

# Bell and Bottle Technology: Community-based Early Warning System

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Bottle rain gauge installed in one of the houses in the village

Flooding is a prevalent problem in the Philippines, especially now that there are heavier rains due to climate change. Experience has shown that being prepared for a disaster can minimize casualty and damage. However, for people living in remote areas, preparedness could be a problem, as they do not usually have access to radio, TV, mobile phones, and other media that can immediately warn of possible floods and landslides. As such, an effective early warning system needs to be designed specifically for far, remote areas.

The Bell and Bottle Early Warning System (EWS) project aims to address this need. With funding from the World Bank, the University of the Philippines Los Baños (UPLB) in cooperation with the Center for Initiative and Research on Climate Change Adaptation (CIRCA) is implementing this project in 15 to 20 villages in Albay province, a mountainous area in the Philippines with many remote communities. The project seeks to establish a low-cost, fast, effective, and community-based early warning system designed for remote communities that are prone to floods and landslides.

### High tech meets low cost

The Bell and Bottle EWS combines high-end technology with a simple but innovative approach to alert people of flood and landslide risk. It uses satellite mapping technologies and ground surveys to identify flood and landslide-

prone areas. Locals are trained to determine alert levels using installed rain gauges made out of soda bottles. When needed, a bell rings to warn the entire community.

Before installing the bells and bottles in Albay villages, the project team performed satellite mapping using Remote Sensing and Geographic Information System (RS/GIS) to identify hotspots where the bells and bottles should be installed. RS takes satellite images of the earth, which are then mapped and analyzed for patterns by GIS software. The project used this technology, verified with ground surveys conducted by locals and geologists, to create a flood and landslide hotspot map of Albay.

Rain gauges, on the other hand, are made from recycled plastic bottles that have water level



The bell, made from an old gas tank: Cheap but effective



The calibrated bottle that measures the amount of rainfall in millimeters. This is placed inside the house so that the beneficiaries do not have to go out and get wet while taking the hourly rainfall data.

One of the villages in Manito, Albay vulnerable to landslide: Disaster waiting to happen

indicators. The bells use ring codes to announce the alert level of the rain gauges.

Initially, Albay locals used mobile phones instead of bells and bottles, to warn each other of floods and landslides. This method was not very effective because some villages have little or no network coverage, and some locals could not afford mobile phones. The dissemination of warning information was therefore slow.

On the other hand, the use of a bell is much simpler and cheaper, and it will warn everyone who hears its ring. As such, the Bell and Bottle EWS can be an alternative to SMS alerts, or a complement if SMS is readily available.

### Community-based design

The effectiveness of the Bell and Bottle EWS depends on the involvement of the people in the community. Locals need to be organized, educated, and trained in using hazard-risk information provided by the EWS. This will allow them to reliably read the rain gauges and respond to readings appropriately.

So far, the Bell and Bottle EWS Project has accomplished the following:

1. Production of a landslide map of Albay;
2. Production of a landslide critical rainfall threshold chart;
3. Installation of bell and bottle alarm systems;

4. Training of beneficiaries; and
5. Establishment of a two-way radio communication system.

The project also aims to provide information and implement activities that would help the community reduce their vulnerability. Activities such as tree reforestation, construction of a zip line across a spill way, and dissemination of information on climate change and disasters are being done in the villages.

The innovative design of the Bell and Bottle makes it a considerable early warning system for remote communities. When the project is complete, it is estimated to protect over 12,000 people in Albay.

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