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Getting the Warning to the People
Local Dissemination Solutions for the Last Mile

PRINCIPLES OF LOCAL DISSEMINATION

Local authorities of tsunami prone regions must inform their communities about an imminent threat and provide clear guidance how to react. Local tsunamis, however, give only little time for warning and evacuation. Therefore, local dissemination must be quick and reliable. The problem is that strong earthquakes usually lead to power failure, a breakdown of communication networks and chaos. However, local dissemination systems must perform even under such circumstances:

- All dissemination technology needs power back up.
- Radio communication (VHF / FM) has proven to be most reliable. Cellular phone networks often break down and do not qualify as a single solution to local dissemination.
- Using multiple ways of delivering the message is important to deal with failure of any one channel.
- Public dissemination is key. Those with access to non-public channels can forward warnings to others.
- Dissemination solutions need to be in line with local resources, especially for maintenance.
- Using well-proven and already established dissemination systems is better than setting up new ones only for tsunami warning.
- Tailor made solutions are required. They depend on the geography of an area and its population distribution.
- The success of local dissemination systems does not depend only on technical solutions. The public must be informed about how they can receive information long before any case of emergency.

MEANS OF LOCAL DISSEMINATION: EXPERIENCE FROM THE PILOT AREAS

Remotely operated sirens transmit an alert tone directly to the public. The tsunami siren protocol by BMKG suggests a steady tone that lasts for three minutes. This siren means: immediate evacuation of coastal areas to higher ground. Sirens can include an announcement function that allows for transmitting additional guidance. The protocol also suggests regular testing every month on the 26th, at 10 am. Any siren operation needs to build upon agreed SOPs.

Good examples of **locally developed siren systems** that are less costly come from Java and Padang. After the tsunami in 2006, the authorities of Yogyakarta and Bantul installed a total of eight sirens along the coast. They are operated by remote and can transmit an alert sound as well as announcements. Padang authorities installed nine sirens in the city. Padang's type of siren has only one kind of tone, and can only be used to sound the evacuation tone.

Radio communication is a very common, cost-effective and failure-proof way of a two-way communication system. Very High Frequency (VHF) is used to communicate over short distances. It does not allow for obstacles in its way (i.e. tall buildings, hills).

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High Frequency (HF) radios are meant for longer distances and can communicate with stations thousands of miles away. Resistant to failure, radio communication has proven to be the most effective means of communication in the aftermath of an earthquake. The technology can be used to receive information, coordinate actors, and disseminate information. Search and Rescue (SAR) in Java established a communication network for early warning purposes along parts of the island's southern coast. This network provides information only to those who have access to a VHF device. These agents can then forward information to people in their surrounding area. As VHF (or HF) radio communication is the domain of radio amateurs and formal institutions, the information transmitted does not directly reach the general public unless the signal is converted into public FM radio frequencies.

Based on an idea from Bantul (Java), stakeholders in the pilot areas of Java and Padang have developed a **way to convert a VHF signal into FM frequencies** that can be received with a normal radio using a simple device, called RABAB in Padang and named after a *Minangkabau* music instrument. This technology allows direct access to a wider public. After an earthquake, authorities can use a handy talkie (VHF) to make direct announcements on FM radio frequencies. For this purpose a frequency must be agreed upon and the public must be informed. When tuned in to the right frequency, the general public can receive announcements with their radios at home, portable radios, cell phones with radio function, and car radios. In Padang and Java, FM receivers are also connected to mosque loudspeakers.

Local radio and TV stations serve as very important actors in local warning dissemination. After receiving a warning from the BMKG, local authorities can disseminate information to local radio and TV stations to broadcast information and guidance directly to the public. In Bali, the authorities reached an agreement with local radio stations on dissemination procedures in case of emergencies. Local radio and TV stations should also have a direct link to the BMKG. In case there is no information from local authorities, they can disseminate BMKG information directly.

When information from local authorities reaches a neighbourhood (e.g., via radio VHF or from a local radio station), people can use simple tools to alert others. In Bali, a famous **traditional communication** tool is the *kulkul*, which is made out of wood or metal, and beaten to attract attention (in other places known as *kentongan*). Balinese communities use it to call people together for community meetings. For tsunami warning, the community needs to agree on an alerting tone and make sure that they can access information from local authorities or the BMKG.

Dissemination of Tsunami Early Warning at Local Level in Indonesia:
an introduction to methods and technologies

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