

TSUNAMI WARNING SYSTEMS FOR RURAL AREAS IN EASTERN ASIA

Slav Malla (ELE)

Ola Al Mallah (CVE)

Abdalla Al-Qallaf (CMP)

Faris Tahtamooni (MCE)

Omar Al-Nabulsi (COE)

Situation

Tsunami originates from a Japanese word that means seismic wave. Three events that cause Tsunami:

Volcanoes Earthquakes Meteor Impact

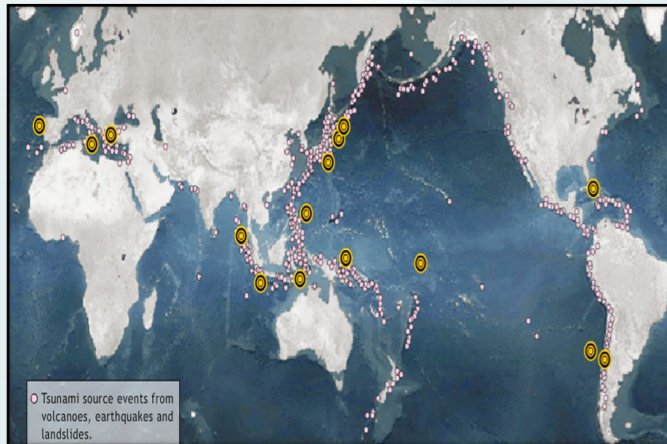


Figure 1: Tsunami occurrence in Eastern Asia [1]

Since the start of the international warning system for the Indian Ocean in 1965 fewer than 1% of Tsunami deaths have occurred as compared to almost 17% of tsunami deaths prior to 1965.

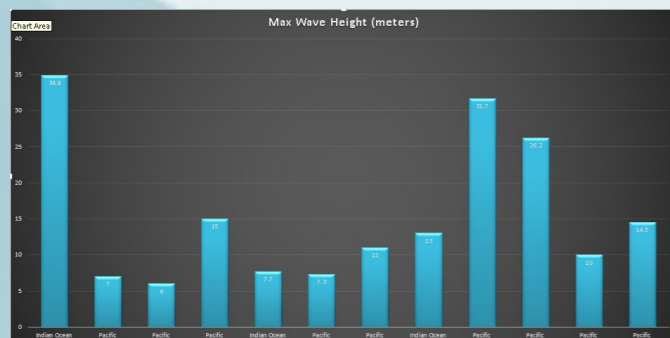


Figure 2: Tsunami Max Wave Heights [2]

The current Tsunami warning system has some drawbacks due to high costs for installation and maintenance.

Problems

Limited range detection systems:

The effectiveness of the system to capture waves that initiate a Tsunami deteriorates with distance.

Distribution Centre has less time to react thus evacuation procedures are not as efficient.

Lack of electricity in rural areas:

Electric power cut offs can cause the sirens that are powered by electricity to malfunction.

Delayed alerts by warning systems impede evacuation plans.

Improper evacuation procedure:

Insufficient evacuation information is being provided.

Solutions

D.A.R.T (Deep-ocean Assessment and Reporting of Tsunamis) can be installed in rural areas. The system is made up of a sensor, a buoy and satellites which are synchronized with the Tsunami warning centers on shore.

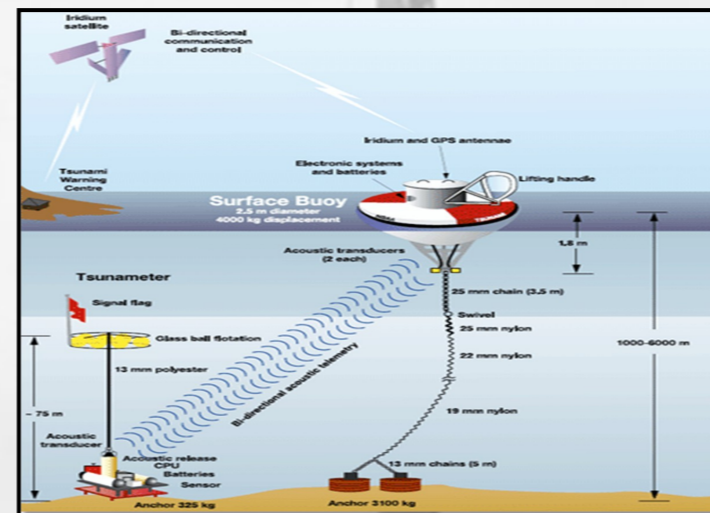


Figure 3: An illustration of a D.A.R.T system [3]

We are focusing on places with ample sunlight. Photovoltaic solar panels can effectively replace direct electric power sources in running sirens and other alerting devices.

Sirens must be evenly distributed throughout the specified region in order to alert as many civilians as possible. Billboards powered by solar energy can be placed beside each siren and be programmed to display a short message whenever the sirens start functioning. The displayed note will show guidelines in a case of evacuation.

Evaluation

DART system:

The system provides the center with critical data and that will decrease the number of false warnings.

Durability of both the buoys and the pressure sensor.

Solar Panels:

Due to ample sunlight in Eastern Asia the installation of solar panels to power the sirens will be cheaper and less time consuming than to run cables from the main electricity generators

- Save money in the long term
- Provide energy reliability
- Achieve durability and low maintenance

Billboards:

The LED billboards will be programmed using a language like C++ or JAVA and it will display safe evacuation procedures.

The number of billboards will be slightly more than the number of sirens and they will be distributed in such a way as to provide most citizens with a safe evacuation route information.

References

- [1] Cook J. , "A map of earthquakes and tsunamis from recent history", *Woods Hole Oceanographic Institute*, .[Online]. Available: <http://www.whoi.edu/oceanus/illustrations> [Accessed: November 4, 2014]
- [2] Anonymous, "NOAA/WDS Global Historical Tsunami Database at NGDC". [Online]. Available: http://www.ngdc.noaa.gov/hazard/tsu_db.shtml [Accessed: November 4, 2014].
- [3] Anonymous, "D.A.R.T Warning System".[Online]. Available: http://www.bom.gov.au/tsunami/about/detection_buoys.shtml [Accessed: November 4, 2014].