

UNESCO & CTBTO: Working together to issue timely alerts



Buttressing the global tsunami warning network

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Tsunami is a Japanese word meaning 'harbour wave'. Tsunamis are primarily generated from an underwater shallow earthquake. They are usually small in deep waters, but become large and cause damage when they approach coasts or harbours. A characteristic of tsunamis is that their destructive impact can occur far away from the area of origin.

Tsunami warning centres and regional tsunami warning systems build on existing detection, verification and communication networks such as international seismic and sea level networks. These include the international seismic monitoring network, the international array of sea level measuring stations (the Global Sea Level Observing System, the Global Telecommunication System of the World Meteorological Organization and associated public geostationary satellites) and the internet. The detailed functioning of a tsunami warning system and centre have been described earlier in *Spectrum* issues 6 and 13.

MASSIVE INDONESIAN TSUNAMI TRIGGERS DEVELOPMENT OF MORE TSUNAMI WARNING SYSTEMS

No single country can develop basin wide tsunami detection systems. As a consequence, the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC/UNESCO) has since 1965 been responsible for the intergovernmental coordination of the

Pacific Tsunami Warning System (PTWS). Following the devastating tsunami of 26 December 2004 in the Indian Ocean, the IOC Member States requested at the 23rd IOC Assembly in June 2005 that similar warning systems be developed for the Indian Ocean, the Caribbean Sea and adjacent regions as well as the northeast Atlantic, the Mediterranean and connected seas. The IOC is primarily concerned with international coordination among nations, while the operational duties of the tsunami warning centres reside with national agencies.

Also following the 2004 tsunami, IOC/UNESCO and the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) agreed to explore the potential of using data from the International Monitoring System (IMS) for tsunami warning purposes.

CTBTO APPROVES TRIAL USE OF MONITORING DATA FOR TSUNAMI WARNING PURPOSES

The CTBTO decided at its special session on 4 March 2005 to cooperate with IOC/UNESCO on a possible contribution to an effective tsunami warning system. The two organizations agreed to share efforts to facilitate the development and operation of tsunami warning centres.

Initially the CTBTO authorized the exploratory provision of data from the IMS requested by national authorities and by international tsunami warning



JANUARY 2010:
Earthquake damage, Port au Prince, Haiti.
Photo courtesy of U.S. Coast Guard Sandra Kay Kneen

The CTBTO National Data Centre in Haiti: helping enhance seismic monitoring and knowledge on tsunami hazards

On 12 January 2010, a 7.3 magnitude earthquake struck Haiti and caused many human casualties, considerable material losses and immense suffering. The capital, Port au Prince, was heavily affected. The “Palais National”, the site of the Haitian Executive Power, and other public buildings collapsed. Hundreds of civil servants died and the capacity of Haiti to deal with the crisis was severely impacted. The earthquake lasted 53 seconds but the disaster lasted much longer.

The seismic hazard in Haiti was not unknown to the specialized scientific community, but there was less awareness in large segments of the population and among decision makers. For instance schoolbooks mentioned little – if anything – about the historical earthquakes and tsunamis that affected Port au Prince in 1751, 1770 and 1860 and the one that affected Cap Haitien in 1842. Consequently an environment/society had emerged that had little resilience to earthquakes and tsunamis.

Following the 2010 earthquake, the Haitian Government, with the support of national and international partners, has engaged in establishing a permanent seismic observation network managed by the Bureau of Mines and Energy (BME). These partners are the National Observatory for the Environment and Vulnerability (ONEV), the Directorate of Civil Protection (DPC), the Faculty of Sciences of the Haitian State University (UEH/FDS), the United States Geological Service (USGS), Natural Resources Canada (NRCan),

l’Institut Physique du Globe de Paris (IPGP), Purdue University and the United States Development Agency (USAID).

The CTBTO has been an important partner in this endeavour as well and has contributed by establishing the CTBTO National Data Centre (NDC) at the BME in September 2011 in close cooperation with UNESCO. The CTBTO NDC is part of the Haitian Seismological Technical Unit (UTS) created in February 2011. The UTS will be responsible for monitoring seismic activity at the national and regional level and for ensuring the compilation of a database useful for research. In addition, the UTS shall promote data exchange with other countries in the region and provide the necessary information on seismic hazards for decision-makers regarding land-use planning in Haiti. These efforts were also underpinned by a training course for Haitian technicians in seismic observation in partnerships with regional centres and universities.

The CTBTO NDC serves as an example of how technology developed by the CTBTO is used for civil purposes. Knowledge on seismic hazards and the contribution to data exchange and analysis provide technical and decision-making institutions with products and tools that can contribute to reducing loss of life and property caused by earthquakes and tsunamis. NDC products can also be of use in the efforts of the scientific community to maintain awareness of the seismic risks faced by Haitian society.

3 FEBRUARY 2010:
 CTBTO Executive Secretary
 Tibor Tóth and UNESCO Director-
 General Irina Bokova after signing an
 agreement to enhance cooperation
 between the two organizations,
 especially for tsunami warnings.



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organizations that were recognized by IOC/UNESCO in accordance with a decision taken by the CTBTO's Working Group concerned with verification issues, IOC/UNESCO has to approve/recognize the national tsunami warning centres that have submitted requests to the CTBTO to use seismic and other IMS data for purposes of producing tsunami warnings.

These centres are officially nominated by Member States to IOC/UNESCO and are national institutions that adhere to the intergovernmental governance of UNESCO. The CTBTO thereafter receives confirmation from IOC/UNESCO of "approved/recognized" tsunami warning centres, which will receive IMS data.

**WORKING TOGETHER TO ISSUE
 EARLIER TSUNAMI ALERTS**

The provisional arrangement between the two organizations proved effective in the development phase of the new tsunami warning systems. In recognition of the successful trial period, an agreement was signed on 3 February 2010 by Irina Bokova, Director-General of UNESCO, and Tibor Tóth, Executive Secretary of the CTBTO, to enhance cooperation between the two organizations, notably for the benefit of tsunami early warning systems and capacity-building in developing countries.

The benefits of using the IMS stations as a supplement to the existing network of seismic stations are:

- a more uniform setting of the stations in the network;
- higher data availability and faster data transmission;
- highly accurate data due to equipment that record seismic waves over a wide range of frequencies; and
- Some IMS stations are in isolated places not populated by other networks.

All of these are factors that contribute to the more accurate determination of earthquake parameters and hence to the issuing of earlier tsunami alerts deriving from potentially tsunamigenic earthquakes.

**OVER 2 GIGABYTES OF
 MONITORING DATA SENT
 DAILY TO TSUNAMI WARNING
 ORGANIZATIONS**

As of March 2012, Australia, France, Indonesia, Japan, Malaysia, the Philippines, Thailand, Turkey and the USA had taken advantage of incorporating CTBTO seismic data into the use of their national tsunami monitoring. Additional countries are expected to sign agreements with the CTBTO in the near future. As an indicator, in 2011, about 2.3 gigabytes of IMS primary seismic, auxiliary seismic and hydroacoustic data were sent in near-real time daily to tsunami warning organizations.

The provision of seismic data is not the only outcome of the strengthened

CTBTO – UNESCO collaboration. IOC/UNESCO and the CTBTO have partnered in assisting Haiti to develop its capacity for seismic and tsunami monitoring (see text box on opposite page).

In closing I want to thank the CTBTO for the very fruitful and productive collaboration our two organizations have enjoyed over the past years and we look forward to continuing along this track.

Dr Watson-Wright thanks Thorchild Aarup, Head IOC Tsunami Unit, Bernardo Aliaga, IOC Programme Specialist and Diana Patricia Mosquera, UNESCO Programme Specialist based in Port au Prince, Haiti, for their assistance with this article.

BIOGRAPHICAL NOTE

WENDY WATSON-WRIGHT

has been Assistant Director General and Executive Secretary of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO) since January 2010.

Prior to joining the IOC, Dr Watson-Wright held a number of senior positions within the Public Service of Canada, including Assistant Deputy Minister, Science, for Fisheries and Oceans Canada from 2001 to 2009 where she was responsible for providing the leadership and policy and scientific direction for all science activities in the department.