The Community-based Last-mile Early Warning System

From an Effort to Turn Local Tsunami Recovery into Regional Disaster Risk Reduction for the Poor

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In this issue

KEY IDEA

In the aftermath of the 2004 tsunami, national authorities across the Indian ocean region were charged, among other things, with developing tsunami information, awareness, education and resource materials for the media, schools, decision-makers and the public. A large amount of training material has been assembled on earthquake and tsunami science and research, tsunami events, the building of tsunami warning and mitigation systems. This issue talks about the importance of a reliable early warning system throughout the world and the efforts needed to reach all the way to the people within the last mile.

When major earthquakes occurring in the Pacific rim have magnitudes large enough to warrant concern, the Pacific Tsunami Warning Center (PTWC) of the National Oceanic and Atmospheric Administration in Hawaii, United States of America will notify authorities through advisory messages. These messages are information bulletins, warnings or watches.

Regional Tsunami Warnings are issued initially to coastal areas near the earthquake epicenter as a means of providing the earliest possible alert of a potentially destructive tsunami. Areas in a regional tsunami warning are generally less than three hours from the estimated tsunami arrival time. Regional Tsunami Watches on the other hand are tsunami watches issued in conjunction with regional tsunami warnings to coastal areas near the earthquake epicenter, but outside the warning area. Areas in a regional tsunami watch are generally less than six hours from the estimated tsunami arrival time.

Moreover, under the leadership of the UNESCO Intergovernmental Oceanographic Commission (IOC) and the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning System, countries across the region have made significant advances to national warning system networks, communications, and government operations and procedures and are now able to disseminate appropriate warnings rapidly to local populations. Some of the examples include, the installation of detection systems including seismic stations and tide gauges in Indonesia, Thailand, and Sri Lanka. As a result of upgraded communication networks using Global Telecommunication System (GTS), Sri Lanka and the Maldives can now receive data from detection systems in a timelier manner so that forecasts can be generated more quickly. Sri Lanka and Thailand have adopted policies and procedures to ensure that tsunami advisories are disseminated rapidly and accurately. Indonesia and Sri Lanka have created multiple communication channels through the use of satellite phones to disseminate information widely and quickly. Thousands of people in Indonesia, Sri Lanka, Thailand, India, and the Maldives have been trained in community preparedness and resilience to minimise the risk to communities in future disasters and hundreds of technical specialists have received training on the end-to-end component of tsunami warning systems.

Last but not least, India is to become the first Tsunami Watch Provider for the Indian Ocean as of June this year. This heralds the dawn of a new era of autonomy for the network of regional tsunami watch providers in the Indian ocean. Up until now, the PTWC in Hawaii and the Japanese Meteorological Agency (JMA) in Tokyo have been offering an interim service. They will nevertheless continue to act in an advisory capacity until 2011. ■

Ahmed Fahmi,
UNESCO, New Delhi

Decrease Vulnerability through Early Warning

Asia's populations and economies are particularly vulnerable to the effects extreme climatic events, given its recent trends of forceful economic growth and attendant disrupted social structures. This issue of *southasiadisasters.net*–with its focus on the importance of Early Warning Systems (EWS)–is therefore especially well timed.

Experience has taught development practitioners and governments the higher value of pre-emption over the expense of post-disaster response and mitigation. Various international and national commitments have been effected to re-orient policies and priorities towards preparedness over recovery. Organisations have invested considerably in improvements to existing technologies; making EWS cheaper and more accessible to communities at risk. Other inexpensive, low-tech alternatives like community radio narrowcasting are also being explored across the region.

However, global governmental and donor investment in EWS projects are but a fraction of what is expended on recovery programmes. Articles in this issue stress the importance in constructing people-centric systems that are contextualised to cultural, economic, and social specificities of the demographic group being addressed. A large part of this contextualisation of course, is recognising and integrating effective traditional knowledge into warning mechanisms.

Political commitment from the government is as critical as having effective information and efficient systems in place. A case in point is Myanmar, where precise predictions of Nargis' path were made available four days before the tragedy struck, and yet at-risk communities were not evacuated in time.

The United Nations system in India, for its part, is ensuring adherence to major components of a comprehensive EWS to deliver 'last-mile connectivity' to the potentially affected:

- A historical and updated knowledge of risks
- A technical monitoring and warning service (VHF wireless radio directly connecting vulnerable villages to the District Collector)
- Enhanced capacities of vulnerable communities to respond to disaster early warnings (via training).

The success of these initiatives - first piloted in tsunami-affected areas - lies in India's National Disaster Management Authority recent proposal to replicate the system in 13 coastal states of the country.

This issue chronicles the many similar efforts across south and south-east Asia to bridge the gaps that still exist. It educates us about international commitments, regional good practices, existing institutional resources and recent technological innovations. Most importantly, it provides us the opportunity to recognise potential synergies that should be explored to reduce duplication of efforts across organisations.

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United Nations, India

Warning and the 2004 Tsunami: Advice from the TEC

In the aftermath of the Indian Ocean tsunami, the Tsunami Evaluation Coalition (TEC) was set up. The TEC notes that early warnings to those at risk could have saved many hit by the monstrous wave on December 26, 2004. These warnings received little or no attention as they were considered unlikely to happen, even though the region is hazard prone[1].

How the Early Warnings Could have Reached Those at Risk

From the time when the submarine earthquake trembled it took only 20 minutes before it hit the shores of Indonesia. Another one and half hours later it hit coastal Sri Lanka, the Maldives coast was hit three hours after that. While the Hawaii Pacific Tsunami Warning Center identified the upcoming tsunami it circulated the news among to its regular lists, which did not include any of the countries hit by this tsunami[2]. A rapid application of traditional knowledge saved community members in the Andaman and Nicobar Islands of India.

Increasing Dependence on IT

Although local knowledge saved lives during the tsunami, the cell phone was identified by the TEC as the main means of communication throughout the disaster. According to the TEC, information technology plays a crucial role in all stages of disaster and risk management[3]. TEC stresses, that there is still a wide gap between those facing the risks of a disaster and the use of new technology. And wherever state-of-the-art technology is introduced, training and education of local managers may remain unfulfilled.

The TEC suggests that district levels should coordinate all use of information technology in a disaster situation[3]. In view of that, sharable software and training tools should be prioritised as well as low-cost satellite communications, internet and GSM for UN and its partners[3]. Media can also play an important role in early warning, as they already possess means of distributing information to a large population in a geographical area. ■

1 Telford et al. 2006, Tsunami Evaluation Coalition Synthesis Report, p. 40.
2 Financial Times, 2005 in: Telford et al. 2006, Tsunami Evaluation Coalition Synthesis Report, p. 41.
3 Bennet et al. 2006, Tsunami Evaluation Coalition, Coordination of International Humanitarian Assistance, p. 66.

Efficient Early Warning System: The Global Scenario

On December 26 2004, the Indian Ocean tsunami hit the coastlines of South Asian and East African countries with major force and virtually no one expected it. Its consequences were highly under-estimated. In Thailand, officials received information on the tsunami heading for the Thai coast, but in fear of creating panic among vacationers and locals, they decided not to send out a public warning. If the Thai officials and other countries' officials had issued warnings there is no doubt that thousands of lives could have been saved.

An early warning system is a tool used to reach people with a warning when a disaster strikes or is likely to do so. A people-centred early warning system seeks to empower individuals so they can react in time and in a way that will reduce the losses of life, injuries, livelihood and property and environment damages. The tsunami and other disastrous events such as hurricanes ravaging in the Caribbean or droughts in Africa are great reminders of the importance of functional early warning systems. With an effective early warning system in place, impact on both lives and livelihoods are likely to be minimised as families can make last minute preparations for a potential emergency. Additionally, a quick response to a possible devastating event is likely to limit the damages.

Gaps

Globally, significant investments of resources have gone into developing early warning systems for nearly all kinds of hazards. New information and communication technologies make it possible to undertake risk assessments and communicate warnings easily. But these kinds of

Finding suitable methods for communicating warnings to the "last mile" remains a critical challenge.

modern early warning systems are mainly available in rich and developed countries. Many developing countries neither possess the adequate equipment and skills nor the financial resources, and thus no early warning system for the hazards they are prone to is possible. Consequently, these countries will suffer more from a devastating hazard than those who can issue early warnings and put their emergency procedures on alert.

The United Nations has identified four elements to be included in a people-centred early warning system: 1) knowledge of the risks faced, 2) technical monitoring and warning service, 3) dissemination of meaningful warnings to those at risk, 4) public awareness and preparedness to act[4].

Activating the Stakeholders

The Hyogo Framework for Action identifies five priority areas for disaster reduction actions. One of the five priorities focusses on risk assessment and people-centred early warning. To develop such an early warning system various participants are needed. Communities exposed to risks are essential stakeholders. The community members should know what risks they are vulnerable to and how to respond to them when they strike. Local governments hold local knowledge on possible threats to their communities. They have to develop an early warning system and communicate them effectively to the population so the potential losses will be minimised.

At the national level, governments are in charge of proposing policies and frameworks in order to implement early warning systems. In the case of a damaging event, governments have the responsibility of verifying that the warnings reach those they are targeted at; those at risk. Regional institutions and organisations supply knowledge and advice to countries that have a common geographical environment. International bodies are scenes where relevant data are exchanged between countries. Moreover, they provide support on various subjects related to early warning.

Non-governmental organisations (NGOs) are important actors in spreading awareness about early warning among both individuals and organisations who are to implement early warning systems. NGOs are critical actors at the local level. The private sector can contribute in various ways i.e. the media has a major role in educating the people on disaster preparedness and dissemination of early warnings. Furthermore, the private sector holds technical skills and know-how in which can be shared with local communities. The science community supplies governments and communities with technical input to further develop early warning systems. Specialised agencies such as meteorological agencies give forecasts and monitoring of weather phenomena. ■

4 UNISDR. 2006. Global Survey of Early Warning Systems. Geneva.

Early Warning Systems: Concept and Global Application

The Hyogo Framework for Action (HFA) is the result of the World Conference on Disaster Reduction (WCDR) hosted by the United Nations International Strategy for Disaster Reduction (UNISDR) in Japan in 2005. The HFA identified five priorities for disaster risk reduction in which the second priority explicitly targets early warning: *Identify, assess and monitor disaster risk and enhance early warning*. A series of initiatives are suggested as means of improving early warning.

A first point is to develop people-centered early warning systems that also reflect demographic, gender, cultural and livelihoods characteristics of the targeted audience. Moreover, it is crucial that warnings are issued in time and in a language understood by the receivers.

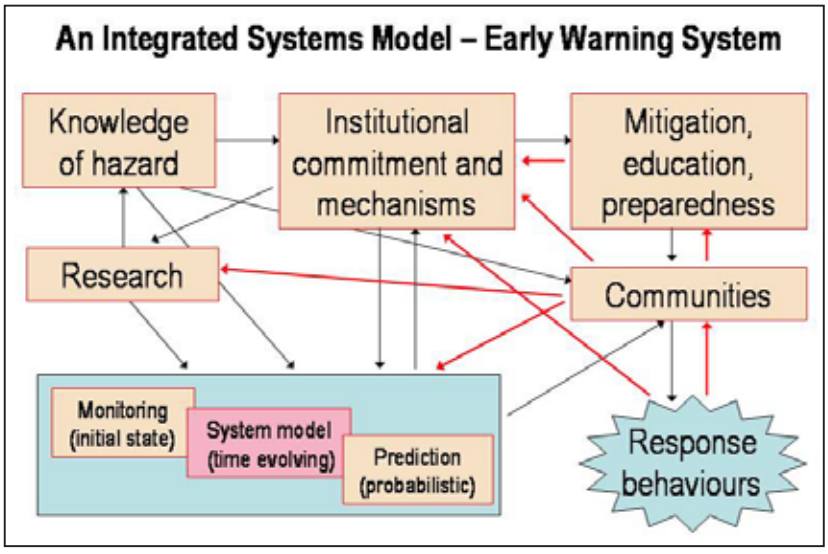
Second, information systems integrated in early warning systems have to be reviewed regularly to ensure a rapid and well-coordinated response when a disaster strikes.

Third, early warning systems should be an integral part of governmental policy and decision-making processes and emergency management systems at local and national levels. Periodic testing and performance assessments should be conducted.

A fourth point is to implement the outcome of the Second International Conference on Early Warning held in Bonn in 2003. In order to attain an efficient early warning system.

Fifth, an implementation of the outcome of the Mauritius Strategy for the further implementation of the Barbados Programme for Action for a sustainable development of small island states including establishment and strengthening of effective early warning systems and other mitigation and response measures.

These activities concern communication, coordination and institutional capacities in early warning. Along with this, financial investments are needed in order to apply the technology required for early warning.



A schematic representation of an early warning system.

Source: UNISDR

When a Component Fails

A people-centered early warning system should consist of the following four components: risk assessment, warning service, communication, and preparedness. If one component fails to fulfill its function, the whole early warning system is in danger. Classically, an early warning system falls short in the communication and preparedness component. There can be various reasons for this, but missing emergency plans may be one of them. During hurricane Katrina, knowledge of the risk did not reach the general public or the policymakers. Hence, the disaster respondents had limited information to help them make wise decisions about evacuation. In the Indian Ocean tsunami, all the four components failed. A tsunami was a phenomenon barley known to the public and not considered a major threat to the region and therefore the region remained unprepared for such an event. Warnings were issued, but confusion and insecurity among government officials and other authorities hampered the dissemination of the warning.

The Broader Potential of Early Warning

These experiences remind us of the importance of a functional and reliable early warning system and the need for implementing policies facilitating the establishment of one. Early warning systems should thoroughly be integrated in research, planning, cost-benefit analysis and implementation *(Dannenmann et al., power point presentation on EU-Info day on TEWS, Paris, France, Jan. 31, 2006)*. ■

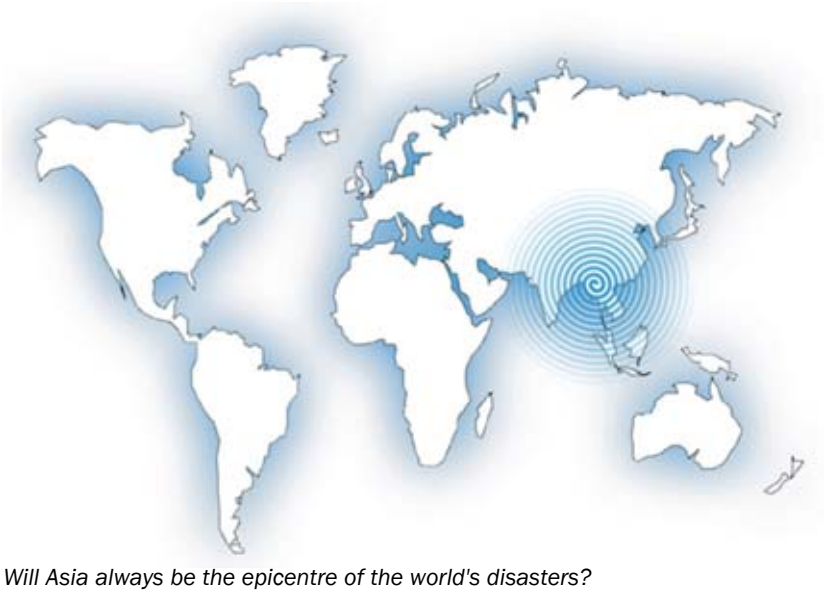
Delhi Declaration on Disaster Risk Reduction in Asia: Support for a Community-based Last Mile Early Warning System?

Confronted with numerous disastrous events each year, Asia is the world's epicentre of disasters. Rapid population growth, unplanned settlements, unsafe construction practices and erratic climatic conditions are factors that contribute to the wide range of disasters that devastate parts of the continent. Some disasters are smaller and do not have any impact on the macro level, while others kill thousands and within seconds wipe out communities that have been established over decades or centuries.

In earlier times, natural disasters were looked upon as phenomena that happened because of nature's anger and not something that one could be prepared against. The focus was solely on post-disaster work as relief and rehabilitation assistance. Newer technology allows us to some extent to foresee an upcoming disaster and we can take preventive measures to mitigate the outcome. Developed countries have invested in both structural and non-structural measures; while developing countries like Bangladesh have managed to reduce the disaster risk though mobilising and raising awareness among communities.

The workshop "Community based Last-Mile Early Warning System" held in Delhi on November 19, 2007 was a follow-up to the Delhi Declaration, the outcome of the second Asian Ministerial Conference held on November 7–8 in Delhi.

The Asian Ministerial Conferences are regional initiatives based upon the Hyogo Framework for Action agreed upon by 168 governments worldwide in 2005 that urge nations to build resilience of nations and communities to disasters. The Beijing Action for Disaster Risk Reduction in Asia in 2005 was an event that sought to further increase the Asian cooperation for the implementation of the Hyogo Framework for Action. The numerous global and regional initiatives taken in order to increase disaster awareness and management are highly appreciated.



Will Asia always be the epicentre of the world's disasters?

The HFA Five Priorities for Action

1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels.

Source: Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, United Nations International Strategy for Disaster Reduction (UNISDR).

The main goal of this 2nd Asian Ministerial Conference on disaster reduction was to review the implementation of the Hyogo priorities of action in Asia in the context of the various initiatives taken by national, regional and international governments during the past two years and share these experiences.

In line with the Hyogo Framework for Action, the Delhi Declaration encourages stakeholders at all levels to implement the five priorities for action (see box). To ensure a long-term financial and operational sustainability of the existing Tsunami Early Warning Systems it encourages the development of trans-boundary end-to-end early warning systems as a priority under the existing sub-regional cooperation frameworks as well as integrating TEWS for the Indian and Pacific Ocean into multi-hazard frameworks. Moreover, the Declaration urges national governments to further strengthen planning as an effective tool to reduce the loss of life and property. ■

Sources: Delhi Declaration on Disaster Risk Reduction in Asia 2007.

Why Call Them Early Warnings if They Are Often Late and Warn None?

In the aftermath of a disaster we often hear, that lives would have been saved if warnings were issued and people knew what to do. The great Indian Ocean tsunami in 2004 was a serious wake-up call for everybody. Disaster managers, authorities and science communities started to talk about early warning and media helped them spreading the word. Several initiatives have been taken to improve the early warning systems around the world. One of the major challenges is how we can issue warnings that reach the last mile: all the way to the people facing the hazard.

Early warning methods change, but enough?

Source: www.viewimages.com

Lesson Exchange

As a follow up to India's national commitment (Delhi Declaration) to Disaster Risk Reduction made at the 2nd Asian Ministerial Conference in New Delhi on November 7–8, 2007, a joint initiative was taken by LIRNEasia and All India Disaster Mitigation Institute (AIDMI) to discuss why warnings keep failing in reaching their targets and what can be done to change this. On November 19, 2007, 25 experts participated in a one-day workshop "Community based Last-Mile Early Warning System" in Delhi. The aim of the workshop was to exchange lessons learned from end-to-end hazard detection and alerting systems that serve grassroots communities in India and Sri Lanka. In fact, each year the countries in the region are investing up to US $ 500 million towards various early warning hardware and software. South Asia is an attractive destination for ICT investments for early warning systems.

Information and Communication Technologies in Disaster Risk Reduction

The key issues during the workshop were application of information and communication technologies in disaster risk reduction, early warning lessons from recent tsunami evaluations and multi hazard early warning systems. The workshop was organised in five sessions where each session included discussion of Indian and Sri Lankan experience. One of the hosting organisations, LIRNEasia had a leading role in sharing their provisional results from the HazInfo Project and to get feedback from the other participants. Other objectives were to develop practical solutions for communicating risk information to rural communities and to start dialogue on the development of a regional last mile warning system.

Mr. Prasad from WORLD[5] in Andhra Pradesh started the first session on methodology, preparedness, training and community organisation with a presentation on application of ICTs in a community-based early warning system. He stressed that there is a huge gap in information dissemination, the grass root populations are totally excluded and the local authorities do not possess the respond capacities.

5 Welfare Organisation for Rural Lean Development.

Mr. Manian from the TNTRC[6] in Chennai talked about sharing knowledge on disaster warning in a community-based last-mile warning system in the second session of the program. TNTRC was established after the 2004 tsunami as an attempt to coordinate efforts among stakeholders. The organisation works as an intermediary between the government and civil society organisations.

The third session focussed on technical aspects in early warning and the transmission of warning to local levels. The CEO of Ekgaon Technologies gave an exposé on enabling communication for adaptation and livelihood resilience. The transmission of information can be done through a number of communication systems. For its HazInfo Project, LIRNEasia chose five different communication systems. For an effective dissemination process of warnings, there has to be a suitable legal framework, which is not always in place. Reviewing the Broadcasting Services Regulation Bill Content Code of India, Aditya Singh noticed that the bill does not identify any role or give any direction to the broadcaster for actions in an early warning process or during a disaster. But the bill says that sports are of national importance and will consequently be mandatorily broadcasted.

The fourth session treated the determination of hazard from national level where Ramesh from the Ministry of Earth Sciences talked about how the Geneva Technologies and World Space Corporation work on developing alerts that can be issued in as many as 24 languages.

The final session focused on the next steps. Samarajiva from LIRNEasia talked about the roles of policy makers, the regulators, the private sector and the civil society, emphasising that organisational problems have to be solved for early warning technologies to be completely realised. Early warning is a tool among others in disaster preparedness and plans. He told us again that it is the governments that have to take a leading role in providing early warning while the civil society and the private sector can support and strengthen it.

Mehul Pandya, AIDMI, expounded lessons for early warning that can be drawn from tsunami evaluations. Both the TEC and the UNISDR underline the importance for additional investments to increase the capacities to deal with future disasters. Even though it is widely acknowledged that taking early warning measures are good investments and the 2004 tsunami reminded us further, initiatives for disaster risk reduction and preparedness receive a small percentage of international aid. As percentage of the total financial donor aid to development, a mere 4% is spent on disaster preparedness and early warning. Calculations estimate that for every dollar spent on disaster preparedness, 10 dollars are saved during the recovery phase. But where functional early warning systems are in place, lives have been saved. AIDMI believes that state government and local authorities are responsible for issuing warnings against natural hazards. But an early warning system has to include the local communities if it is to be effective.

He then discussed whether early warnings are usually early enough. He then went on to talk about designing an early warning system and developing a relevant strategy saying that it must be an iterative process—an organisation cannot have a prototype and just "do". Mihir Bhatt spoke of having a "pre-mortem"—declaring a failure prior to a launch of an early warning system.

The community-based last-mile Early Warning System workshop was important follow-up to the 2nd Asian Ministerial Conference on Disaster Risk Reduction in Asia.

After this workshop AIDMI and LIRNEasia want to host similar workshops in Indonesia and the Maldives to further discuss how one can include the last mile in early warning. Moreover, there are plans to hold road shows in the four Indian cities of Kolkata, Chennai, Mumbai and Port Blair. These will be half-day events where the civil society and the local governments will come together and discuss and exchange ideas for furthering effective early warning practices. ■

6 Tamil Nadu Tsunami Resource Centre.

Emerging Regional Initiatives in Early Warning

During the tsunami recovery, a major emphasis has been put to integrate disaster management in the reconstruction and redevelopment of Tamil Nadu. Recovery and reconstruction programmes can be effective tools for increasing safety standards.

One important aspect of disaster management is early warning. This has been introduced both at national and regional levels, but still has to be developed and established at the community level. It is especially important to have a top to bottom information flow mechanism and to build the capacity in the community so they can respond to issued warnings. To be able to communicate a warning efficiently one has to have an effective and reliable communication system, public awareness and social infrastructure.

Community radio roll the hills of Sri Lankan a village on three wheels.

Source: www.flonnet.com

Early Warning in Tamil Nadu

Since there is an obvious need and demand for an early warning system at local levels the Government of Tamil Nadu in cooperation with the United Nations Development Program has introduced a programme with the aim of institutionalising and strengthening early warning systems in the coastal districts of the state. The programme focuses on transmitting simple warnings to those at risk. The three main objectives are to: 1) review early warning systems existing for different hazards, 2) strengthen dissemination mechanisms of early warning to communities via community training and participation, and 3) institutionalise of early warning systems within Disaster Management Committees and Disaster Manage-ment Teams at the community level.

A pilot project on community-based early warning is being implemented in 54 villages throughout Tamil Nadu. The stakeholders[7] provided training to 2560 members of local early warning teams on how to spread relevant warnings. The Very High Frequency communication system has connected the 54 villages to the District Collector's office that now can issue warnings to the districts within seconds after receiving a warning from the meteorological agency. The pilot is still going on and the final results are not yet available. ■

7 CREED, IGSS and UNDP.

Community Radio

The Government of Tamil Nadu's community radio policy has permitted 5000 local radio stations to start broadcasting within the next five years. In Nagapattinam a new radio station has been established by the Dhan Foundation, VOICES and UNDP. It has programmes on a great range of subjects: health, education, agriculture and disaster preparedness. They do have a special mission to focus on the empowerment of women. The eight-member staff works hard to produce interesting programmes and the feedback has so far been positive.

This is a great opportunity to integrate early warning into people's lives. However, there are some issues that prevent an optimal output from this community radio. The radio sends their programmes on air through a public narrow casting loudspeaker system. To get the best coverage, a mix of broadcast, narrow cast loudspeakers and cablecast is favourable. But the government policy requires an NGO to operate in the area for at least three years before they get a licence to operate. Seeing that the majority of the NGOs operating in Tamil Nadu only emerged after the Indian Ocean Tsunami it will take another couple of years before community radios will be common. ■

Sources:
Tamil Nadu Tsunami Resource Centre www.tntrc.in.
May 2007, Progress Report, United Nations Team for Tsunami Recovery Support.

The Well-prepared Japanese

Prior to the Indian Ocean tsunami, the concept and vocabluary of "tsunami" of tsunami was a rather unknown phenomenon to people in general. But a country that for decades has had a tsunami-warning centre is Japan. The Japanese archipelago is situated on two different tectonic plates and is therefore constantly threatened by earthquakes. Recalling the great Kobe earthquake in 1995 where 6434 people were crushed to death and assets worth the staggering sum of 200 billion USD were destroyed.

The Japan Meteorological Agency (JMA) has over the years created a high technology Earthquake and Tsunami Observation System. Some 80 water-borne sensors and 180 seismic stations around the country are send-ing signals to ETOS around the clock.

Variety of Delivery Channels

With the appropriate technology to identify an upcoming earthquake or tsunami, Japan also possesses several well-developed delivery channels for its emergency warnings.

The Simultaneous Announcement Wireless System (SAWS) is a system of receivers and transmitters for all kinds of messages that is installed by local authorities. The transmitters are placed in government offices, while receivers are situated in different responders' offices such as hospitals, schools, fire stations and other locations. Important governmental and commercial buildings have receiver towers and loudspeakers installed.

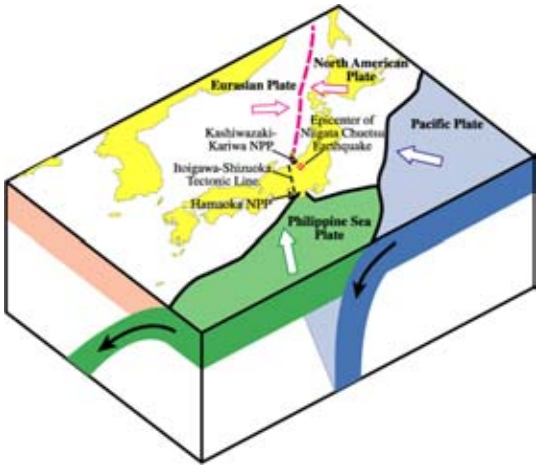
Early warning in your living room.

The Mobile Announcer System is for the locations that are not covered by the SAWS. Fire engines with loudspeakers drive around to spread the warning.

In villages and rural areas, installed sirens signal the inhabitants to turn on their TV-screens or radios for further information. In cooperation with the national media, the JMA issues warnings that reach the population through their TV-screens. When a warning is issued it is superimposed on the television screen. In certain public areas television screens are on standby to display issued warnings.

For communities without any other warning system, one has to call each and every one of those at risk or in the worst case reaching them physically by going from house to house. This is evidentially very time-consuming and the warning may not reach the ones at risk in time, but it is the only way to reach those who lack an early warning system.

With a well-developed early warning in place, Japan also has a population that knows how to respond to a warning. For decades, disaster awareness and preparedness has been taught to Japanese school-children from an early age. Thus, the general awareness of possible threats among the Japanese are very high and most citizens could evacuate within minutes in an emergency situation. ■



The Japanese archipelago is situated on a series of different tectonic plates, making it very prone to earthquakes. Source: http cnic jp.

Tsunami Waves Hit the Japanese Coast

In November 2006 small tsunami waves hit the coast of northern Japan. An earthquake with the magnitude of 8.1 was measured in the Kuril Islands which are situated north of Japan and south of Russia. The JMA expected waves of at least two metres to hit the coast. When it is detected that an earthquake is likely to provoke a tsunami, the Japanese early warning system will issue warnings within three minutes. This time, the tsunami warnings for the Russian Pacific Coast were later withdrawn. The highest waves that reached the Japanese coast were 40 cm and neither personal injuries nor materialistic damages were reported.

Local Initiatives: Global Examples

As with most of India, Andhra Pradesh is also very prone to natural disasters. It's internal geographical diversity makes different regions within the state vulnerable to different natural hazards. Both floods and droughts are common devastating incidents. The coastal regions are regularly hit by cyclones. 71 cyclones have hit Andhra Pradesh the last hundred years. Recently the state has suffered from extensive damages and losses because of major cyclones. In November 1996 a cyclone tore through the district of Godawi and killed 976 people and caused damages for Rs 20 billion. The Indian Ocean tsunami also affected Andhra Pradesh in 2004.

As a part of the last-mile hazard warning system, the Andhra Pradesh-based NGO WORLD[9] made a needs assessment on its status in 150 villages across the state. It was found that the status of dissemination of last-mile hazard warning system in the coastal areas is well established at the district level and to a certain degree also on the *mandal* level[10]. The hazard warning info channels are present, but the information does not reach the people at the grassroots level, those who are the most vulnerable and face the highest risk. The main reason why these warnings do not reach the last mile is due to absence of effective communication systems and qualified staff to communicate the warning at this level.

Failing Government Response

When Andhra Pradesh is hit by a disaster in one of its coastal districts, its top-level district officers have to go to the affected village to take charge of the immediate relief work such as evacuation and rescue operations. The local administration is neither educated in these matters, nor do they have any plans and guidelines or other disaster preparedness measures to follow when a disaster occurs. This is not only a problem in Andhra Pradesh, but throughout the whole subcontinent. Moreover, there is little indication that district authorities recognise and support the response skills that exist among community members.

ICT as a Means of Early Warning

In order to create resilience and a greater awareness towards natural hazard threats, one must work with community-based organisations. It is crucial to involve the communities in all development steps. WORLD has initiated a project for disaster intervention in five of the state's coastal districts. One of the objecitves for this project is to use ICTs to warn communities about any upcoming disaster.

The information technology (IT) sector makes continuous progress which also can be of great importance in dealing with disasters. The biggest network provider in Andhra Pradesh has a good coverage even in coastal areas. As mobile equipment is further developed, the price of it decreases and should be affordable even at the community level. If information and warnings are to be of any help the local community's participation is vital.

To make an early warning system efficient and sustainable the community-members themselves have to be involved. WORLD's project emphasises the promotion of strengthened and apt community-based organisations to work on disaster prepearedness in their local environment. Through education and awareness building, communities will be more resilient and a people-managed early warning system could be put in place. ■

9 Welfare Organisation for Rural Lean Development

10 A mandal is an association of local people.

Indian National Centre for Ocean Information Services (INCOIS)

The mission of INCOIS is to provide ocean information and advisory services to society, industries, government agencies and scientific communities through sustained ocean observation, information management, modelling and constant improvements through systematic and focused research. They are also concerned about capacity building, training and education. They have announced that they are preparing training material for the general public on earthquakes, tsunami and storm surges as well as web site covering the same subjects in various languages.

Because of its vulnerability to natural hazards, India has been forced to take measures towards reducing their impact. INCOIS's newly developed tsunami early warning system was tested September 12th 2007 when a major earthquake shook Indonesia. The quake had a magnitude of 8.4.[8] With the present technology, Indian authorities have two to three days lead-time to issue warnings and evacuate people at risk from upcoming cyclones. When a tsunami is discovered, there are only hours available, this requires a highly effective early warning system Will INCOIS fit the need? ■

8 www.gisdevelopment.net

Was any Lesson Learnt from December 2004?

On July 17th 2006 a three-metre high tsunami wave hit the south coast of Java in Indonesia after a submarine earthquake of a magnitude of 7.7 trembled outside its southwestern coast.[11] The wave struck a 110-mile stretch of coastline destroying houses, cars, motorbikes, boats and leaving at least 668 causalities.

How efficient are defect buoys?
Source: www.civildefence.govt.nz

When the earthquake was registered, officials at the Indonesian Meteorological and Geophysics Agency concluded that a tsunami would only be likely no more than 100 kilometres from the epicentre and thus suggested the implausibility of a repetition of the great tsunami of December 2004. Several other countries issued warnings for parts of their territories, especially islands in the Indian and Pacific Oceans.[12]

Both the Pacific Tsunami Warning Centre in Hawaii and The Japanese Meteorological Agency warned the Indonesian government of a possible tsunami 45 minutes before it hit the coast. No official warning to the Indonesian population at risk was issued until seven minutes before the tsunami arrived, which was not enough time for the warning to reach the last mile. The delay was said to be to due to work on monitoring the aftershocks of the submarine earthquake.

After the devastating tsunami in 2004, an initiative of installing an early warning system for Indonesia was taken. A five-year project was commenced with the final aim to place 22 buoys around Indonesian waters. At time of the tsunami only two were in place and it was later revealed that both of them had been defective for months. The initiative lacks funding as pledges from donors have failed to come. An official at Indonesia's Ministry of Research and Technology confessed that there was no siren to alert people or any other channels for issuing a warning in the tsunami-hit area.[13] Many survivors explained in the aftermath that remembering photos and report from the 2004 tsunami saved their lives. ■

11 Reuters, September 12th 2007.
12 The Guardian, July 18th 2006.
13 MSNBC News Service July 18th 2006.

Global Weather Data Exchange

When mapping community vulnerabilities and sensitivities to weather, climate and water-related risks it is essential to have historical data on meteorological and hydrological phenomena. The World Meteorological Organisation (WMO) keeps such records and provides technical information and analysis on which they base public warnings. The WMO seeks to deliver accurate and reliable information in a timely manner to disaster managers and authorities wherever a disaster occurs. To be able to distribute this information, WMO has established various sub-agencies and programmes. Among these programs is the Global Observation System that sharesinformation on weather, water and climate from across the world.

The global telecommunication system (GTS) is the world's meeting place for a global exchange of all kinds of weather related data and information including weather forecasts, data on seismic activity, climate analyses, and water and tsunami-related information. This system is active at all times throughout the year and thus highly important in multi-hazard early warning systems.

14 satellites, hundreds of ocean buoys, aircrafts, ships and almost 10 000 land-based stations convey data. National Meteorological and Hydrological Services (NMHS) around the globe emit more than 50 000 reports and several thousand charts and other digital products through the common GTS every day. ■

When Warnings Work

After 490 years of silence, Mount Pinatubo in the Philippines woke up.
Source: http://news.nationalgeographic.com

Early Warning Saves Lives

In April 1991, the Mount Pinatubo volcano in the Philippines slowly woke up after 490 years of inactivity. It was the second largest terrestrial eruption in the last century. The number of deaths (300) was relatively small considering the magnitude of hazard that neighbouring populations faced. There were several explanations to this:

- The upcoming hazard was identified at an early moment,
- Successful application of modern surveillance and monitoring techniques,
- A precise calculation of the volcano's destructive phases,
- Appropriate warnings were issued at the right time,
- Civil defence officials and other disaster respondents rapidly took actions,
- The great majority of inhabitants (60,000) were evacuated in time.

This incident itself is clear evidence of the importance of early warning and how well it can work. Certainly, the Philippine population was aware of the possible threat of a volcanic eruption, which made them react quickly when warnings were issued. The respondents succeeded in clearly communicating and coordinating relief operations.

Disaster Preparedness in World Class

Island states in the Caribbean Ocean and neighbouring countries experience cyclones and hurricanes annually. Accordingly, Cuba has one of the world's best disaster preparedness plans. Repeated mock drills on their plans and early warning system each year keeps the population aware and prepared. Activation of the early warning system involves all stakeholders, from the army and the civil defence to official authorities and cooperatives. Planned measures are activated depending on the level of the hurricane.

With the speed of 220 kilometres per hour, Hurricane Michelle reached Cuba on November 4, 2001. This category four hurricane was the strongest to hit the island in 50 years. The Institute of Meteorology had already warned about the hurricane approaching the coast and 87,000 workers in 12 and 150 municipal headquarters were activated. 7,00,000 people were evacuated; more than 1/3 of them needed temporary shelter and other basic assistance. Also, 7,77,000 animals were rescued from Michelle. Buildings, agriculture and communication infrastructures was damaged severely. But only five deaths and 12 injuries were reported. ■

Source: Living with Risk: A global review of disaster reduction initiatives, UN-ISDR 2004.

To help prepare for and respond to the numerous hurricanes that Cuba faces each year, the country has developed emergency plans and maintains a major stand-by workforce for response.

Early Warning Systems and the Media

The Indian Ocean tsunami in 2004 received more media coverage than almost any disaster in living memory. There are several reasons to this. December is the time for celebrating Christmas in most parts of the world and is traditionally a slow news period, which meant that at the time the tsunami hit South Asian shores, there were numerous columns waiting to be filled. The tsunami itself was a new and extraordinary phenomenon at the time unknown to Jack and Jill. December is also the peak season for tourism and many western tourists stayed in the area when the monstrous waves hit.

This created proximity among those sitting comfortably safe on the other side of the world and their fellow citizens fighting for their survival and the local people loosing assets and loved ones in Asia and Africa. Many people knew or had close ones vacationing in Thailand or the Maldives and felt that the catastrophe also hit them. One can say that this incident united the world society in a way we seldom have noticed previously. It generated more interest and donor money than any other event before. The quality of the media coverage and how well the money was spent are issues open for discussion.

Disastrous headlines are profitable.

Powerful Ink

They are big; they are powerful and have a conspicuous role in today's society and many people's lives. Media carries a great responsibility as a watchdog of rulers, disseminator of information and as a scene for exchange of opinions. Sitting at the desk deciding which stories will enter the spotlight of the day is not an easy job. The news are many and so are the considerations to be taken. The majority of current media institutions are dependent upon sales figures to assure their own survival in a tight market. And often, what makes sales figures boom does not coincide with ideal journalistic priorities. Seeing that the great tsunami of 2004 received major media attention, but other disastrous events have received far less. The 2005 Kashmir earthquake killed some 70,000 people but a quick search online confirms that this hazard got only a small part of the attention. Media coverage of other disasters, especially slow killers like droughts, can be characterised in the same way.

Can Inform, but Can't Make us Listen

In an early warning process, the media plays a significant role but not the only one. Climate change and its possible impact on us and the world we are living in are subjects that are widely published in different media across the world. The possibilities of more extreme weather causing flooding, droughts and other catastrophic events are well covered. Through their reporting, commentaries, and articles on these topics, media is contributing to building awareness among the public. Then, media can inform us, like a warning can be issued through TV or radio, but they do not possess the power to make us listen. This is why media alone cannot implement an early warning system.

The 2004 tsunami keeps reminding us of our vulnerability to the forces of mother earth. The interest in the tsunami was exceptional and is still wide. Several survivors of the 2006 tsunami in the Solomon Islands explained that remembering photos and news from the one in 2004 made them realise what was happening and they fled the beach areas.

Mass media is an efficient approach of reaching a large population within a short timeframe. This gives media a special responsibility in taking part of early warnings systems around the world. Suitable policies and particular agreements between governments and media institutions on how to proceed when a disaster strikes should be in place. Effective dissemination of warnings can be life saving. ■

Power (and Frequency) to Local Communities

For an early warning system to be an efficient tool, it not only has to be technically sound, but it also has to be applied in the right manner. This is to say that early warning managers have to know how to run it and those it is aimed at need to know how to respond. If these elements are missing it does not help having state-of-the-art equipment. During the third international conference on early warning in Bonn 2006, the UN Special Envoy for Tsunami Recovery, Bill Clinton reminded us of the following: *"All the sophisticated technology won't matter if we don't reach real communities and people. Satellites, buoys, data networks will make us safer, but we must invest in the training, the institution building, the awareness raising on the ground."*

Spreading awareness can be educational and entertaining through community radio.

Common Alert Protocol

The Common Alert Protocol (CAP) is a plain but all-purpose tool for all-hazard emergency alerts and public warning exchange.

CAP is an XML-based data format for exchanging public warnings and emergencies between alerting technologies. CAP makes it possible to disseminate a warning message synchronously over many warning systems to many applications. CAP augments warning effectiveness and makes the task of activating a warning for responsible officials easier. CAP allows multi-audience and language messaging and facilities for digital images, audio and video along with a other features.

For more information on CAP, visit: http://xml.coverpages.org

Training volunteers

Various initiatives have been made with a focus on reaching the last mile, which too often proves to be the most difficult part in an early warning process. The Indonesian Red Cross has teamed up with its American sister organisation and created a multi-faceted risk reduction program that is dedicated to spread disaster-awareness among exposed communities. The Integrated Community-Based Risk Reduction Program (ICBRR), they have set up includes early warning systems, strengthening the local Red Cross competence in disaster preparedness-related activities. Outcomes like, how they worked with teachers, community members, local governments and other stakeholders are reflected in this initiative. With a versatile team it is more likely to be sustainable. The Red Cross has provided training to Red Cross volunteers that will bring their newly gained disaster preparedness knowledge to villages. The responses from villagers are overall very positive towards disaster preparedness programmes.

There is a general agreement upon the need of disaster awareness and preparedness in our communities. Now, we do have to follow up on this. Like the Tamil Nadu Tsunami Resource Centre has established a community radio that functions both as an educative and communication channel, other disaster managers, public authorities and other stakeholders should pursue the goal of reaching the last-mile. NGOs do have an important role here. They are generally trusted and valued actors in development work and can take a leading position in promoting and undertaking action in order to educate communities, disaster managers and others in early warning. ■

Between a Rock and a Hard Place

The tragedy of the 2004 Indian Ocean tsunami become even bigger without any official early warning system in place. The Bengkulu earthquake of September 12, 2007 shows that this is unlikely to be repeated. What we must guard against now is indifference to warning and against populations that will refuse to evacuate in the face of real danger.

Tsunami prediction is an inexact art practiced in conditions of imperfect information and time pressure. In the Pacific Basin, which has had the most experience with tsunamis, 75 per cent of all warnings are false. But this matters little because the false warnings often do not get through to the general population.

Tsunamis are short-fuse hazards. It took 90 minutes for the 2004 India Ocean tsunami to reach the South-eastern coast of Sri Lanka. In September 2007, the earthquake occurred at 11:10 UTC or 4:40 PM Sri Lanka time. Tsunami Bulletin 001 issued by the Pacific Tsunami Warning Centre at 11:24 UTC (4:54 PM Sri Lanka time) projected arrival times of over three hours.

Time must be allocated to decision making at the national level about issuance of watch, warning or evacuation messages, and decision making and action at community level, including evacuation if appropriate. This means that the time taken to communicate the watch/warning/evacuation messages must be minimised.

This does not mean, however, that evacuation orders should be given as quickly as possible. False evacuation orders will reduce public response over time.

Given the massive costs associated with evacuation orders (not only in lost productivity but deaths, injuries and other negative outcomes), government must be the sole authority. Given the certainty of blame if a tsunami does hit, over-use of warnings and evacuation orders is likely. It is important that procedures be established not only to make considered but quick decisions about watch/warning/evacuation messages, but also to counter the bias towards excessive warnings and evacuation orders.

Disaster risk-reduction professionals know that false warnings are an consequence of the inexact art of predicting the onset of hazards: but the general public does not. If they are subject to too many false warnings, they will not respond even to true warnings.

Now that we have surmounted the problem of not issuing warnings, we have to address the problem of false warnings. ■

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