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Sustainable Tsunami Observations – a Global Challenge

The Boxing Day tsunami goes into the history of mankind as one of the worst natural disasters on record. More than 300,000 people died in the catastrophe.

The level of international support for the tsunami victims has been tremendous. The UN appeal has raised almost 7 billion USD. Moreover, a substantial amount of support has been donated by companies and individuals to non-governmental organizations.

It is fair to say that the human and economic costs of the tsunami were not entirely unexpected. The International Strategy for Disaster Reduction (ISDR) of the United Nations has estimated that more than 70% of the economic damage of natural disasters in the OECD countries has been caused by seismic and hydrodynamic disasters (earthquakes, storm surges, tsunamis, etc.), whereas weather-related disasters are more frequent and dominate the news but

do not create as much economic damage.

Is this an indication that weather-related disasters are al-

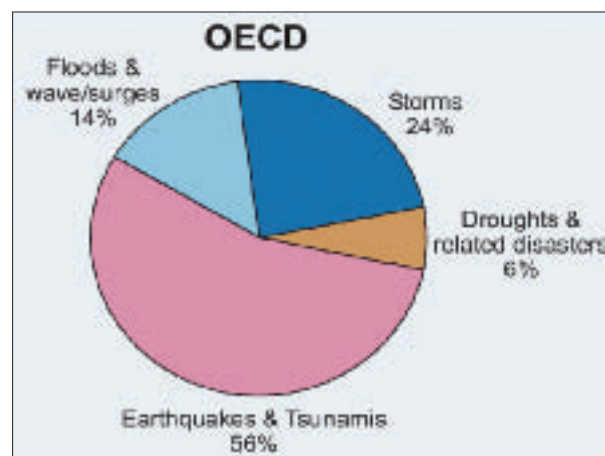
ready well observed and predicted, and therefore their potential for disasters is tamed? Should the focus of hazard mitigation

move towards the oceans and the Earth's crust?

The wider demand for preparation and readiness

In the aftermath of the Boxing Day tsunami, there has been a surge of suggestions for various types of early warning systems that could monitor and detect tsunamis. Many of these are technically as well as logistically expensive. For example, the DART system deployed by the USA in the northern Pacific Ocean costs about 150k USD per year per buoy to maintain.

The economic damage caused by different types of natural disasters in OECD countries in 1994-2003. Source: ISDR



Even the USA has found it difficult to find sustained funding for such a system.

How could the likes of the Asian “tigers”, the rapidly developing tsunami-affected nations in the Indian Ocean as well as their kin elsewhere in the world, find the funding to maintain an equally expensive system, which would survive the long-term political changes and still function after 50 years?

The key to such a sustainable system must be its ability to produce continuous added value to the society. Only through a continuous supply of information that is of societal value can a hazard monitoring and prediction system find a political justification in the long run. Keith Alverson, the head of the Global Ocean Observing System (GOOS) of the Intergovernmental Oceanographic Commission (IOC) addressed this matter clearly in his article for Nature:

“... the best way to ensure that a tsunami warning system remains fully operational for decades to come is to embed it in broader efforts to observe the ocean” (K. Alverson, 2005: Watching over the World’s Oceans. Nature 434, pp. 19-20).

Or, as Alverson highlighted in one of his speeches, suppose you have two cars; one that you use every day and therefore regularly maintain, and another one that is only used for emergencies and which may not have been used for 20 years. Which car would you choose if you had to urgently take your spouse or child to hospital?

Global tidal gauge network

Such a sustainable system for tsunamis already exists: the global tidal gauge network, operated under the IOC’s Global Sea Level Observing System (GLOSS) program. GLOSS has about 290 real-time sea level stations around the globe. Although the network was originally designed as a tool for monitoring long-term changes in sea levels, many

What is GLOSS?

The Global Sea Level Observing System (GLOSS) is an international program conducted under the auspices of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) of the World Meteorological Organization (WMO) and the Intergovernmental Oceanographic Commission (IOC).

GLOSS aims to establish high quality global and regional sea level networks for application to climate, oceanographic and coastal sea level research. The program became known as GLOSS as it provides data for deriving the “Global Level of the Sea Surface”.

The main component of GLOSS is the “Global Core Network” (GCN) of 290 sea level stations around the world for long-term climate change and oceanographic sea level monitoring. ●

(Source: <http://www.pol.ac.uk/psmsl/programmes/gloss.info.html>)

of its stations already currently transmit their information in near-real time to the global data networks.

Tele-tsunamis, that is, tsunamis that cross entire ocean basins, can be detected and verified with tidal gauges situated on coasts and ocean islands. Perhaps more importantly, the non-tsunamis, that is, false alerts from earthquakes that have not gener-

ated tsunamis, can be verified as well, therefore substantially reducing the economic costs of a tsunami alert system.

Local ownership

A system like GLOSS is sustainable, since it is operated and maintained by local caretakers, who can use the data for their own benefit – such as harbor maintenance, for instance.

Observing the Oceans

Vaisala provides tide/coastal meteorological stations that can be used for observing the oceans – in support of and when upgrading the existing systems and technology.

The water level is monitored by using multiple measuring methods. Each station is also equipped with sensors for coastal meteorology (temperature, humidity, air pressure and wind). This allows monitoring of not only tsunamis but also storm surges and coastal weather in connection to violent storms.

Proper site selection, installation and training, solid construction, stand-alone powering option, real-time accurate data, as well as satellite and GPS capabilities are all features required from a good coastal meteorological station. ●

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The GLOSS stations have a very good track record, which is due to such a local ownership of the system. In general, ownership of the multi-purpose tsunami warning system should belong to the countries that operate it.

Ownership also promotes awareness and readiness, which is essential for people to be able to respond correctly to all natural hazards, be it storm surges or tsunamis. The importance of preparedness is emphasized in the case of local tsunamis, which often leave only a few tens of minutes of reaction time after the triggering event.

For local tsunamis, which are much more frequent than tele-tsunamis, a dense network of tide gauges could also be useful for detection and for warning the local population through communications such as alerts on the mobile telecommunication network.

What next?

GLOSS and other components of the IOC’s Global Ocean Observing System (GOOS), are designed to address the daily information need of societies. They are more likely to be sustainable and in operation until the next tsunami than any one-off system.

The international community would be well-advised to make the best use of currently available technology (like multi-purpose tide gauges on islands) and existing organizations (IOC and its GLOSS and GOOS) to concentrate on arriving as fast as possible at the simplest yet sustainable and cost-effective tsunami warning system, and to integrate that system into the daily operations of the local society as well as the global networks. New developments, which are identified through research and cost-effectiveness studies, will then be able to complement that system when available, and to contribute to the build-up of continuously improved ocean information services. ●