



**UNESCO / IOC
INTERNATIONAL TSUNAMI INFORMATION CENTER (ITIC)**

**ITIC TRAINING PROGRAMME HAWAII (ITP-HAWAII)
TSUNAMI EARLY WARNING SYSTEMS
AND THE PACIFIC TSUNAMI WARNING CENTER (PTWC) ENHANCED PRODUCTS,
TSUNAMI EVACUATION PLANNING AND UNESCO IOC TSUNAMI READY PROGRAMME**

**3-13 September 2019
Honolulu, Hawaii USA**

The ITIC Training Program on Tsunami Early Warning and Mitigation Systems has focused since 2005 on improving operating procedures for tsunami warning and emergency response as essential for successful tsunami warning. While infrequent, tsunamis can be extremely deadly because of their quick onset and immediate impact in minutes. In order to warn quickly and have the public evacuate when necessary, agencies must pre-plan and have protocols and procedures which are well-known to every stakeholder and to the public, and which are well-exercised and practiced. Communities must know their hazard and risk, and prepare in advance, so that every person can recognize the tsunami danger and know what to do to save their lives.

This training follows the tsunami warning chain, with week one focusing on tsunami warning activities and week two focusing on tsunami emergency response. Emphasis is on the importance of Standard Operating Procedures (SOPs) for enabling consistent and rapid tsunami warning and response, and using Hawaii as a working example. SOP development is a dynamic process, and each event is unique in its generation and impact, and so also in its response. In every event, we learn a little more about the science of tsunamis and how to better mitigate against their impact.

Training activities will include warning and response decision-making, use of decision-support tools, and evacuation planning. Emphasis is also placed on building community preparedness, especially for local tsunamis, through the UNESCO IOC Tsunami Ready programme.

Resource Persons (in order of speaking):

Dr. Laura Kong, Director, International Tsunami Information Center (ITIC), Honolulu, HI, USA
Dr. Charles "Chip" McCreery, Director, Pacific Tsunami Warning Center (PTWC), Honolulu, HI, USA
Dr. Kwok Fai Cheung, Professor, Dept of Ocean and Resources Engineering (ORE), School of Earth Science and Technology (SOEST), University of Hawaii (UH) at Manoa, Honolulu, HI, USA
Kevin Richards, Natural Hazards Officer/Planner, Hawaii State Emergency Management Agency (HI-EMA), Hawaii, USA
Dr. Stuart Weinstein, Deputy Director, PTWC, Honolulu, HI, USA
Dr. David Walsh, Senior Oceanographer, PTWC, Honolulu, HI, USA
Dr. Dailin Wang, Senior Oceanographer, PTWC, Honolulu, HI, USA
Tammy Fukuji, Information Technology Specialist, ITIC, Honolulu, HI, USA
Crystal van Beelen, Disaster Preparedness Officer, City & County of Honolulu, Dept of Emergency Management, Oahu, Hawaii, USA
Gary Chock, Structural Engineer (Hawaii and California), Martin & Chock, Honolulu, HI USA
Christa von Hillebrandt-Andrade, Manager, Caribbean Tsunami Warning Prog (CTWP), Mayaguez, PR, USA
Dr. Bruce Howe, Professor, ORE, SOEST, UH-Manoa, Honolulu, HI, USA, and ITU/WMO/IOC UNESCO Joint Task Force Chair for SMART Cables
Michael Angove, Tsunami Program Manager, NOAA NWS, Silver Spring, MD, USA

FINAL AGENDA

Session	Start Time	End Time	Topic	Location, Speaker
1 - 3			TUESDAY, 3 SEPTEMBER DAY 1	NOAA Pier 38
			Opening, Course Overview, Tsunami Early Warning, Country Presentations	
	8:15	8:45	PICKUP ALA MOANA HOTEL (AMH, Polynesian Hospitality bus - Art to meet group); TRANSIT to NOAA Pier 38 training venue	Sonen
	8:45	9:00	Registration	
1.1	9:00	9:30	Opening Welcome and Introductions	ITIC, PTWC
1.2	9:30	9:45	Programme Logistics – IRC Building, Local Transportation, Coffee/Tea/Lunch Breaks, Internet/Phone/Fax, Foreign Visitor Forms, etc	Art Sonen, Tammy Fukuji, ITIC
1.3	9:45	10:00	Course Overview, Manual, Materials, including Awareness and TW Tools	Laura Kong, ITIC
2.1	10:00	10:30	Responding Rapidly and Effectively: Tsunami Warning and Emergency Response Requirements	Charles McCreery, PTWC
	10:30	10:45	COFFEE / TEA BREAK	
2.2	10:45	12:00	Country Presentations (15 min each) – Tonga, Chile	Participants
	12:00	13:30	LUNCH	
			Country Presentations, IOC Tsunami Warning and Mitigation Systems	
	13:30	14:30	Country Presentations (15 min each) – Peru, Malaysia	Participants
2.3	14:30	15:00	UNESCO IOC Global Tsunami System: Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS); Roles of Tsunami National Contacts, Regional Tsunami Service Providers and Tsunami Information Centers, Tsunami Warning Focal Points, National Tsunami Warning Centers	Kong
	15:00	15:15	COFFEE / TEA BREAK	
			Earthquake Seismology and Tsunami Science	
3.1	15:15	16:00	What earthquake science you need to know to warn for and respond to tsunami warnings? Earthquake Seismology – what, where, how, when, and damage caused	Kong
3.2	16:00	16:45	What tsunami science you need to know to warn for and respond to tsunami warnings? Tsunami generation, propagation, and inundation - what, where, how, when, and damage caused	Kong
	17:00	17:30	RETURN TO HOTEL	Sonen
3 - 4			WEDNESDAY, 4 SEPTEMBER DAY 2	NOAA Pier 38
			Tsunami Hazard Assessment - Hawaii examples	
	8:15	8:45	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to NOAA Pier 38 training venue	Sonen
3.3	8:45	9:30	Tsunami Warning and Mitigation Systems - Hawaii example	Kong
3.4	9:30	10:45	Tsunami Hazard Risk Assessment: Tsunami Modeling	Kwok Fai Cheung, Univ of Hawaii
	10:45	11:00	COFFEE / TEA BREAK	

3.5	11:00	12:00	Tsunami Hazard Risk Assessment: Hawaii inundation mapping for evacuation; Port and Harbor Response planning	Cheung
	12:00	13:30	LUNCH	
			Tsunami Warning Center and Emergency Response (TWC/TER) - Lessons Learned	
2.2	13:30	14:00	Country Presentations (15 min each) – Malta, China, Grenada	Participants
4.1	14:00	14:30	Tsunami Warning Center Overview: What do Tsunami Warning Centers (TWCs) do? What do TWCs provide to Tsunami Emergency Response (TER) agencies? Challenges in Detection and Tsunami Threat Assessment	McCreery
4.2	14:30	15:15	Lessons Learned from Past Tsunamis - Warning (Hawaii 1946-1994; Chile 1960; Nicaragua 1992 / Java 2006 / Mentawai 2010; Sumatra 2004; Tonga 2006; Samoa/Tonga 2009 (doublet); Chile 2010; Japan 2011; Bengkulu 2012; Haida Gwaii 2012; Kaikoura NZ 2016, Indonesia 2018)	McCreery, Kong
	15:15	15:30	COFFEE / TEA BREAK	
4.3	15:30	16:00	Tsunami Emergency Response Overview: What do TER agencies provide to the Public? Challenges in Alerting, Evacuation, Safe-to-Return (All-Clear), and Preparedness	Kong
4.4	16:00	16:45	Lessons Learned from Past Tsunamis - Response (Hawaii 1986, 1994; Papua New Guinea 1998; Samoa/American Samoa 2009; Chile 2010; Japan 2011, Palu Indonesia 2018)	Kong, McCreery
	17:00	17:30	RETURN TO HOTEL	Sonen
5-6			THURSDAY, 5 SEPTEMBER DAY 3	HI-EMA, IRC Rm 1377
			Hawaii State Emergency Management Agency visit	
	8:15	8:45	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to Hawaii State Emergency Management Agency (HI-EMA) Emergency Operations Center, Diamond Head Crater (Art to meet at Crater)	Sonen
5.1	8:45	10:15	Visit Hawaii State Emergency Management Agency (HI-EMA): Response to PTWC Tsunami Products, Hawaii Emergency Alert System (EAS) and Siren System	Kevin Richards, HI-EMA
	10:15	12:00	TRANSIT to JBPHH Pass and ID Office to pick up base passes (Art Sonen to meet and escort onto Ford Island)	
	12:00	13:00	LUNCH, Stadium Mall (on your own)	Sonen
	13:00	13:30	TRANSIT to IRC (Art Sonen to escort over bridge)	Sonen
			TWC Standard Operating Procedures (SOPs), PTWC SOPs and visit	
2.2	13:30	14:00	Country Presentations (15 min each) – El Salvador, Saint Vincent and Grenadines	Participants
6.1	14:00	14:15	IOC TWC and TER SOP Manual, End-to-end Tsunami Warning – Stakeholder and their needs, Roles and Responsibilities, Standard Operating Procedures, and their linkages	Kong
6.2	14:15	14:45	SOPs and Checklists: TWC Templates and examples for Distant, Regional, and Local Tsunamis: Monitoring, Detection and Evaluation, Communications, Message Dissemination (IOC MG 76)	Weinstein
			HOMEWORK - Review & improve country TWC SOP / Checklists (especially for local/regional threat). To be used for Day 8 exercise	Kong

6.3	14:45	15:30	Pacific Tsunami Warning Center: Crisis Event SOPs: Earthquake and Sea Level Monitoring (Data networks and acquisition, quality-control/health status), Earthquake Analysis Methods, Threat Analysis, Forecasting, Products, Dissemination; Routine Operations SOPs: Quality Control and redundancy, contingency and backup. (PTWC Operations, Systems and Procedures Manual)	Weinstein
	15:30	15:45	COFFEE / TEA BREAK	
6.4	15:45	16:45	Visit PTWC - data networks and acquisition, monitoring, analysis, quality-control/health status, communication and dissemination, redundancy, contingency/backup, etc	Weinstein, Sardina, PTWC
	17:00	17:45	RETURN TO HOTEL	Sonen
6-7			FRIDAY, 6 SEPTEMBER DAY 4	IRC Rm 1377
			TWC Topics - Earthquake Source Characterization and Monitoring, Tsunami Monitoring PTWC Enhanced Products	
	8:15	9:00	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to NOAA IRC (Art Sonen to meet and escort over bridge)	Sonen
6.5	9:00	9:30	TWC Operations: Sea Level Monitoring - Methods, Instruments, Limitations, Challenges	PTWC
6.6	9:30	10:15	Pacific Tsunami Warning Center Enhanced Products - Why, What, Criteria, Staging of Products; Explanation of Each Product: Public Text, Graphical Deep-Ocean Tsunami Amplitude, Coastal Tsunami Amplitude, Coastal Tsunami Amplitude Polygons, Tsunami Amplitude Statistics, Coastal Tsunami Amplitude KMZ file	McCreery
6.7	10:15	10:45	PTWC Operations: Travel Time Forecasting – Methods, Limitations, Uncertainty, Sensitivity Studies (Location, Depth, Magnitude)	Dailin Wang, PTWC
	10:45	11:00	COFFEE / TEA BREAK	
6.8	11:00	12:00	PTWC Operations: Wave Amplitude Forecasting – Methods (ATFM, SIFT, RIFT), Limitations, Uncertainty, Sensitivity Studies (Location, Depth, Magnitude)	Wang
	12:00	13:00	LUNCH	
			Travel time and Wave Amplitude Forecasting, Tsunami Warning Decision Support Tools, TsuCAT	
6.9	13:00	13:25	TWC Operations: Real-time Earthquake Detection and Fast Source Characterization, Methods and Limitations: Locating Earthquakes (seismometers, seismic stations, sparse networks and hypocentral bias, etc)	PTWC
6.10	13:25	13:50	TWC Operations: Real-time Earthquake Detection and Fast Source Characterization, Methods and Limitations: Estimating Magnitudes (macroscopic intensity and instrumental)	PTWC
6.11	13:50	14:15	TWC Operations: Real-time Earthquake Detection and Fast Source Characterization, Methods and Limitations: Determine Fault Mechanisms (Double-couple 1st motions to W-Phase Centroid Moment Tensors)	PTWC
6.12	14:15	14:30	NTWC Competencies (draft approved at ICG/PTWS-XXVIII, 2019)	Kong
7.1	14:30	15:00	Tsunami Warning Decision-Support Tools - Overview: Message Alerts, (CISN, USGS web site (CMT, ShakeMap, PAGER, Sea level monitoring (Tide Tool, IOC Sea Level Monitoring web site); Global Historical Tsunami Databases (WDS/NCEI web tools), Tsunami Travel Time (TTT) calculation, TsuCAT	Kong
	15:00	15:15	COFFEE / TEA BREAK	

7.2	15:15	16:15	2 Groups: 1. Tsunami Warning Decision-Support Tools (CISN, Tide Tool, TTT) - laptop installation. 2. PTWC Operational Tools (SIFT, RIFT, Wphs CMT) - demonstration	ITIC, PTWC
7.3	16:15	16:45	Tsunami Coastal Assessment Tool (TsuCAT) - Demonstration, Installation, Use	Kong, Fukuji
	17:00	17:45	RETURN TO HOTEL	Sonen
			SATURDAY-SUNDAY, 7-8 SEPTEMBER - FREE DAYS	
8-9			MONDAY, 9 SEPTEMBER DAY 5	NOAA Pier 38
			Tsunami Emergency Response (TER) SOPs, Communications, Media and Social Media, Transient Population Readiness	
	8:15	8:45	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to NOAA Pier 38 training venue	Sonen
8.1	8:45	9:15	NTWC and TER Guidance on how to use PTWC Enhanced Products for National Warnings and Evacuation - Land and Marine Threats and Public Safety: Flow Charts, Criteria Tables, Timeline-driven SOPs, Message Templates (IOC MG 76)	Kong
8.2	9:15	9:55	SOPs and Checklists: TER operations - Example Warning Plans for Coordination of Information Flow and Evacuation (IOC MG 76). Private Sector SOPs. Developing timeline-driven SOPs (Who does What, and When (Roles and Responsibilities)?)	Kong
8.3	9:55	10:15	Local-Source Tsunami Response Best Practice (approved at ICG/PTWS-XXVIII, 2019)	Kong
	10:15	10:30	COFFEE / TEA BREAK	
8.4	10:30	11:15	Emergency communications - Robustness, reliability, redundancy. Technologies for the downstream transmission of warnings to communities.	Weinstein
8.5	11:15	12:00	Tsunami Evacuation, Tourist and Special Needs Population Readiness: Case Study, City & County of Honolulu	Crystal van Beelen, City & County of Honolulu
	12:00	13:30	LUNCH (TW Tools troubleshooting as needed)	
8.6	13:30	14:15	Improving Response and Managing (reliable and unreliable) Information Flow during an Event: Roles of Media and Social Media - Case Studies	Kong
			HOMEWORK - Review & improve country TER SOP / Checklists (especially for local/regional threat) and Media SOP. To be used for Day 8 exercise	Kong
8.7	14:15	15:00	Learning Activity: Improving Response – Tsunami Warning and Emergency Response - What happens during an event?	Kong, McCreery
			Tsunami-resistant building design, UNESCO IOC Tsunami Ready	
	15:00	15:15	COFFEE / TEA BREAK	
8.8	15:15	16:00	Tsunami Mitigation: Designing buildings to withstand tsunamis - ASCE 7 2016, International Building Code 2018, and FEMA P-646 rev 3 (2019)	Gary Chock, Martin & Chock
9.1	16:00	16:30	Implementing Tsunami Ready programs to recognize community readiness - Guidelines, Recognition Process	Kong
	16:30	16:45	HOMEWORK - QGIS installation and familiarization - instructions	Fukuji, Kong
	17:00	17:30	RETURN TO HOTEL	Sonen

9-11			TUESDAY, 10 SEPTEMBER DAY 6	NOAA Pier 38
			Hazard Assessment, Inundation Mapping	
	8:15	8:45	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to NOAA Pier 38 training venue	Sonen
9.2	8:45	9:15	QGIS installation - troubleshooting	Fukuji, Kong
9.3	9:15	9:45	Building Awareness and Community Preparedness - Tsunami Evacuation Planning - considerations and requirements. Preparing for Community Tsunami Evacuations: from inundation to evacuation maps, response plans and exercises (IOC MG 82)	Kong
10.1	9:45	10:00	Tsunami Hazard Assessment - Methods, Techniques	Christa von Hillebrandt- Andrade, CTWP
10.2	10:00	10:30	Global Historical Tsunami Hazards - Pacific, Caribbean, Mediterranean, Indian Ocean; Probabilistic Earthquake and Tsunami Hazard	Weinstein
	10:30	10:45	COFFEE / TEA BREAK	
10.3	10:45	11:15	IOC Regional Efforts on Tsunami Seismic Sources - Caribbean, Central America, South China Sea, Southwest Pacific meeting outcomes, and upcoming plans for Colombia and Ecuador	Kong
10.4	11:15	12:00	Use of Tsunami modeling for hazard and risk assessment. Case Study: Using ComMIT / MOST for hazard assessment and TsuCAT for exercise development	Kong
	12:00	13:30	LUNCH (QGIS troubleshooting as needed)	
			Evacuation Mapping	
11.1	13:30	14:00	TR PREP-1: Making Community-based Evacuation Maps, Routes, and Signage - guidance	von Hillebrandt- Andrade
11.2	13:30	14:15	Create Community Evacuation Map - paper and pencil - Valparaiso, Chile example	Participants
11.3	14:15	14:45	Create Community Evacuation Map, including routes, signage - QGIS instructions	von Hillebrandt- Andrade
	14:45	15:00	COFFEE / TEA BREAK	
11.4	15:00	16:45	Create Community Evacuation Map, including routes, signage - QGIS; Valparaiso, Chile example	Participants
			HOMEWORK - Finish Evacuation Map	
	17:00	17:30	RETURN TO HOTEL	Sonen
11 - 13			WEDNESDAY, 11 SEPTEMBER DAY 7	NOAA Pier 38
			Evacuation Mapping, Response Planning, Awareness	
	8:15	8:45	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to NOAA Pier 38 training venue	Sonen
11.4	8:45	9:45	Create Community Evacuation Map, including routes, signage - QGIS; Valparaiso, Chile example (continued)	von Hillebrandt- Andrade, Participants
12.1	9:45	10:30	TR RESP-1 and PREP-4: Making Community Response Plans and Conducting Drills - guidance, how-to, and templates	von Hillebrandt- Andrade
	10:30	10:45	COFFEE / TEA BREAK	
12.2	10:45	12:00	Create Community Response Plan using guidance, how-to, and templates	Participants
			HOMEWORK - Finish reviewing country TER SOP / Checklists. Finish community response plan.	
	12:00	13:30	LUNCH (TW Tools troubleshooting as needed)	

13.1 (not given due to time)	13:30	14:15	Building Awareness and Community Preparedness - strategies and examples, Caribbean PAE Strategy and Philippines Development Process, ITIC available materials, Hawaii examples	von Hillebrandt-Andrade, Kong
13.2	14:15	14:30	TR PREP-2: Creating Public Awareness poster, including evacuation	Kong
	14:30	14:45	COFFEE / TEA BREAK	
	14:45	15:45	Create Public Awareness poster, including evacuation (continued)	"Country" Teams
13.3	15:45	16:45	Team Sharing: Creating Public Awareness poster	Von Hillebrandt-Andrade, Kong, "Country" Teams, "Judges"
	17:00	17:30	RETURN TO HOTEL	Sonen
13 - 14			THURSDAY, 12 SEPTEMBER DAY 8	IRC Rm 1377
			Awareness, Exercises	
	8:15	9:00	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to NOAA IRC (Art Sonen to meet and escort over bridge)	Sonen
14.1	9:00	9:45	Talking with the Media - guidance Building Awareness and Community Preparedness – Tsunami Exercises and Drills, IOC Tsunami Exercise Guideline, examples	von Hillebrandt-Andrade
14.2	9:45	10:00	Exercise Hawaii Wave 2019 (EHW-19) Tsunami Exercise, Decision-making using PTWC Enhanced Products - Introduction, Format, Conduct	Exercise Controllers – Kong, McCreery
	10:00	10:15	COFFEE / TEA BREAK	
14.3	10:15	12:00	ECW-18 Tsunami Exercise Preparation - "Country" TWC / TER SOPs, Criteria Tables, Response Plans, Alerting, Media, Evacuation, Cancellation, etc	"Country" Teams
	12:00	13:00	LUNCH	
			Exercise Hawaii Wave 2019 (EHW-19)	
14.4 (verbal only)	13:00	13:30	EHW-19 Tsunami Exercise - setup and last instruction	Exercise Controllers
14.5	13:30	15:45	EHW-19 Tsunami Exercise - Decision-making using PTWC Enhanced Products	"Country" Teams, "Product Customers, Exercise Controllers
	15:45	16:00	COFFEE / TEA BREAK	
14.6	16:00	16:45	Post-Exercise Evaluation - preparation for Press Conference	Exercise Controllers, "Country" Teams, "Customers"
			HOMEWORK - Finish Situation Report and Briefing	
	17:00	17:30	RETURN TO HOTEL	Sonen
14 - 18			FRIDAY, 13 SEPTEMBER DAY 9	IRC Rm 1377
			EHW-19 Pres Conference, Emerging Tools and Technologies, Logistics wrap-up	
	8:15	9:00	PICKUP ALA MOANA HOTEL (Polynesian Hospitality bus); TRANSIT to NOAA IRC (Art Sonen to meet and escort over bridge)	Sonen

14.7	9:00	10:00	EHW-19 Tsunami Exercise Hotwash - Press Conference: "Country" brief followed by "Media" / Audience Question-and-Answer	"Country" Team representatives (TWC and TER), Customers, "Media"
	10:00	10:15	COFFEE / TEA BREAK	
15.1	10:15	10:45	Improving Tsunami Warning – Emerging Techniques and Technologies: Earthquake Finite Fault Modeling, PTWC real-time GNSS/GPS detection of co-seismic deformation	Weinstein
15.2	10:45	11:15	Improving Tsunami Warning - Emerging Tools and Technologies: ITU/WMO/IOC SMART Cables for Observing the Ocean	Bruce Howe, JTF SMART Cables Chair
15.3	11:15	11:45	UN Decade of Ocean Science for Sustainable Development - Tsunamis	Michael Angove, NOAA NWS
16	11:45	12:15	Visit ITIC ITP-Hawaii 2019 Logistics wrap-up	Sonen, Fukuji
	12:15	13:15	LUNCH	
			Summary and Next Steps, Closing	IRC Auditorium
17.1	13:15	13:45	2019-2020 Calendar: ICG and TOWS Action Items and Priorities	Kong, von Hillebrandt-Andrade
17.2	13:45	14:45	Summary Discussion (Way Forward, Next Steps, Gaps and Needs): UNESCO IOC Tsunami Ready, World Tsunami Awareness Day, UN Decade of Ocean Science for Sustainable Development	ITIC, PTWC, USA, All
	14:45	15:00	COFFEE / TEA BREAK	
18	15:00	15:30	Presentation of Certificates and Closing Ceremony	ITIC, PTWC, NWS PR, USA
	16:00	16:45	RETURN TO HOTEL	Sonen
			Friday - Saturday, 13-14 SEPTEMBER	
			Hotel Checkout - Depart for home country	