Tsunami Evacuation Maps, Plans, and Procedures (TEMPP)

... communities knowing what to do and where to go

ITIC Essential Community Preparedness
Capacity Building, Honduras, Central America, 2015-16
PTWS Next Priority (5 yrs) – Preparedness

Since 2014 PTWS PTWC New Products start, Preparedness:

- **Communities must know what to do and where to go when a tsunami is imminent (> 50% lack plans)**
- **ITIC capacity building course – Tsunami Evacuation Maps, Plans, and Procedures (TEMPP)**

**EXERCISE PACIFIC WAVE 2015**

Evacuation Map?

- 53% YES
- 45% NO

*Tsunami Signage*
GOAL:

- Reliable tsunami evacuation maps done by communities and govt agencies.
- Globally applicable standardized tools and methodologies
  - Develop with Pilot – Central America, in Spanish
  - 5 linked training workshops over 1.5 years (2015-16)
    Start with modeling. End with functional exercise
  - Final Product: IOC Publication (2017) – TEMPP
    Review from ICGs, Global TOWS Inter-ICG TT Disaster Mgmt & Preparedness
  - Simultaneous pilots other countries possible subject to funding
Course Development - Partners

- **ITIC lead**, with USA (CTWP, PMEL, NTHMP), NZ, Philippines, IOC, PTWS WGs, TOWS WG

- **Course Development Team** - Warning, Modeling, Disaster Mgmt, Community Preparedness, Educ/Outreach practitioners

- **Pilot Country (Honduras) feedback**

- **PTWS Task Team Evac Planning and Mapping**
  - Chair – Dr. Laura Kong, ITIC
  - Caribbean: Alison Brome, CTIC; Patrick Tyburn, Martinique, France
  - Central America: Norwin Acosta, INETER, Nicaragua
  - SE Pacific: Representative, NDMO (Chile ONEMI or Peru INDECI), Chair, PTWS Southeast Pacific Working Group
  - SW Pacific: 'Ofa Fa'anunu, Tonga Metl Svc; Chair, PTWS SWP WG
  - DRR and Community Preparedness: Julie Leonard, PTWS WG 3 Vice-Chair; John Kimbrough, USAID/OFDA/LAC
  - IO and SE Asia: Ardito Kodijat, IOTIC; Irina Rafliana, Indonesia
  - Mediterranean and North Atlantic: Gerassimos Papadopoulos, Greece
Focus and Stakeholders: Scientists make Inundation Maps for Evacuation

1. **Simple approach (poor bathymetry):**
   - Historical observations provide value of maximum tsunami run-up in locality
   - This constant value of maximum run-up will be used to determine inundation line everywhere in the community

2. **Refined approach:**
   - Historical seismic events are used as tsunami sources in hydrodynamic models.
   - Hydrodynamic models are used to compute tsunami inundation and run-up. Variable maximum run-up will be used at different locations

3. **Sophisticated approach (good bathymetry):**
   - A Credible Worst Case scenario is evaluated from all available data (historical, seismic, tectonic)
   - Hydrodynamic models are used to compute tsunami inundation and run-up. Variable maximum run-up will be used at different locations
Focus and Stakeholders: Communities make Evacuation Maps

- Local workshops
- All Stakeholders
- GIS-facilitated maps
- Critical facilities, Schools, Hospitals, Special needs
- Safe Assembly areas
- Time of day, year
- Walking routes, Practice Exercises
<table>
<thead>
<tr>
<th>WORKSHOP / TRAINING SCHEDULE</th>
<th>DATES</th>
<th>PURPOSE / GOAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMPP 1: Tsunami Inundation Modeling – ComMIT/MOST tool</td>
<td>27-31 July 2015</td>
<td>Inundation modeling training using ComMIT tool and MOST model</td>
</tr>
<tr>
<td>TEMPP 2: Seismic Tsunami Sources for Honduras Meeting</td>
<td>29 Feb– 1 March 2016</td>
<td>Identification of credible worst-case tsunami scenarios to use for inundation mapping</td>
</tr>
<tr>
<td>TEMPP 2: Inundation Mapping for Evacuation – process</td>
<td>2-3 March 2016</td>
<td>Create Inundation map for a given community as an ensemble of inundation scenarios. Output results in GIS formats</td>
</tr>
<tr>
<td>TEMPP 4: Response Plans and SOPs, Socialization, Community Exercises</td>
<td>27-39 Sep 2016</td>
<td>Create Response Plan (warning / evacuation SOPs); Develop Exercise Plan, Create essential awareness materials (signage, maps, flyers)</td>
</tr>
<tr>
<td>TEMPP 5 Official Adoption Ceremony, Functional Exercise</td>
<td>Nov / Dec 2016</td>
<td>Official Adoption of Maps, Functional Tsunami Exercise, inc evacuation, TR recognition, Pilot Wrap-up</td>
</tr>
</tbody>
</table>
Pilot Activities: May – June, 2015

1. IOC CL 2578, Pilot Announcement, May 2015
   Honduras selected (1 Pacific, 1 Caribbean community)

   - Stakeholders coordination meeting
   - Brief on process. ID communities/agencies/govt/NGO

3. Course Development, June 22-26, 2015 + continuing
   - Inundation and evacuation mapping best practices – Japan, Hawaii/WA/PR States, Philippines, NZ, IOC
   - Hazard Assessment tools: NOAA ComMIT, GIS

- Inundation and evacuation mapping best practices:
- Hazard and evacuation mapping tools: ComMIT, GIS
TEMPP Input and Planning, Feb, June 2016

- PTWS Task Team on Evacuation Mapping and Planning and TOWS TTs - input
- TOWS Task Team on Disaster Management & Preparedness (TT-DMP)

➢ TEMPP Project to establish Evacuation Mapping Guidelines (TT-DMP activity)
TEMPP2, Feb 29 – Mar 3, 2016

- Seismic Tsunami Sources for Honduras – Expert Mtg
- Tsunami Inundation Mapping for Evacuation training
Course Documents

- Evacuation Overview
- Numerical Models in Hazard Assessment
- ComMIT tool manual (MOST model), including Appendices (abridged requirements, in Spanish)
- Seismic Worst-Case Scenarios for Tsunami Hazard Assessment (no credible sources)
- Establishing Tsunami Inundation for areas not-modeled or with low-hazard (no history, low population, poor DEM)
- Creating Evacuation Maps – 2013 Japan National Guidance, Philippines, NTHMP
- How to Create Tsunami Response Plans – UNESCO SOPs, NTHMP (Hawaii, CA)
- How to Conduct Community Tsunami Exercises - NTHMP
Tsunami SOP Manual (2016)

- UNESCO - ITIC Project (from 2008)
- US Examples (HI, CA)
  - Response Plans
  - EOC Checklists

PLANS AND PROCEDURES FOR TSUNAMI WARNING AND EMERGENCY MANAGEMENT

READER’S GUIDE

1. INTRODUCTION
2. END-TO-END TSUNAMI WARNING SYSTEM
   2.1 What is a Tsunami Warning System (TWS)?
   2.2 Understanding the end-to-end system
   2.3 Documents supporting a TWS
3. TSUNAMI WARNING
   3.1 Introduction
   3.2 Roles and Responsibilities of a TSP
   3.3 Roles and Responsibilities of a NTWC
   3.4 NTWC Operations Manual
   3.5 NTWC SOPs
   3.6 NTWC SOP Development
   3.7 Core activities of a NTWC – event response operations
   3.8 Core activities of a NTWC – post and non-event operations
4. TSUNAMI EMERGENCY RESPONSE
   4.1 Introduction
   4.2 The Roles and Responsibilities of a EMA
   4.3 Tsunami emergency response plans
   4.4 Tsunami emergency response SOPs
   4.5 Development of TER plans and SOPs
5. GENERAL BIBLIOGRAPHY
6. ANNEXES
   - Annex A GUIDELINES FOR NTWC SOPs
   - Annex B GUIDELINES FOR EMA TSUNAMI EMERGENCY RESPONSE PLANS AND SOPS
   - Annex C CASE STUDIES National Tsunami Warning and Emergency Response Plan, NTWC SOP, TER SOPs (Distant-generated Tsunami SOP; local-generated Tsunami and Earthquake SOP, Plans and Planning Template, Tsunami Evacuation SOP
   - Annex D SOP STRENGTHENING PROJECT
Japan Fire & Disaster Management Agency

- 2013 Report: Study Group of Promoting Guideline for Tsunami Evacuation Countermeasures
- National - Guideline for Municipality to make Tsunami Evacuation Map and Plan

Diagram:
- Earthquake
- Tsunami
- Tsunami Evacuation Map and Plan
- Target time line
- End of a tsunami
- Refuge plan
Tsunami Evacuation Planning – flow chart

Prefecture

Set tsunami evacuation areas
Guideline for Municipalities to Make Tsunami Evacuation Map and Plan

Municipality

Identify evacuation actions for warning or advisory

Expected casualties and/or property damage

Designate tsunami evacuation area

Identify actions for tourists, fishermen, and harbor workers

Resident Cooperation

Workshops
- Specify safety level of emergency evacuation points – what is purpose
- Educate on evacuating to safe places
- Identify emergency evacuation points by regional workshops
- Identify building tsunami evacuation towers or artificial elevations

Identify difficult evacuation area (vertical)

Safe emergency evacuation points selected by municipality

Identify difficult evacuation area (horizontal)

Safe evacuation routes selected by municipality

Official designation of emergency evacuation points

Official designation of evacuation roads and routes

What is known and needed:
- Expected Tsunami Arrival Time
- Set evacuation goals
- Set evacuation roads and routes
- Set Evacuation possible distance

Workshop – Responding Topics
- Initial actions
- Ensuring safety of participants to lead evacuation
- Authoritative tsunami information and transmission
- Issuing evacuation order
- Tsunami education and outreach
- Evacuation drill
- Other notes

yes

no

Make Tsunami evacuation plan and hazard map. Socialize

Review through drills etc.
Understand tsunami danger
What is making a regional evacuation plan important. Understand the regional tsunami danger
• Understanding about the purpose of workshop (3.3.1)
• Understanding about disasters (3.3.2)
• Understanding about regional risks (3.3.3)

Consider how to evacuate from a tsunami
Consider the evacuation (When, How, Where)
• What are the evacuation actions (3.3.4)
  ✓ Making the tsunami evacuation map (evacuation routes and points)
  ✓ Thinking about actions before the evacuation, things to bring, the means to get information, and so on.

Verify evacuation map and plan through drills (3.3.5)
Practice an evacuation drill, and review evacuation routes or actions based on lessons learned

Consider future tsunami measures (3.3.6)
Consider how to make use of what was learned in the workshop as future tsunami mitigation measures
Conceptual Diagram for Tsunami Evacuation Map and Plan

- Emergency evacuation point
- Evacuation road
- Evacuation route
- Difficult evacuation area
- Tsunami evacuation buildings
- Evacuation possible distance
- Evacuation area
- Tsunami inundation area
- Evacuation goal
- In principal, avoid the evacuation to this direction
- Shoreline
- Tsunami prevention facility
個別訓練

★訓練のすすめ方

事態では実際に災害しながり、常態から避難所までの経路と所要時間を確認する作業が中心になります。イラストマップなどを参考しながら、どこへどのような逃れるのかを事前に考えておく必要があります。

ビデオ撮影が加わる場合、訓練の一部を被災者や子供をビデオカメラで撮影します。被災者や子供が撮影された映像は、技術陣の指導を受けて、訓練の振り返りをすることを目的としています。

たとえば、「キセルを避けていく」避難のためには、避難の協力やサポートの利用がある場合かといった点です。

★訓練のポイント

ビデオ撮影を加えた場合、すべての参加者を訓練するための準備をしています。訓練までの準備は以下の通りです。

上に表記しているように、訓練のすべての参加者に、訓練の目的や内容を説明し、訓練の要領を説明します。訓練の要領は以下の通りです。

訓練の要領は以下の通りです。

★期待される効果

自分自身が「訓練」をつける訓練を教示するので、訓練の目的を「わからない」として意識して、慎重にきめることなく、乾燥することなく、自分自身の訓練の説明を聞き、その解決方法を個別に教示することを事前に確認することができます。

学校での災害対策と組み合わせて実施すれば、子供を含む地域住民の災害対策を要望、訓練に関する知識を活用したくでなく、地元、学校、行政の連携を強化します。さらに訓練を教示することの必要性は、学校での訓練の重要性を強調します。

また、子供たちから、訓練に関するメッセージを訓練参加者（たとえば教師や）にお伝えし、学校の緊急時対応や、地域の緊急時対応を強化することとともに、訓練の必要性を強調することを提案します。
HOW TO CONDUCT TSUNAMI DRILL

A TSUNAMI is a series of waves commonly generated by underwater earthquakes. Because of this, tsunami hazard zones can be vast and require careful study.

DESIGNING A TSUNAMI EVACUATION PLAN

Step 1: Acquire a tsunami hazard map and create a detailed community map.

Step 2: Identify safe evacuation areas.
- Should be outside identified tsunami Hazard Zone.
- Can be reached by foot within the shortest possible time.
- The total area of the site can hold an entire community.
- Can be easily identified by residents.

Step 3: Recommend evacuation routes.
- The Tsunami Evacuation Map should show the best routes (safest, fastest) for people to use in case of emergencies.
- Discuss with community leaders and residents to put up three kinds of signage:
  - Tsunami prone area
  - Tsunami evacuation route
  - Tsunami evacuation site
- Create draft of tsunami evacuation plan/working map showing tsunami inundation zone, identified evacuation areas, and routes.
- Organize a small group workshop with community leaders and residents.
- Discuss draft map and seek comments and inputs to improve.

Step 4: Develop complete version of the map.
- Finalize map from the inputs of community members and leaders.
- Evacuation maps should be simple and easy to read and should include essential information such as:
  - Tsunami hazard zones
  - Safe evacuation areas
  - Recommended evacuation routes
  - Local landmarks

Step 5: After coming up with the final tsunami evacuation plan:
- The Barangay Disaster Risk Reduction and Management Committee (BDRRMC) should take the lead in implementing the plan (e.g., assign specific roles to each member of the community and conduct regular tsunami drills).

A TSUNAMI EVACUATION MAP shows areas identified within hazard zones and areas which are safe. This map provides direction to identified evacuation sites.

PHASES OF A TSUNAMI DRILL

1. ALARM PHASE:
- 1 minute alarm signifying a strong earthquake

2. REACTION:
- People do the response procedure during the earthquake such as "duck, cover and hold"

3. EVACUATION PHASE:
- Residents quickly move out of their houses to go to designated evacuation areas

4. ASSEMBLY PHASE:
- Families from the same area or puroks should group together to better facilitate headcount/accounting of residents

5. HEADCOUNT PHASE:
- How many are expected to arrive based on barangay population information?

6. DRILL TERMINATION:
- The drill master should inform the participants that the drill has ended

7. POST-DRILL EVALUATION:
- Assessing the conduct of drill is important for improving future activities
UNESCO IOC - 2015

- Pilot – Pacific (2017): Honduras, Ecuador, Vanuatu, Samoa, Tonga
- Pilot – Indian Ocean: Regional discussion on World Tsunami Awareness Day (2016)

<table>
<thead>
<tr>
<th>INTERNATIONAL TSUNAMI READY (I-TR)</th>
<th>DONE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MITIGATION (MIT)</strong></td>
<td></td>
</tr>
<tr>
<td>MIT-1. Have designated and mapped tsunami hazard zones</td>
<td>X</td>
</tr>
<tr>
<td>MIT-2. Have a public display of tsunami information</td>
<td>X</td>
</tr>
<tr>
<td><strong>PREPAREDNESS (PREP)</strong></td>
<td></td>
</tr>
<tr>
<td>PREP-1. Produce easily understood tsunami evacuation maps as determined to be appropriate by local authorities in collaboration with communities.</td>
<td>X</td>
</tr>
<tr>
<td>PREP-2. Develop and distribute outreach and public education materials</td>
<td>X</td>
</tr>
<tr>
<td>PREP-3. Hold at least three outreach or educational activities annually</td>
<td>X</td>
</tr>
<tr>
<td>PREP-4: Conduct an annual tsunami community exercise.</td>
<td>X</td>
</tr>
<tr>
<td><strong>RESPONSE (RESP)</strong></td>
<td></td>
</tr>
<tr>
<td>RESP–1. Address tsunami hazards in the community’s emergency operations plan (EOP).</td>
<td>X</td>
</tr>
<tr>
<td>RESP–2. Commit to supporting the emergency operations center (EOC) during a tsunami incident if an EOC is opened and activated.</td>
<td>X</td>
</tr>
<tr>
<td>RESP–3. Have redundant and reliable means for a 24-hour warning point (and EOC if activated) to receive official tsunami threats.</td>
<td>X</td>
</tr>
<tr>
<td>RESP–4. Have redundant and reliable means for 24-hour warning point and/or EOC to disseminate official tsunami alerts to the public.</td>
<td>X</td>
</tr>
</tbody>
</table>

(Caribbean Guidelines, 2015)
Thank You

Dr. Laura Kong Director, ITIC
Christa von Hillebrandt-Andrade, Manager, CTWP
Diego Arcas, Acting Science Director, PMEL