REPORT OF
TASK TEAM FOR EVACUATION PLANNING AND MAPPING

DR. LAURA KONG
TASK TEAM CHAIR
Note: This Report covers the period since the PTWS Steering Committee (July 2016-March 2017), and includes discussion on the “Tsunami Ready” pilot conducted in conjunction with the TEMPP pilot.

1. BACKGROUND

In July 2014, the Pacific Tsunami Warning and Mitigation System Steering Committee (PTWS SC) approved Working Group 3’s (Disaster Management and Preparedness) that the next priority of the PTWS after the implementation of the PTWC New Products on October 1, 2014, should be on Preparedness. The International Tsunami Information Center (ITIC) recommended a capacity building focus on evacuation and proposed a new course, Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) that was accepted by the PTWC SC.

In April 2015 at the Twenty-sixth session of the ICG/PTWS, Member States affirmed the priority focus and established a Task Team on Evacuation Planning and Mapping (TT-EPM), chaired by the ITIC Director and comprised of experts in Warning, Modeling, Disaster Management, Community Preparedness and Education and Outreach, to provide guidance to ITIC during the development of the Course. Following, the ICG/CARIBE-EWS also endorsed the new course.

In June 2016, the PTWS SC noted that the ICG/CARIBE-EWS had completed guidelines for a “Tsunami Ready” recognition programme, and it acknowledged the potential of such programmes for the PTWS. The SC requested the PTWS Working Group 3 on Disaster Management, Preparedness, and Risk Reduction to investigate the extent to which the Caribbean guidance required adaptation for the PTWS, taking into account “Tsunami Ready” pilots.

From July 2015 to February 2017, the ITIC, NOAA Caribbean Tsunami Warning Program (CTWP), and the IOC collaborated to develop and pilot the course in Honduras and inviting Central America and Mexico to participate. In addition, a “Tsunami Ready” pilot was conducted for the town of Cedeño, Honduras.

In February 2017, the TOWS WG noted with satisfaction the progress made during the intersessional period on Tsunami Evacuation Mapping, noting that

- PTWS had successfully completed the TEMPP pilot over two years in Honduras
- ITIC, CTWP, and IOC are ready to provide guidance to countries that want to implement similar projects
- Existing best practice and evacuation mapping guidelines have been identified
- PTWS will finalise project documentation and make it available to ICGs, noting the interest of IOTWMS and CARIBE-EWS

The TOWS WG also

- Noted the Tsunami Ready Community based performance recognition program was achieved in St Kitts & Nevis and Cedeño (Honduras)
Recommended the Assembly to instruct ICGs to consider piloting the CARIBE EWS Tsunami Ready guidelines and report back to the TOWS-XI with a view to develop harmonized consistent global guidelines

2. PTWS TASK TEAM ON EVACUATION PLANNING AND MAPPING

The PTWS Task Team on Evacuation Planning and Mapping was established by Recommendation ICG/PTWS-XXVI.1 (April, 2015) under Chair Dr Laura Kong (ITIC) and with Terms-of-Reference as follows:

1. Develop a new programme aimed at facilitating tsunami resilience through community preparedness, specifically through the preparation of tsunami evacuation maps and associated response plans for tsunami-vulnerable coastal communities. Programme globally applicable and utilizing standardized tools and methodologies where they exist.

2. Take advantage of existing resources, the new programme should link existing training workshops, such that modules cover
   - Evacuation Planning
   - Evacuation Map Development (inundation modelling and map creation)
   - Tsunami Warning & Emergency Response SOPs
   - Conducting Tsunami Exercises (including evacuation)

3. Compile and take into consideration best practices worldwide.

4. Conduct a Pilot(s) using ‘real’ communities to produce an evacuation map.

5. After each training delivery, develop feedback mechanisms that will adapt and lead to improvements in the next course delivery.


Membership to include experts in Warning, Modelling, Disaster Management, Community Preparedness, Education and Outreach, reporting to the Steering Committee and chaired by Ms Laura Kong (ITIC).

The Task Team Members are:
Chair – Dr. Laura Kong, ITIC
Caribbean region: Alison Brome, Caribbean Tsunami Information Center; Patrick Tyburn, Martinique, France, ICG/CARIBE-EWS WG 4 Chair on Preparedness, Readiness, and Resilience
Central America region: Norwin Acosta, INETER, Nicaragua
Southeast Pacific region: Chair, ICG/PTWS South East Pacific Working Group, currently Humberto Gomez, INOCAR, Ecuador
Southwest Pacific region: Chair, ICG/PTWS South West Pacific Working Group, 'Ofa
3. TEMPP PROJECT

ITIC has led the development of a standardized process and training course under its Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) Project. TEMPP is a collaborative effort of the USA (NOAA, USAID/OFDA), IOC, and New Zealand. NOAA’s Caribbean Tsunami Warning Program is a co-lead with ITIC for the TEMPP Project.

The TEMPP Project has developed a course that covers the process of producing reliable and practical community-level tsunami evacuation maps. The Course covers cases where modeling is and is not available, demonstrates the application of different levels of tsunami modeling to construct inundation maps, works through the process of creating a community-owned evacuation map, with appropriate routing, safe area assembly, signage, and tsunami response and evacuation plan, and finally, uses an exercise to test emergency response operational readiness of communities.

A TEMPP Course Development Team (CDT) worked with ITIC to identify best practices and provide input to the Course trainings. The CDT consisted of:

Bernardo Aliaga, PTWS Technical Secretary, Programme Specialist, UNESCO/IOC
Dr. Diego Arcas, Director, NOAA Center for Tsunami Research (NCTR), Pacific Marine Environmental Laboratory (PMEL)
David Coetzee, Manager, Capability & Operations, NZ Ministry of Civil Defence and Emergency Management
Dr. Laura Kong, Director, ITIC
George Crawford, Community Preparedness, retired from Earthquake and Tsunami Program Manager, USA Washington State Military Department Emergency Management Division
Christa von Hillebrandt-Andrade, Chair, ICG/CARIBE-EWS; Manager, and Carolina Hincapie, Deputy Manager, CTWP
Mylene Villegas, Chief Science Research Specialist, Geologic Disaster Awareness & Preparedness Division (GDAPD), Philippine Institute of Volcanology and Seismology (PHIVOLCS)
Tim Walsh, Chief Hazards Geologist, USA Washington State, Dept of Natural Resources

The PTWS Task Team on Evacuation Planning and Mapping is providing guidance to the ITIC and the TEMPP CDT. The CDT is identifying and incorporating best practices worldwide, and linking existing materials and trainings on tsunami standard operating procedures and exercises. The TEMPP course and process is built upon previous efforts, and consists of a linked series of
tsunami trainings. After the Honduras Pilot is completed, the Course and its methodologies will be formalized and offered widely, and published as part of the IOC Manuals and Guides series. Targeted trainees include Tsunami National Contacts and Tsunami Warning Focal Points, other governmental institutions staff (local and national) and civil society organizations leaders. Tsunami modeling training targets physical scientists and oceanographers in governmental institutions and universities.

3. TEMPP ACTIVITIES

The TEMPP Project is using a Pilot to develop the Course. The Pilot is being run in Honduras with the communities of Cedeño (Pacific) and Sambo Creek (Caribbean). While the ITIC and partners are leading the effort, significant commitments from Honduras as the beneficiary country have been required for the Pilot. The Pilot is structured to enable the relevant national agencies to work at the local level with communities in the development of tsunami evacuation plans, maps, and procedures. Upon the Pilot’s completion, the host country should have sufficient training to replicate the process in other tsunami-prone communities in their country.

For each Honduras training, 1 representative for the other Central American Countries (Guatemala, El Salvador, Nicaragua, Costa Rica, and Panama), and Mexico, was also invited to participate. The typical class size was 20 persons.

The direct outcomes for the host country include:
- Communities that know what to do and where to go, and
- Country capability and tools to replicate the community evacuation map process elsewhere

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<th>Overall Timeline</th>
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<th>Project Responsibility</th>
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<td>New Course and Pilot</td>
<td>2015-2017</td>
<td>ITIC</td>
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<td>IOC Circular letter to select host</td>
<td>May 11, 2015</td>
<td>ITIC, PTWS WG 3, USAID, IOC, CTWP</td>
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<tr>
<td>Countries submit questionnaire to host</td>
<td>May 11-22 2015</td>
<td>Central America - Pacific Coast Countries</td>
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<td>Host country selected</td>
<td>Week May 25, 2015</td>
<td>Pilot Selection Committee</td>
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<tr>
<td>Course Development</td>
<td>Throughout 27 April 2015 (Honolulu) 22-25 June 2015 (Honolulu) 11-14 April 2016 (Honolulu) Email – Google Hangout</td>
<td>Course Development Team</td>
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<td>Course Guidance</td>
<td>Throughout 23 February 2016 (Paris) 28 June 2016 (Honolulu) 22 February 2017 (Paris, TOWS WG Inter-ICG TT DMP) Email</td>
<td>PTWS Task Team on Evacuation Planning and Mapping</td>
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<tr>
<td>Workshop/Training</td>
<td>Dates</td>
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<tr>
<td>TEMPP 1: Tsunami Inundation Modeling – ComMIT/MOST tool</td>
<td>27-31 July 2015</td>
<td>Inundation modeling training – How to use ComMIT tool with MOST model</td>
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<tr>
<td>Post-TEMPP 1: ComMIT Homework review</td>
<td>19 October 2015</td>
<td>Review of TEMPP 1 homework exercises (create high and low resolution models and run up to 24 scenarios)</td>
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<tr>
<td>Post-TEMPP 1: ComMIT Homework review</td>
<td>3 Nov 2015</td>
<td>Progress report and troubleshooting with Pilot country.</td>
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<tr>
<td>TEMPP 2: Seismic Tsunami Sources for Honduras Meeting</td>
<td>29 Feb–1 March 2016</td>
<td>Identify and agree on credible worst-case tsunami scenarios to use for inundation mapping</td>
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<tr>
<td>TEMPP 2: Inundation Mapping for Evacuation – process</td>
<td>2-3 March 2016</td>
<td>How to create Inundation Map as ensemble of inundation scenarios; How to output results in GIS format</td>
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<tr>
<td>Pre-TEMPP 3: Preparation of Evacuation Maps</td>
<td>2 August 2017 - Webinar</td>
<td>Data needs and other needs to be able to create evacuation maps</td>
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<td>TEMPP 3: Evacuation Mapping – process, Tsunami Ready community recognition guidelines, Tsunami Awareness</td>
<td>11-15 August 2016</td>
<td>How to create Evacuation Map from Inundation Map using GIS tools with community engagement; Building preparedness using a Tsunami Ready (TR) program; Creating Essential Awareness materials</td>
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<td>TEMPP 4: Warning and Emergency Response, Socialization - Education &amp; Awareness, Exercise planning</td>
<td>7-11 November, 2016</td>
<td>How to create a Tsunami Response Plan (SOPs for warning and community evacuation); How to conduct a Tsunami Exercise</td>
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4. **PTWS TASK TEAM MEETINGS AND OTHER INPUT**

The PTWS Task Team on Evacuation Planning and Mapping met on 23 February 2016 (Paris, France) on the margins of the TOWS WG and Inter-ICG Task Teams, on 28 June 2016 (Honolulu, Hawaii, USA) as part of the PTWS WG and TT meetings, and on 22 February 2017 (Paris, France) as part of the TOWS WG Inter-ICG Task Team on Disaster Management and Preparedness. All meetings were participated to by a subset of the Task Team, and also by participants already attending the other meetings (e.g., TOWS, PTWS WG/TT). At each meeting the Chair provided TEMPP status, and asked for feedback on planned training agenda topics.

See previous report for attendees to the Task Team and CDT Participants to the 23 February 2016 and 28 June 2016 meetings.

Task Team and CDT Participants to the 22 February 2016 meeting were:
- Ardito Kodijat, Indian Ocean Tsunami Information Center
- Gerassimos Papadopoulos, Greece
- Bernardo Aliaga, IOC
- David Coetzee, NZ Ministry of Civil Defence and Emergency Mgmt
- Christa von Hillebrandt-Andrade, CTWP
- Laura Kong, ITIC

Additional participants are listed were those attending the TOWS WG Inter-ICG Task Team on Disaster Management and Preparedness, 21-22 February 2017, [http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=1899](http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=1899)
5. EXISTING BEST PRACTICES
The following is an incomplete list of best practices that were used to develop the TEMPP course. The final TEMPP course manuals will contain a complete resource and reference list of best practices and examples:

Indonesia
- Guideline Tsunami Drill Implementation for City and Regency
- Signage Standard

India:
- IOWAVE16 National Tsunami Exercise Plan
- Odissa Community Drill Exercise Plan

IOC UNESCO
- How to Conduct IOC Wave Exercises, 2011
- IOTIC, Exercise Training Modules, 2015
- ITIC, NZ, Plans and Procedures for Tsunami Warning and Emergency Management, Guidance for countries in strengthening tsunami warning and emergency response through the development of Plans and Standard Operating Procedures for their warning and emergency management authorities
- ITIC, SOP Training Materials, 2007-2016

ISO Water Safety Signage

Japan
- Fire and Disaster Management Agenda, Chapters 2 and 3: Tsunami evacuation planning guidance in municipalities and regions, 2013
- Cabinet Office, Tsunami and Storm Surge Hazard Map Manual, 2004
- PARI, Outline of Guideline for Development and Utilization of Tsunami Disaster Management Map, 2009

NZ MCDEM:
- Tsunami Evacuation Zones
- Signage

Philippines
- Developing Tsunami Prepared Communities
- How to Conduct Tsunami Drill

USA:
- National Tsunami Hazard Mitigation Program: Evacuation Modeling and Mapping Guidelines, Signage, Family Emergency Plan card
- NOAA Center for Tsunami Research (NCTR), ComMIT Manual and MOST model
6. LESSONS LEARNED FROM TEMPP PILOT

MOST GRATIFYING
Most gratifying part of TEMPP in Honduras was seeing the empowerment and commitment of the local community and municipality.

COMMITMENT – PROJECT AND FUTURE SUSTAINABILITY
- It is very important to have the commitment of the upper management of the country throughout the project and an appearance at all deliveries.
- National Agency commitment to further implement and sustain what was achieved difficult. EM agency like COPECO is in constant response mode - despite Juan Jose's best efforts he could not dedicate the necessary time for coordination
- Sustainability will be better if TEMPP engagement can continue longer, such as through
  a. UNESCO, which is to be there with or without project, continues to look for funding to support and cover gaps. DIPECHO, will help give people more confidence and hopefully the national and local experts will be empowered enough to continue.
  b. Enabling multiple partnerships (instead of competition, GOAL is a good one) that stay for a while. Example is South America where national agencies, with exemptions, are running and improving by themselves, after several years of support.
  c. Many told us: "don't abandon us", "we still need your help", but there are self-starters, e.g., Costa Rica where there is more capacity and authority (SINAMOT purpose is tsunamis, whereas in other agencies, different hazards and programs compete for resources).
- Important to link multi-hazard preparedness to help engage communities. As Cedeno people experience storm surges, so they already know the importance to have and work with response plans, enhance their local capabilities and turn themselves in a resilient community.

PARTICIPANTS
- NATIONAL – GOOD MIX DESIRED
  o To the degree possible a good mix between people that might be of a more temporary nature (e.g., political appointees) and the long-term employees.
  o Need to include from local to national authorities, all that are expected to be involved in the process from early on. In Honduras, the local and municipal authorities were invited as of TEMPP3.
  o Consider including at least two people from each country (Scientist + EM) for all trainings. They work together from the beginning, and present their results for a local community at the end of TEMPP as final requirement for certificate.
  o Non-scientists said that even if they did not understand everything they thought it was beneficial to be there and have a greater appreciation for the science and uncertainties. Municipal authorities would have liked to be part of discussions from day one.
  o University participants were vital. It seems striking a balance between working with a research team and with the disaster-response agency is key. We were very fortunate that in Honduras we had the involvement of the University and the NGO GOAL - need to encourage this cross sectoral participation.

- BACKGROUND
Engagement, support and commitment of experts outside the National Agency (UNAH and GOAL) was key for reaching the objectives and future sustainability.

If there is going to be discussion of items that are not within the expertise of the participants, make sure that the non-experts are somehow integrated and don’t feel totally left out (the case of the EM during the Seismology discussion).

TEMPP1/2 and TEMPP 3/4/5 had different participants. Several said they wished they had participated to all TEMPPs. Several Hondurans who did this said that participating to all was very useful because they (scientists) finally could see how their efforts were used, and that will help them better contribute for the future.

- **REGIONAL**
  - Bringing in neighboring countries/states is a good idea, support thru and after the trainings. Eg. Nicaragua is collaborating with Honduras.
  - Regional participants allowed information sharing (e.g. for instance El Salvador's work in the Gulf) across countries that may not have occurred otherwise.

**OTHER SESSIONS - OUTSIDE OF TEMPP, BUT REQUIRED**

- Important to make sure that there is going to be DEM that meets minimum requirement for the modeling. no DEM = no Map. Need to add session(s) to ComMIT focusing on DEM/DTM and the preparation of the grids.
- Seismic experts meeting to identify sources for inundation mapping. Most of the TEMPP participants took a passive role and sat back as audience for most of the discussions. It was easy for them to disengage in this situation. Identification of sources, like creation of DEM, is decoupled from the rest.

**EQUIPMENT - COMPUTERS**

- Consider providing hardware (eg. computers) for participants. Many had to use their personal laptops, which did not meet the specifications and then the results were not in institutional machines, but personal devices.

**TRAINING CONDUCT - PROJECT STAFFING**

- Kick-off meeting important. Travel to Honduras prior to TEMPP1 to gain buy-in from the University which ended up playing a significant role.
- For TEMPP to be successful, you need trainers. It would be difficult to develop capacity with just the manuals. Trainers need to speak the local language, either with trainers that speak the language or thru the use of translators.
- Local Coordinator important, or add at least two trips for the external coordinator for follow-up on ComMIT and before the exercise and for Tsunami Ready recognition.
- Good to video tape so people could go back to clarify.
- Follow-up webinars between trainings is a good practice, could have been improved.
- Ensure enough time between trainings for further local development.
  - For evacuation map creation and finalization with community - you do not want to re-visit and change afterward. For example, between TEMPP3 and 4, Honduras made updates on data bases (coastal line, streets, facilities, etc), thus delaying the timeline and process to obtain a "final" version of the evacuation map.
Before TEMPP5, evacuation routes were walked to determine where the signage should be installed and final details for the evacuation drill were listed. However, for the drills, signage was not completely deployed

- Need more time for TEMPP5, probably a full week - PREP, Exercise and then Hot Wash and Debrief

**RESOURCES - FUNDING**

- Need to have realistic expectations of national funding, in Honduras the national participants required the funding up front to make the travel. The National Govt. had very little funding to support activities.  
  Need to be smarter in choosing which activities/items are easier for national agencies to fund. For example, travel, even local, is often hard, but printing, vehicles, emergency operations, materials are easier.
- Additional expenses for Tsunami Ready included in Budget - even if TR is not going to be pursued, but an exercise is going to be done, need the signs, printing of the maps, etc.

### 7. RECOMMENDATIONS TO PTWS-XXVII

(Draft to be completed after further Plenary discussion)

An important question to be answered by Member States is whether this Task Team should continue for the next intersessional period with possible changes to its Terms of Reference as the Pilot is nearly completed, or discontinued having mostly completed its Tasks.

The Task Team does offers the following recommendations to the ICG/PTWS-XXVII:

- **Notes** with appreciation the progress that has been made with regards to the establishment of a training programme for the creation of Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) under the lead of ITIC;

- **Notes** continuing challenges by countries in obtaining adequate bathymetric and elevation data sets for inundation and evacuation mapping, but that basic maps can be established that should not require detailed inundation modelling;

- **Emphasizes** the importance that every tsunami-vulnerable community should have an evacuation map and plans, and should regularly practice through drills and exercises; and

- **Notes** the interest of the XXX(countries) in the TEMPP process, and that the topic and interest was further discussed at the PTWS South West Pacific Working Group in 22-23 August 2016;

- **Encourages** Member States to make this a highest priority action to save lives.