



**UNESCO / IOC International Tsunami Information. Center (ITIC)
US National Oceanic and Atmospheric Administration (NOAA)
US Geological Survey, Earthquake Science Center (USGS)**

ITIC/NOAA/USGS TRAINING PROGRAMME - INTERNATIONAL (ITP-INTL):

**STRENGTHENING TSUNAMI WARNING OPERATIONS
AND STANDARD OPERATING PROCEDURES**

Indonesia Agency for Meteorology, Climatology, and Geophysics (BMKG)

**Jakarta, Indonesia
14 - 17 January 2020**

Tsunamis can be extremely deadly because of their quick onset and immediate impact in minutes. In order to warn the public quickly, agencies must pre-plan and have reliable protocols and standard operating procedures (SOPs) which are well-known to every stakeholder, and which are well-exercised and practiced. SOP development is a dynamic process, and each event is unique in its generation and impact, and so also in its response. In every damaging event, we learn a little more about the science of tsunamis and new techniques and technologies are developed to improve our tsunami warning forecasting and decision-making.

The interactive workshop will use historical data, some played back in real time, to analyse and decide on tsunami warning actions using today's tools and methodologies, taking into consideration Indonesia's SOPs. We will also review and identify science lessons learnt from recent past earthquakes and tsunamis around the world (for example, the 2010 Chile, 2011 Japan, 2016 Kaikoura New Zealand, and others).

On Day 1, a stakeholder planning workshop will be conducted to further develop Indonesia's plans for the deployment of SMART cable technologies aimed at strengthening earthquake and tsunami detection, source characterization, and tsunami wave forecasting.

Resource Persons:

Dr. Laura Kong, Director, International Tsunami Information Center (ITIC), Honolulu, HI, USA

Dr. Charles McCreery, Director, PTWC, Honolulu, HI, USA

Dr. Walter Mooney, Senior Research Geophysicist, US Geological Survey, Menlo Park, CA, USA

FINAL AGENDA

Sess ion	Start Time	End Time	Topic	Speaker
			DAY 1, MONDAY, 13 JANUARY 2020	
1-4			INDONESIA SMART CABLE PROJECT	
			Agenda separate	
			DAY 2, TUESDAY, 14 JANUARY 2020	
5-7			LEARNING FROM PAST EVENTS - 1	
			Current Status of Tsunami Warning	
5.1	8:30	8:45	Welcome and Opening Remarks, Self-introductions	BMKG, USGS
5.2	8:45	9:15	TOWS Task Team on Tsunami Watch Operations - Global Standards and Performance Indicators	McCreery
5.3	9:15	9:45	Pacific Tsunami Warning Center - present status and updates	McCreery
5.4	9:45	10:15	InaTEWS – BMKG present status and updates	BMKG
	10:15	10:30	COFFEE / TEA BREAK	
6.1	10:30	11:15	Science Lessons Learnt from Past Events	Dr. Walter Mooney, USGS
6.2	11:15	11:30	Local Source Tsunami Response Best Practice (ICG/PTWS-XXVIII, 2019)	Kong
6.3	11:30	11:45	Tsunami Coastal Assessment Tool (TsuCAT), v4.1	Kong

*Remainder of Agenda was delayed,
EXERCISE INDONESIA WAVE were conducted on
January 15 (IW20-Chile), 16 (IW20-Japan), and 17(IW-Kaikoura)
Several presentations were not done due to lack of time.*

7.1	11:45	12:00	Exercise Indonesia Wave 2019 (IW19) - Format, Conduct	Kong, McCreery
	12:00	13:00	LUNCH	
			Tsunami Warning Decision-making using data from past events	
			Three tsunami exercises will be conducted. Participants will role play as the country's NTWC, using Indonesia experience and/or SOPs for response and decision-making	
7.2	13:00	13:15	IW20-Chile 2010: Background (Tectonics, Seismic, Tsunami, Agency, Monitoring), Decision-Making Considerations	Mooney, McCreery
7.3	13:15	13:45	IW20-Chile 2010: Preparation	Kong, All
	13:45	14:00	COFFEE / TEA BREAK	
7.4	14:00	16:00	IW20-Chile 2010	Kong, All
			DAY 3, WEDNESDAY, 15 JANUARY 2020	
			BMKG UNIVERSITY SHARING	
	9:00	10:00	Welcome and Introductions	STMKG
	10:00	10:30	Lateral Spreading and Liquefaction - Palu Earthquake effects	Walter Mooney, USGS
	10:30	11:00	Improvements in Tsunami Warning since 2004, and Emerging Techniques and Technologies for the Future	Charles McCreery, PTWC
	11:00	11:30	International Developments in Tsunami Warning and Mitigation	Laura Kong, ITIC
	11:30	12:00	Question and Answer, Discussion	STMKG
	13:00	13:45	LUNCH and transit back to BMKG	

7			LEARNING FROM PAST EVENTS - 2	
			Tsunami Warning Decision-making using data from past events	
7.5	13:45	14:00	IW20-Japan 2011: Background (Tectonics, Seismic, Tsunami, Agency, Monitoring), Decision-Making Considerations	Mooney, McCreery
7.6	14:00	14:30	IW20-Japan 2011: Preparation	Kong, All
7.7	14:30	16:30	IW20-Japan 2011	Kong, All
			DAY 4, THURSDAY, 16 JANUARY 2020	
7-8			LEARNING FROM PAST EVENTS - 3	
			Tsunami Warning Decision-making using data from past events	
	8:30	8:45	Recap and Plan for today	Kong
7.8	8:45	9:00	IW20-New Zealand 2016: Background (Tectonics, Seismic, Tsunami, Agency, Monitoring), Decision-Making Considerations	Mooney, McCreery
7.9	9:00	9:15	IW20-NZ 2016: Preparation	Kong, All
7.10	9:15	10:45	IW20-NZ 2016	Kong, All
	10:45	11:00	COFFEE / TEA BREAK	
8.1	11:00	12:00	Other Event Examples (2006 Kurils, 2019 Vanuatu, etc.) - pitfalls in analysis, warning decision-making, and cancellation (not done)	McCreery, Kong, All
	12:00	13:00	LUNCH	
			Tsunami Warning Decision-making - Atypical events	
8.2	13:00	13:45	Atypical events - Challenges, Requirements, and Guidance for Effective Tsunami Warning: Slow earthquakes, Non-thrust earthquakes	Mooney
	13:45	14:30	Discussion (not done)	Kong, All
	14:30	14:45	COFFEE / TEA BREAK	
8.3	14:45	15:00	Atypical events - Challenges, Requirements, and Guidance for Effective Tsunami Warning: Volcanic Eruptions and Landslides (not done)	Mooney, McCreery
	15:00	16:00	Discussion	Kong, All
9-11			DAY 5, FRIDAY, 17 JANUARY 2020	
			EMERGING TECHNIQUES AND TECHNOLOGIES	
			Using GNSS for Tsunami Warning	
9.1	8:30	9:15	Introduction to using GNSS for Seismic Source Characterization (not done)	Mooney
9.2	9:15	10:15	Current GNSS Efforts for Seismology (USA, Chile Japan, and Globally) (not done)	Mooney
	10:15	10:30	COFFEE / TEA BREAK	
9.3	10:30	11:30	Current GNSS Efforts for Tsunami Warning (USA, Chile, Japan, and Globally)	McCreery
	11:30	13:30	LUNCH, PRAYER	
			Developing Inundation Forecasts for Tsunami Warning	
10.1	13:30	14:00	Introduction to Inundation Forecasting – requirements and outputs (not done)	McCreery
10.2	14:00	14:30	Current Efforts in Chile, SIPAT (SHOA, Univ. of Santa Maria) (not done)	McCreery
10.3	14:30	15:00	Current Efforts in USA (US NTWC and PTWC) (not done)	McCreery
	15:00	15:15	COFFEE / TEA BREAK	
11	15:15	15:45	Closing, Presentation of Certificates	BMKG, USGS, NOAA, US Embassy