

Search

Search Tips

SUBSCRIBE NOW!

Current Issue

Archives

E-mail the Editor



FRONT PAGE

CURRENT ISSUE

READER SERVICES

ADVERTISING

OUR SPONSORS

Sponsors



World Leader
in Electronics
Services
Design
Production
Logistics
Warranty/Repair

FEATURE ARTICLE

November 2005

Indian Ocean Tsunami Warning System to Become Operational in 2006

By Grace Jean

A tsunami warning system for the Indian Ocean may become operational as early as next summer, according to an expert familiar with the plans.



“What we’ve said on paper is we’d like to get a fully operational system up and running by July 2006,” said Laura Kong, director of the UNESCO International Tsunami Information Center, based in Honolulu, Hawaii.

Representatives from 28 Indian Ocean nations have united in an intergovernmental coordination group under UNESCO, the United Nations Educational, Scientific and Cultural Organization, to plan and implement the Indian Ocean Tsunami Warning and Mitigation System.

“It’s trying to bring everyone together to make sure we have a regional system of monitoring and communicating, and alerting at the national level,” said Kong.

At the group’s first meeting in August, officials set forth a plan calling for the establishment of seven regional tsunami advisory centers in the Indian Ocean basin, the installation and upgrading of coastal sea-level gauges, seismic instruments and stations, and the deployment of deep underwater sensors.

Collectively, the instruments will have the ability to detect earthquakes and to confirm whether or not a tsunami has been generated, said Kong. Then, each individual nation would be responsible for implementing a system to transmit tsunami alerts to its people.

The Dec. 26, 2004, Indian Ocean tsunami claimed an estimated 300,000 lives. While there were seismic instruments and some seismographic stations in place at the time to detect earthquakes, there was no tsunami warning system in the region, said Kong. As a result, local authorities and residents could not be forewarned, she said.

Observation of the wave is the most critical piece of tsunami detection. In order to do that, countries need to have coastal or deep ocean gauges in place, said Kong.

Upgrades to seismic instruments and other coastal sea-level gauges in the Indian Ocean will begin this month. The participating nations are in the process of determining which deep ocean tsunami detection technologies to pursue. Germany, India and the United States are among the nations that have technologies available. The U.S. technology, called DART, or Deep-Ocean Assessment and Reporting of Tsunamis, has been recognized as the leading system (see related article).

“DART for sure could have saved lives,” said Christian Meinig, director of engineering at the National Oceanic and Atmospheric Administration’s Pacific Marine Environmental Laboratory, which developed, designed and built DART.

The multinational group expects to have 23 real-time sea-level stations established in the Indian Ocean by the end of the year.

“All countries in the Indian Ocean basin have some sea-level measuring device operating in their ports and bays. In the majority of cases, these are not real-time instruments,” wrote Koichiro Matsuura, director-general of UNESCO, in a speech delivered by Patricio Bernal, executive secretary of UNESCO’s Intergovernmental Oceanographic Commission. The new instruments will operate on solar power to make the signals autonomous from the local energy source, which is usually lost during an emergency. Such technology will require closer supervision and maintenance, he added.

Tsunami advisory centers will be established in seven nations: Australia, India, Indonesia, Iran, Malaysia, Pakistan and Thailand.

These stations will receive the data transmitted by the seismic instruments and the deep ocean sensors. In the event of a tsunami, the stations would send out an alert to local authorities, who would then commence evacuation procedures set forth by their respective nations.

The funding for constructing the warning system will come primarily from Indian Ocean nations, said Kong. Key countries, such as Australia and India, have committed tens of millions of dollars toward the effort.

“We’re doing okay, but I think we could do a lot better and reach more people if there were more funding, more resources, more people trying to provide services,” she said.

Officials estimate the system will cost \$200 million in equipment and services alone.

Countries around the globe have pledged approximately \$3 billion for reconstruction efforts in the Indian Ocean nations affected by the floods. However, the agencies overseeing the construction of the warning system have not received any significant amounts of money, said Kong.

“We’d like to make sure all these countries have sufficient funding to build their warning system,” said Kong.

According to Kong, the U.S. tsunami warning system in the Pacific operates on an annual budget of less than \$2 million. She estimates the cost of running and maintaining the Indian Ocean warning system to be about \$25 million, based on an average of \$1 million per country for staffing, operations and instrumental maintenance.

In April 2004, the Intergovernmental Oceanographic Commission (IOC) of UNESCO set up an interim tsunami monitoring advisory system for the Indian Ocean. Both the U.S. Pacific Tsunami Warning Center and the Japan Meteorological Agency have been providing earthquake information to 25 nations there, telling them where an earthquake occurred, its size and the level of tsunami threat, said Kong. But because neither country has tsunami-detection sensors in the Indian Ocean, they cannot confirm the generation of an actual tsunami following an earthquake.

In addition to the scientific equipment, Kong says an education campaign also is needed.

“I think just an increase of awareness means maybe half of the people wouldn’t lose their lives,” said Kong.

Costas Synolakis, director of the Tsunami Research Center at the University of Southern California, agrees. He has been traveling around the Indian Ocean basin to gather field data about tsunami inundation.

“What we learned in Asia is that those who recognized the signs [of a tsunami] were saved,” he said.

Part of that awareness comes from knowing how tsunamis will impact a particular region.

“We need to have inundation maps that reflect different levels of risk,” said Synolakis. “We should be able to have plans for 3-foot, 5-foot, 10-foot tsunamis. You really don’t have the time to run computation models, no matter

how quickly they run,” he said.

These maps would tell people that if there’s a 10-inch high tsunami in a particular region of the ocean, for instance, then it means in Madagascar, the wave would be 5 feet high. Armed with such information, authorities could better implement their evacuation plans, he said.

But Synolakis believes proper tsunami detecting equipment would have lessened the detrimental impact of the Dec. 26 tsunami.

“Had there been a NOAA buoy, yes, it would have helped, because the Pacific Warning Center would have known that a tsunami was generated. It would have saved lives, definitely. Even a single buoy,” said Synolakis. “Tens of thousands of people could have been evacuated in 1.5 hours if you had a buoy between, say, Sri Lanka and Thailand,” he added.

“It’s hard to know how many fewer people would’ve died if there had been some kind of effective warning system. It’s one thing to order an evacuation if you have two to three hours notice. It’s another thing to prepare if you have 10 minutes notice,” said Kong.

On June 14, a 7.2 earthquake off the coast of California generated a small tsunami that prompted the evacuation of some coastal areas in northern California and southern Oregon.

The alert was issued by the tsunami warning center in Alaska, which typically handles such matters for the west coast.

“It was a valid call from the warning center in Alaska,” said Jay Wilson, earthquake and tsunami programs coordinator for the Oregon Office of Homeland Security’s emergency management division.

Complications arose when the tsunami warning center in Hawaii issued a separate bulletin that was intended for its international audience.

“There were many people here who received it incidentally. It was interpreted as a cancellation for the initial warning,” said Wilson.

The confusion resulted in some jurisdictions canceling their evacuations.

“It was a nightmare,” said Synolakis. “People were calling us from all over, asking, ‘what do we do?’ ”

Most tsunami warnings in the United States have come from earthquakes generated near Alaska or in the western Pacific Ocean, said Wilson.

“Those have all meant that they were hours from impending land fall. This one was different,” he said. It made landfall in minutes. The generation of a tsunami warning by a near-shore earthquake was a first for the west coast.

“We’ll never have an opportunity like this again, to be tested as thoroughly as we were in terms of the amount of work that has gone into assessing the level of preparedness,” said Wilson. They still have a lot of work to do, he said.

Having a deep ocean sensor located 350 miles off the west coast was effective because “it allowed [the warning centers] to see it was a non-destructive wave,” said Kong.

But Wilson countered, “It took almost an hour for the few centimeter high tsunami to be verified at one of the buoys off the Oregon coast to cancel the warning. Those buoys don’t do us any good on a near-shore earthquake,” he said.

The one country that has had the most experience with tsunamis caused by near-shore earthquakes is Japan, said Kong, because the country sits in a very active tectonic boundary.

In the last 2,000 years, 100- to 200,000 people there have lost their lives in tsunamis. The last devastating tsunami in Japan occurred in 1993. It killed about 250 people because they had a 10-minute warning to evacuate, said Kong.

As a result, Japan installed warning equipment that alerts coastal residents within minutes, said Kong.

“They have a very good system that they use—a lot of automation. And it’s tied to the media in broadcasting alerts,” said Kong.

Because of the national threat right off shore, they don’t really need to use deep ocean sensors like the United States does, said Kong.

Scientists like Synolakis have been working to make tsunamis more predictable.

“What we have learned in the past three years is how to really use the signal that we get from the buoys to improve our real-time forecasting,” he said. In five years, he hopes scientists will be able to forecast a tsunami much like meteorologists today forecast a hurricane’s landfall.

Unlike tsunamis, hurricanes move very slowly, “so we have a much more difficult time in forecasting,” he said. However, tsunamis tend to be more predictable because they don’t change paths like hurricanes can.

The Indian Ocean tsunami has sparked a call for a global warning system, said Kong. UNESCO is working to implement such a system by 2007, and is considering expanding it to an “all-hazard” system.

Raytheon Corp. has developed a technology that it says would utilize satellite radio to transmit tsunami warnings (see related article).

“If this technology is providing a way to send messages efficiently and cost-effectively and without interfering with data, that would be great,” said Kong.

The intergovernmental group meets this month in India to determine the selection of the deep ocean sensor technology and to finalize details of the warning system implementation.

[Back To Top](#)