

Photos, images and maps from the recent Asian Tsunami Disaster. The tsunami, resulting from an undersea earthquake close to Sumatra on 26

December 2004, killed around 155 000 people and affected millions in Bangladesh, India, Indonesia, Kenya, Madagascar, Malaysia, Maldives, Myanmar, Seychelles, Somalia, South Africa, Sri Lanka Tanzania and Thailand



United Nations Environment Programme

Awareness and Preparedness for Emergencies at the Local Level (APELL)

## APELL and Tsunamis A community-based approach for disaster reduction

A fully aware, well informed and properly trained population is the best guarantee of safety and of successful response to any disaster. This is especially true for tsunami hazards.

Unfortunately, most communities are not prepared for the hazards they face and often lack the reflexes to take effective action when disaster strikes. If we could reach out to communities before disasters and inform them of what to do 'just in case', impacts could be reduced dramatically.



Tsunamis are not new or unknown. They have been responsible for millions of deaths over the centuries, and have now claimed the lives of some 155 000 people in the Asian disaster. Tsunamis are not a frequent hazard, but the destruction they cause can be colossal, including death flooding, contamination of drinking water, fires, toxic contamination from ruptured tanks, loss of vital community infrastructure and crop devastation.

In 1883, the violent explosion of the Krakatoa volcano in Indonesia, produced tsunamis measuring 40 metres which crashed upon Java and Sumatra, killing over 36 000 people.

Tsunami early warning systems must be set up as a first step to better preparedness. But if we are to reach the most vulnerable, we must also start with community-based projects. Disaster

preparedness at the local level should focus on teaching people how to act in a disaster and how to develop emergency plans. How well people react in an emergency depends largely on how successfully such plans are communicated to them.

Although nothing can be done to prevent events such as the tragedy in Asia, it is certain that community awareness combined with warning systems could help to reduce their impacts. Tsunamis can be identified and monitored and, if the communities in potential risk areas are properly prepared, people can be warned and evacuated. Proper planning can dramatically reduce loss of life and property.

This brochure shows how community preparedness can help to reduce the impact of a tsunami disaster. It gives some background information on the phenomenon and then highlights options for making communities better prepared through a bottom-up, community-based, participatory approach known as APELL.

APELL, standing for Awareness and Preparedness for Emergencies at the Local Level, is a process designed to create public awareness of hazards and to ensure that communities and emergency services are adequately trained, coordinated and prepared to cope with disaster.



Tsunami impact area



Destruction in Banda Aceh, Indonesia  
Photo: Till Mayer, IFRC\*



Beach at Galle, Sri Lanka  
Photo: Till Mayer, IFRC\*



Phuket Strike in Thailand, before and after the tsunami

\*IFRC – International Federation of Red Cross and Red Crescent Society – Photos taken from IFRC website at: <http://www.ifrc.org/index.asp>

## The Pacific Tsunami Warning System (PTWS)

The Pacific Tsunami Warning Centre, in Hawaii, serves as the international warning centre for tsunamis that pose a Pacific-wide threat. The PTWS is comprised of 26 Member States that are organized as the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU). The main purpose of the group is to ensure that tsunami watches, warning and advisory bulletins are disseminated to member states throughout the Pacific.

The ICG/ITSU is a subsidiary body of the United Nations Educational, Scientific, and Cultural Organization, Intergovernmental Oceanographic Commission (UNESCO/IOC). The IOC also maintains the International Tsunami Information Centre (ITIC) to assist in the work of the ICG/ITSU, and identification of improvements to the international tsunami warning system.

- UNESCO IOC-IGC/ITSU Website: (<http://ioc.unesco.org/itsu/>)

### Tsunami Safety Rules

Adapted from the International Tsunami Information Centre (ITIC)

1. All earthquakes do not cause tsunamis, but many do. When you hear that an earthquake has occurred, stand by for a tsunami emergency.
2. An earthquake in your area is a natural tsunami warning. Do not stay in low-lying coastal areas after a strong earthquake has been felt.
3. A tsunami is not a single wave, but a series of waves. Stay out of danger areas until an 'all-clear' is issued by a competent authority.
4. Approaching tsunamis are sometimes preceded by a noticeable rise or fall of coastal water. This is nature's tsunami warning and should be heeded.
5. A small tsunami at one point on the shore can be extremely large a few miles away. Don't let the modest size of one make you lose respect for all.
6. When a warning is issued, a tsunami exists. The tsunami of May 1960 killed 61 people in Hilo, Hawaii, and they thought it was 'just another false alarm.'
7. Like hurricanes, all tsunamis are potentially dangerous even though they may not damage every coastline they strike.
8. Never go down to the shore to watch for a tsunami. When you can see the wave you are too close to escape it. Never try to surf a tsunami; tsunamis do not curl or break like surfing waves.
9. Sooner or later, tsunamis visit every coastline. Warnings apply to you if you live in any coastal area.
10. During a tsunami emergency, your local civil defence, police, and other emergency organisations will try to save your life. Give them your fullest cooperation.

## Background information on tsunamis

A tsunami, the Japanese word meaning 'harbour wave', is actually a series of waves caused by undersea or coastal seismic activity. Tsunamis originate when underwater earthquakes, landslides, volcanic activity, eruptions or similar events displace sea water on a massive scale.

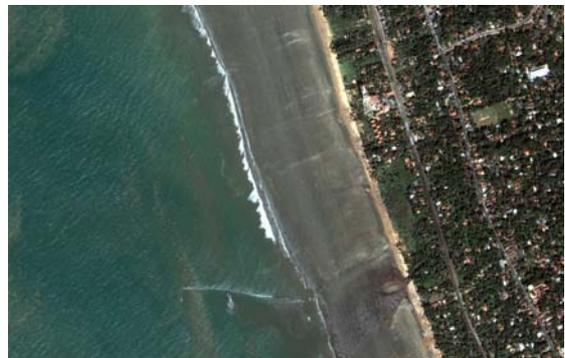
Offshore, tsunamis have very long wavelengths and low 'amplitude' (wave height); they may even be imperceptible to people on boats or ships. In deep water they can travel great distances at speeds of 500 to 1000 km/hr. However, as they approach the shore, they lose speed and reduce wavelength but gain greatly in height, ultimately surging over land with great destructive power.

**Not all earthquakes generate tsunamis. Underwater earthquakes with shallow focus (less than 70 km) along subduction zones are responsible for most destructive tsunamis.**

## Is it possible to visually identify a tsunami from the coast?

Yes and no. A tsunami does not always appear as the vertical wall of water, known as a bore, typically portrayed in drawings. The initial onshore signs depend on what part of the wave first reaches land: a wave crest will cause a rise in the water level; a trough will cause the water to withdraw from the coast. A rise may not be significant enough to be noticed by the general public and observers are much more likely to notice the withdrawal of water. This is often far greater than a tide related withdrawal and may even leave fish floundering on the seafloor.

For communities that are prepared but not connected to a warning system, this characteristic may be the only chance they have to trigger an emergency plan.



Satellite picture from the coast of Sri Lanka showing the withdrawal of the Sea

Communities that are aware, educated and prepared have a much better chance of identifying these tell-tale phenomena and of moving quickly to higher ground to save lives and avoid other destructive impacts.

## Where to find more information on tsunamis

- NOAA's Pacific Marine Environmental Laboratory: <http://www.tsunamiwave.info>
- National Disaster Education Coalition <http://www.disastereducation.org/guide.html>
- The Western States Seismic Policy Council: <http://wsspc.org/>
- Tsunami and Earthquake Links: <http://walrus.wr.usgs.gov>
- FEMA: Backgrounder: Tsunamis: <http://www.fema.gov>
- Tsunami, The Great Waves: [http://www.prh.noaa.gov/itic/library/pubs/great\\_waves/tsunami\\_great\\_waves.html](http://www.prh.noaa.gov/itic/library/pubs/great_waves/tsunami_great_waves.html)
- Tsunami: Linking Insurance and Science: <http://www.nerc-bas.ac.uk/tsunami-risks/index.html>
- Surviving a tsunami--Lessons from Chile, Hawaii, and Japan: <http://pubs.usgs.gov/circ/c1187/>

## Community Preparedness for tsunamis – *APELL in practice*

---

For tsunamis, as for other hazards, APELL means community preparedness achieved through community participation in emergency planning. In the APELL process, this is based on dialogue between all stakeholders, including local authorities, rescue services and community leaders.

APELL in practice means: an emergency plan to which the community has provided substantial input and which ordinary citizens can understand; communities that have emergency plans, evacuation routes and centres; hospitals prepared to deal with evacuees and injured people; and local authorities ready and able to receive tsunami warnings and to communicate them to communities at risk in order to trigger immediate evacuation.

Better prepared communities have a much better chance of responding effectively to tsunamis. People who are truly aware of the hazard, can use local knowledge of natural tsunami warnings, will have stronger essential infrastructure and will use land-use planning to site schools and hospitals on higher ground. Their emergency services will also be able to evacuate potential risk areas quickly, and tsunami-educated children cooperate during an emergency.

Achieving these ends does not require major changes nor the mobilization of extraordinary resources. In the first instance, however, it requires political will. Some actions that central and local governments could consider are spelled out below, others are indicated in the column on the right.

### Possible risk reduction measures

adapted from the - United Nations Disaster Management Training Programme (1997). *Introduction to Hazards*

---

- Establish and implement tsunami early warning systems.
- Build tsunami evacuation routes and publicise their locations. Post signs directing people to higher ground away from the coast.
- Review land use in tsunami hazard areas so that no critical facilities such as hospitals and police stations, high-occupancy buildings such as auditoriums or schools, or petroleum-storage tank farms are located where there is a tsunami hazard.
- Establish building codes or guidelines (for example, for construction of houses on stilts to survive the waves or use of reinforced concrete structures). Buildings such as hotels can be constructed with the first floor living area above potential wave height. Structural columns must resist the impact; walls are expendable.
- Build barriers or buffers such as special breakwaters or seawalls. Potential inundation areas may be designated as parks or sports areas.
- Publish a special section in the local newspaper with emergency information on tsunamis. Localize the information by printing the phone numbers of local emergency service offices, the Red Cross, and hospitals. Inform the community of any local public warning systems periodically.

## APELL and tsunami prevention and preparedness for coastal zones

### Within the APELL process:

#### The community will:

- recognize and follow tsunami warnings
- be aware and recognize tsunami events based on indigenous knowledge (unusual withdrawal of the sea)
- follow established evacuation routes and go to higher ground when an earthquake is felt or if alerted
- know which news services are appropriate before, during and after earthquakes and tsunami events
- stay away from low-lying areas during the disaster
- know if their property is in a tsunami prone area and what prevention measures should be taken

#### Rescue services would:

- be properly equipped and trained
- have local tsunami inundation maps showing prone areas, and vulnerability assessments
- monitor changes in the ocean and meteorological and seismic warnings continuously
- implement local emergency plans
- mobilize community resources
- assess immediate needs for evacuation, shelter, medical care, route diversions, etc.
- have communication channels with the public during crisis
- perform full-scale evacuation drills

#### Government authorities of coastal areas prone to tsunami hazard could take steps towards:

- the development of tsunami inundation maps for tsunami hazard zones
- the establishment and enforcement of legislation on safe land-use in tsunami hazard-prone areas
- locating schools, hospitals and essential infrastructure on higher ground
- strengthening and enforcing building codes in tsunami prone areas
- planning, to regulate development in tsunami prone areas
- the creation of economic incentives
- making public information on tsunami hazards available
- training emergency services and communities on tsunami preparedness
- making medical services ready for a tsunami crisis
- improving local preparedness by fostering links with national disaster management programmes
- implementing early warning systems for tsunami monitoring or integrating existing early warning systems

#### International agencies could:

- coordinate international and regional cooperation on disaster management
- support effective early warning systems and assessment studies
- encourage governments to adopt and enforce suitable legislation and policy on disaster management, including national contingency plans
- support the promotion of prevention and preparedness procedures at the local level

## How does APELL operate?

The APELL process is a management tool that helps local people develop the information and decision-making structures they need to address the hazards facing their community. By engaging stakeholders in a process of structured dialogue and coordination, APELL's 10-step approach leads to the development of a single, unified emergency response plan for the entire community.

**Development of a local tsunami awareness continuity mechanism is vital for the communities to stay alert, it's very easy to forget!**

APELL is extremely useful in areas where local communities are not easily connected to national contingency planning and warning systems. In such areas, it is essential that the local population is informed about tsunamis and educated to recognize the signs which are the forerunners of an approaching tsunami, so as to take appropriate action on their own initiative. APELL is a process that helps to empower local people so that they can organize, act together and overcome barriers to successful community action.

UNEP developed the APELL programme in the 1980s, in association with the chemicals industry, with the intention of addressing public hazards from industrial installations. It has since been widened to encompass ports, transport, mining, and natural disasters.

### Tips for local tsunami preparedness include:

- Hazard and risk assessment – to identify hazards and determine coastal areas most vulnerable to tsunamis
- Tsunami inundation maps – to designate areas expected to be damaged by flooding or waves
- Evacuation routes – for the community to reach higher ground or move inland easily
- Emergency plans – to be disseminated and tested regularly with involvement of the public
- Awareness raising campaigns – to educate the community; children should be involved

## UNEP

The mission of the **United Nations Environment Programme** (UNEP) in the field of disaster reduction is to address the immediate and long term human, social, health, economic and environmental impacts of natural and human-induced disasters, minimizing the resulting environmental emergencies that they cause. UNEP's approach is to promote disaster management to reduce vulnerability and enhance coping-mechanisms through capacity building, and activities in the field of early warning and assessment, prevention and preparedness, emergency response mechanisms, post-disaster and post-conflict assessment, and environmental rehabilitation.

### **UNEP - Division of Technology, Industry and Economics**

39-43 quai André Citroën - 75739 Paris Cedex 15, France  
Tel. +33 (0) 1 44 37 14 50; Fax +33 (0) 1 44 37 14 74

E-mail: [apell@unep.fr](mailto:apell@unep.fr) Website: <http://www.uneptie.org/apell>

## APELL 10-step approach

1- Identify the emergency response participants and establish their roles, resources, and concerns

2- Identify and assess all hazards and risks (multi-hazard approach) that may result in emergency situations in the community. Propose early warning, prevention and mitigation measures

3- Have participants review their own emergency response plans to ensure a coordinated response

4- Identify the required response tasks not covered by existing plans

5- Match these tasks to the resources of the identified participants

6- Make the changes to improve existing plans, integrate them into an overall community plan, and gain agreement

7- Commit the integrated community plan to writing and obtain approval from local governments

8- Educate participating groups about the integrated plan

9- Establish procedures for periodic testing, review, and updating of the plan

10- Educate the community about the integrated plan – Awareness raising campaigns

#### Brochure Bibliography:

UNDP - United Nations Disaster Management Training Programme (1997). *Introduction to Hazards*  
UNESCO, US Department of Commerce, NOAA (2002). *Tsunami, The Great Waves*  
UNEP Publication (1988). *APELL Handbook*  
OCHA (1978). *Disaster Prevention and Mitigation, a Compendium of Current Knowledge, Volume 3, Seismological Aspects*  
USGS, National Tsunami Hazard Mitigation Program (1999). *Surviving a Tsunami – Lessons from Chile, Hawaii, and Japan*  
National Disaster Education Coalition (2004). *Talking About Disaster: Guide for Standard Messages*