan Tsunami Scenarios Database	Elliott, Yamamoto
2.7	16:15	17:00	Using Sea Level Monitoring software (Tide Tool, IOC Sea Level web site)	Elliott, Yamamoto
2-TER			24 NOVEMBER 2009, DAY 2:	
			MORNING - Alerting and Case Studies	
2.1	9:00	9:15	Day 1 Review and Day 2 Agenda	Kodijat
2.1	9:00	9:45	Warning Dissemination and Public Alerting Options - Potential roles of the Media	Kodijat
2.2	9:45	10:30	Use of Timelines in Emergency Response	Kodijat
	10:30	11:00	COFFEE /TEA BREAK	
2.3	11:00	12:30	Tsunami Emergency Response - Distant and Local Tsunami Threat - Case Studies on present operations -New Zealand, Hawaii, Japan, Indonesia	Kodijat
	12:30	13:30	LUNCH	
			AFTERNOON - Exercises and SOP Development	
2.4	13:30	14:15	Use of Exercises in Tsunami Preparedness	Kodijat
2.5	14:15	15:00	Using Templates to Develop Timeline of Processes and Actions as SOPs	Kodijat
	15:00	15:30	COFFEE /TEA BREAK	
2.6	15:30	17:00	Work on improving Pakistan TER SOPs: Using Templates to Develop Timeline of Processes and Actions as SOPs	Pakistan

Day-3

Session	Start Time	End Time	Topic	Speaker
3-TWC			25 NOVEMBER 2009, DAY 3:	
			MORNING - Messages and TWC SOPs	
3.1	9:00	9:15	Day 2 Review and Day 3 Agenda	Elliott
3.2	9:15	10:30	Pakistan TWC SOPs for routine daily maintenance and quality control: Earthquake and Sea Level networks	Yamamoto
	10:30	11:00	COFFEE / TEA BREAK	
3.3	11:00	12:30	Review, and Question and Answer - Improving SOPs	Elliott, Yamamoto
	12:30	13:30	LUNCH	
			AFTERNOON - TWC SOPs	
3.4	13:30	15:00	Work on improving Pakistan TWC SOPs	Pakistan
	15:00	15:30	COFFEE / TEA BREAK	
3.4	15:30	17:00	Work on improving Pakistan TWC SOPs - continued	Pakistan
3-TER			25 NOVEMBER 2009, DAY 3:	
			MORNING - TER SOPs	
3.1	9:00	9:15	Day 2 Review and Day 3 Agenda	Kodijat
3.2	9:15	10:30	Work on improving Pakistan TER SOPs: Timeline of Processes and Actions	Pakistan
	10:30	11:00	COFFEE / TEA BREAK	
3.2	11:00	12:30	Work on improving Pakistan TER SOPs: Timeline of Processes and Actions - continued	Pakistan
	12:30	13:30	LUNCH	
			AFTERNOON - TER SOPs	
3.2	13:30	15:00	Work on improving Pakistan TER SOPs: Timeline of Processes and Actions - continued	Pakistan
	15:00	15:30	COFFEE / TEA BREAK	
3.2	15:30	17:00	Work on improving Pakistan TER SOPs: Timeline of Processes and Actions - continued	Pakistan

**Day-4**

Session	Start Time	End Time	Topic	Speaker
4			26 NOVEMBER 2009, DAY 4:	
			MORNING - TWC Operations	
4.1	9:00	9:15	Days 1 - 3 Review	Elliott
4.2	9:15	9:30	Days 4-5 Agenda	Elliott
4.3	9:30	10:30	Tsunami Warning Center Operations - Limitations and Challenges	Yamamoto
	10:30	11:00	COFFEE /TEA BREAK	
			TER Operations, Day 5 Exercise	
4.4	11:00	11:45	Tsunami Emergency Response Operations - Limitations and Challenges	Kodijat
4.5	11:45	12:30	Day 5 Tsunami Exercise Planning: Conduct, Format, Scenario, Outcomes	Elliott / Kodijat
	12:30	13:30	LUNCH	
			AFTERNOON - Pakistan Tsunami SOPs and Exercise Preparation	
4.6	13:30	14:15	Pakistan TWC SOPs - all scenarios	Pakistan
4.7	14:15	15:00	Pakistan TER SOPs - all scenarios	Pakistan
	15:00	15:30	COFFEE / TEA BREAK	
4.8	15:30	16:00	Tsunami Exercise Preparation Needs	Elliott / Kodijat
4.9	16:00	17:00	Tsunami Exercise Preparation	Pakistan

**Day-5**

Session	Start Time	End Time	Topic	Speaker
5			27 NOVEMBER 2009, DAY 5:	
			MORNING - Pakistan Tsunami Exercise	
5.1	9:00	9:45	Final Tsunami Exercise Preparation	Pakistan
	9:45	10:15	COFFEE / TEA BREAK	
5.2	10:15	12:15	Tsunami Exercise	Exercise Controllers, All
	12:15	14:00	LUNCH	
			Post-Exercise Evaluation	
5.3	14:00	14:45	Exercise Evaluation Preparation	Pakistan
5.4	14:45	15:30	Exercise Evaluation - Comments, Problems, Improvements	Exercise Controllers,
	15:30	16:00	COFFEE /TEA BREAK	
			AFTERNOON - Project Summary and Closing Ceremonies	
5.5	16:00	16:30	Project Summary Discussion: Strategies, Approaches, Steps for achieving end-to-end TWS - Recommendations for moving forward	Elliott, All
5.6	16:30	17:00	Presentation of Certificates and Closing	IOC, Pakistan

LIST OF PARTICIPANTS

Appendix – III

<b>S.No.</b>	<b>Particulars of Participants</b>
1	Mr. Muhammad Khalid Professional Assistant Pakistan Meteorological Department, Karachi
2	Mr. Muhammad Sohail Gadiwala Senior Programmer, Pakistan Meteorological Department, Karachi
3	Mr. Muhammad Riaz, Chief Meteorologist Pakistan Meteorological Department, Karachi
4	Syed Naseer Haider, Senior Electronic Engineer, Pakistan Meteorological Department, Karachi.
5	Mr. Anver Aman Lieutenant Commander, Pakistan Navy, Karachi
6	Mr. Taufeeque Rauf, Lieutenant Commander, Pakistan Navy, Karachi
7	Mr. Kanwar Waseem, Provincial Secretary, Pakistan Red Crescent (Sindh), Karachi
8	Dr. Tariq Masood Ali Khan, Professor, University of Karachi, Karachi
9	Mr. Tariq Ali, Sub-Engineer, Pakistan Meteorological Department, Karachi.
10	Mr. Khaliq-uz-Zaman, CDEO, Pakistan Meteorological Department, Karachi.
11	Mr. Abdul Ghaffar Khan, CDEO, Pakistan Meteorological Department, Karachi.
12	Mr. Sheikh Khalid, CDEO. Pakistan Meteorological Department, Karachi.
13	Mr. Muhammad Farooq Shaukat, CDEO, Pakistan Meteorological Department, Karachi.
14	Mr. Ameer Haider, CDEO, Pakistan Meteorological Department, Karachi.

Appendix – III

<b>S.No.</b>	<b>Particulars of Participants</b>
15	Mr. Asif Ali, Professional Assistant, Pakistan Meteorological Department, Karachi.
16	Mr. Amir Javaid, Meteorological Assistant, Pakistan Meteorological Department, Karachi.
17	Mr. Naseer Ahmed, Deputy Director, National Disaster Management Authority, Islamabad
18	Mr. Haider Hasan, Assistant Professor, NED University, Karachi
19	Cdr (R) M. Ashraf, Chief Hydrographer, Karachi Port Trust, Karachi
20	Mr. Najeeb Ahmed Amir, Meteorologist, Pakistan Meteorological Department, Islamabad
21	Mr. Habib Jamal, Meteorologist, Pakistan Meteorological Department, Karachi.
22	Mr. Tariq Ibrahim, Meteorologist, Pakistan Meteorological Department, Karachi.
23	Mr. Shafiq-ur-Rehman, Assistant Meteorologist, Pakistan Meteorological Department, Karachi.
24	Mr. Dilawar Abdul Razzaq, Senior Research Officer. National Institute of Oceanography, Karachi
25	Mr. Naimatullah, Coastal Engineer, National Institute of Oceanography, Karachi
26	Mr. Attalullah, Electronic Engineer, Pakistan Meteorological Department, Karachi.
27	Mr. Karam Khan, Meteorologist, Pakistan Meteorological Department, Karachi.