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Evaluating Last-Mile Hazard Information Dissemination: A Research Proposal

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LIRNE*asia* is regional, non-profit ICT policy and regulation capacity-building organization incorporated under the Companies Act of Sri Lanka, No. 17 of 1982, in 2004. It is currently funded by the International Development Research Centre and *info*Dev through LIRNE.NET. Additional information is available at www.lirneasia.net

RESEARCH PROBLEM AND JUSTIFICATION:

In the aftermath of the Indian Ocean tsunami of December 2004, it was evident that if Sri Lanka along with the other affected countries had an effective disaster warning system in place, many lives could have been saved[1]. The lack of a national disaster warning system compounded by a non-existent local warning communication system and public training makes it unlikely to this day that hazard information will reach individual households at the "last mile" even if an ocean-based tsunami detection system is deployed.. A detection and monitoring system for tsunamis is necessary, but not sufficient by itself to reduce a tsunami disaster leave alone higher probability disasters like hurricanes, floods and landslides. An effective national early warning system will not only include technical systems for detection and monitoring but also national and local warning communication systems to notify the public, a process of training local officials and providing public education to respond appropriately to warnings, and preparation of protocols and response plans well in advance of potential hazards.

To address these issues, LIRNE*asia* developed a participatory concept paper for the design of an effective all-hazard public warning system titled, *National Early Warning System: Sri Lanka (NEWS:SL)*[2] which was partially funded by the IDRC. This well received concept paper was submitted to the Sri Lankan Presidential Commission on the Tsunami, to the Task Force for post-tsunami reconstruction (TAFREN) and the Parliamentary Select Committee on the tsunami. It played an important public educational role as well. The central focus of the concept paper was a national early warning system. As the concept paper states, a national early warning system is a pure public good that will be undersupplied by the market and hence the responsibility for its supply falls on the government. However, it is uncertain and unlikely that the "last mile" of the warning system, including the relevant training, will be provided either by the market or by the government. Although a national warning system using the national media and other means may serve the urban dwellers adequately, the rural residents especially those living near the sea, the source of major hazards[3], are more vulnerable for a number of reasons. For example, the ownership of communication media is dramatically lower in Sri Lanka's Eastern Province (EP) compared to the more urbanized Western Province[4] (WP). The disparity in access to media along the urban-rural divide is one reason why traditional media channels need to be supplemented with last-mile communication systems in coastal

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[1] Samarajiva, R.(2005), Learning from the Tsunami, *SLID Power Pages*, Vol 5, Issue 1 and also available online: http://www.lirneasia.net/2005/07/icts-and-early-warning/

[2] Available: http://www.lirneasia.net/national-early-warning-system/

[3] Hurricanes, tidal surges, tsunamis, water spouts etc.

[4] Ownership of TV sets-49.2% EP, 85.2% WP; Telephone/mobile-13.9% EP, 45.3% WP; Radio-62.7% EP, 84.1% WP. From *Annual Report 2004*, Central Bank of Sri Lanka, Table 10.

villages. Furthermore, urban centres have greater densities of emergency services and probably more organizations with greater resources to respond in a timely manner to hazard situations than villages. In rural areas, residents are left to their own resources to respond to hazard situations. Training on how to respond to hazard warnings along with last mile communication systems is hence a greater requirement in rural areas.

OBJECTIVES:

General objectives

The general objective is to evaluate the suitability of five ICTs deployed in varied conditions for their suitability in the last mile of a national disaster warning system for Sri Lanka and possibly by extension to other developing countries.

Specific objectives

An experimental research design will be adopted to evaluate the role played by a number of factors that contribute to the design of an effective last mile hazard information dissemination system. The specific objectives of this research project are to evaluate the following factors:

1) Reliability of ICTs as warning technologies;
2) Effectiveness of ICTs as warning technologies;
3) Contribution of training to an effective warning response;
4) Contribution of the level of organizational development of a village to an effective warning response;
6) Gender-specific response to hazard mitigating action;
5) Degree of integration of ICTs in the daily life of villages;

RESEARCH DESIGN

Indicators of "effectiveness"

The hazard warning system that is being evaluated in this study is composed of ICTs that are deployed to carry hazard information to the last mile as well as the hazard mitigation response that is developed through training. Both these components will be evaluated for their effectiveness.

The indicators of effectiveness that will be evaluated in this study are outlined below:

Reliability- Did the technology work on the day of the hazard event (simulated or natural)? Which ICTs worked and did not work on the day of the hazard event will be documented. Reasons for failure will also be analyzed. Assigned villagers will maintain a log book of down-time during crisis and non-crisis situation of the ICT that is deployed in their village during the duration of the study.

Reaction time-The time taken for villagers to undertake hazard mitigation action (setting off village-level alert, evacuation to designated safe areas etc) from the moment hazard warning is received. The response time will be recorded for each of the villages which will reflect on the effectiveness of the hazard mitigation training. As outlined in the hypotheses, villages that have received training should perform better than villages that receive no training.

The reaction of time of the ICTs in delivering hazard warning will also be evaluated. The time taken from the moment warning is issued from Sarvodaya's Hazard Information Hub and received by the villages via deployed or existing ICTs will also be measured. For ICTs to be considered effective as components of the last mile warning system, they must enable the delivery of warnings within an acceptable timeframe. The acceptable threshold will be determined by the researchers during the deployment phase.

Bidirectionality-If villagers are going to be both recipients of hazard information and also sources of hazard detection and monitoring information, the deployed ICTs should enable bidirectional communication. The ICTs will be evaluated for the extent to which they allow villages to communicate information on localized hazards such as floods and landslides to Sarvodaya's Hazard Information Hub and other vulnerable villages. Simulated localized hazard events will be created in selected villages to assess the effectiveness of ICTs in carrying hazard information from the villages back to the Hazard Information Hub.

Integration of ICTs into village life- One of the important criteria for evaluating the effectiveness of ICTs will be the degree to which the different technologies can be integrated into the day-to-day life of the community. ICTs that can be leveraged as a means for accessing information that facilitates people's economic transactions, allows them to keep in touch with their relatives and friends or even serve as a medium of entertainment in addition to being a mechanism for communicating hazard information will not only be more valuable but is more likely to be better maintained and in good order when disaster strikes. The deployed ICTs will be evaluated for the extent to which they are integrated into the daily lives of the people through village surveys and observation of their additional uses.

A point system will be used to evaluate the various components of the last mile hazard information dissemination system identified above. The following is the scoring system that will be followed for the evaluation:

Reliability	**40%**
Reaction time	**30%**
Bidirectionality	**10%**
Integration of ICTs in everyday life	**20%**

Total	**100%**

Methodology:

Since the current project is being conducted as a pilot research project rather than an implementation project, it is necessary to deploy the five ICTs identified below in sufficient number of villages to evaluate their effectiveness in different geographical, infrastructural and socioeconomic contexts. The project will be implemented in 32 tsunami affected villages along the coast of Sri Lanka that belong to Sarvodaya's network of villages. A survey will be conducted among 226 tsunami affected Sarvodaya villages to ascertain their degree of organizational development, the district they belong to and the infrastructure that is available. Based on the survey data, the sample of 32 villages will be selected that reflect the diversity of the 226 tsunami affected villages.

Sarvodaya follows a development model that envisages 15,000 villages in Sri Lanka villages that come under its purview to develop through five evolutionary stages described below. Half of the 32 villages selected, will be composed of highly developed stage 4 and 5 villages and the other half would be composed of less organized stages 1, 2 and 3 Sarvodaya villages.

- Stage 1: Inquiry from the village and organization of an introductory *shramadana* camp for the village, during which problems are analyzed together and needs identified.
- Stage 2: Establishment of various groups (children's, youngsters, mothers' and farmers' groups), construction of a child development center, and training of staff.
- Stage 3: Program for meeting the basic needs and setting up institutions (including the founding of the Sarvodaya Shramadana Society, which is responsible for the village's development initiatives);
- Stage 4: Measures to produce income and employment; establishment of complete self-reliance and self-financing;
- Stage 5: Support for other village communities.

It is expected that more organized villages have more effective hazard response compared to less organized villages.

The 32 villages will be assigned to a quadrant of the research table (Table 1) below, based on a number of criteria: ICT technology to be deployed, whether they receive training, the degree of organizational development etc. The sample will be first divided into two groups of 16 villages clustered on their degree of organizational development—stage 1, 2 & 3 cluster and stage 4 & 5 clusters. The two clusters of 16 villages will be vertically divided into two groups where one group of 16 villages receive training on hazard response and the second group of 16 villages receive no training.

As can be seen above, four quadrants are created, where **Quadrant 1** is composed of less organizationally developed villages which are provided with hazard response training; **Quadrant 2** is composed of less organizationally developed villages which are not provided training; **Quadrant 3** is composed of organizationally more developed villages that are provided with hazard response training; and **Quadrant 4** is composed of organizationally more developed villages which are not provided with any training. Each quadrant composed of 8 villages are deployed respectively with a VSAT, a mobile phone, a fixed phone, an addressable satellite radio (ASR), an ASR plus a ham radio, an ASR plus fixed phone, an ASR plus a mobile phone and one control village where no ICTs are deployed (other than what already exists in the village).

The proposed research design will allow us to compare the performance of various ICTs deployed in different village contexts and in the absence or presence of hazard response training. The control villages will shed light on the extent to which having dedicated ICTs for hazard warning contribute to an effective hazard response. Along with the deployment of ICTs in the villages, training will also be provided to the villagers: 1) to identify local hazards so that villagers can be source of hazard information for locally developing hazards and 2) training for undertaking, warning dissemination, evacuation and other relevant actions when a hazard is reported 3) as well as for coordinating post-disaster relief operations.

Simulated drills will be conducted over a six month period where hazard warnings will be disseminated to individual villages in the quadrants and their hazard response will be systematically assessed. The villages' response to any naturally occurring hazard will also be evaluated during the entire project duration of 24 months. The criteria for evaluation will include the rapidity at which an alert is issued after receipt of warning, the organizational efficiency in coordinating collective action, the choice of appropriate response to the particular hazard, the speed at which evacuation is carried out, the proper functioning of the ICT and related technologies among others.

Table 1: Sample allocation table

	Training				**No Training**			
Sarvodaya Village Stages 1, 2 & 3	VSAT	Mobile phone QUADRANT 1	Fixed phone	ASR	VSAT	Mobile phone QUADRANT 2	Fixed phone	ASR
	ASR + Ham radio	ASR + Fixed phone	ASR + Mobile Phone	Control Village	ASR + Ham radio	ASR + Fixed phone	ASR + Mobile Phone	Control Village
Sarvodaya Village Stages 4 & 5	VSAT	Mobile phone QUADRANT 3	Fixed phone	ASR	VSAT	Mobile phone QUADRANT 4	Fixed phone	ASR
	ASR + Ham radio	ASR + Fixed phone	ASR + Mobile Phone	Control Village	ASR + Ham radio	ASR + Fixed phone	ASR + Mobile Phone	Control Village

Hypotheses

1**. *Stage 4 & 5 Sarvodaya villages that are more organized, i.e., have a formal structure that enables coordination and direction of activities will respond more effectively to hazard warnings than less organized stage 1, 2 & 3 villages.***

2. ***Villages that are provided training in recognizing and responding to hazards along with deployment of ICTs will respond more effectively to hazard warnings than villages that received no training.***

3. ***Villages that have ICTs deployed for dissemination of hazard information will respond more effectively to hazard warnings than villages that have to rely on their existing channels of information for warnings.***

4. ***ICTs that in addition to their hazard function can also be leveraged in other areas to enrich the lives of the villages will potentially have lower downtime than ICTs that are poorly integrated into the day to day life of the beneficiaries.***

On the two extremes of last mile warning technology spectrum is the VSAT and the Addressable Satellite Radio (ASR). The VSAT allows rich, bi-directional communication including voice, data images etc. whereas the ASR only allows one-way communication, where hazard warning is communicated to the satellite radio set. ASR has similar characteristics to the broadcast media and in addition to being a unique technology for early warning in its own right, it can also serve as a proxy for the broadcast media in this project. In 12 villages, ASR is deployed with another ICT in order to provide two-directional communication capability to the villages. As mentioned previously and in the NEWS:SL report, people are not only recipients of hazard warnings but are also sources of hazard information. It is expected that coastal villages can be the first line of information to hazards emanating from the sea and two-way communication capability will give them the means of informing Sarvodaya's Institute of Disaster Management of potential hazards. Additionally, the overlapping of ICTs in a village will allow us to assess the need for having redundant hazard warning technologies.

When disaster strikes, some groups of the population like women, children, elderly, the physically and mentally challenged are more vulnerable to its impact. For example, it has been well-established that natural disasters impact women and children disproportionately in the community. The Indian Ocean Tsunami of Dec 26, 2004 is a case in point, where more women and children died than men[5]. An efficient early warning system must take into account the vulnerable group in society and devise a disaster evacuation plan accordingly. As part of the training that is imparted to villagers under this project, special emphasis will be placed on hazard mitigation response that prioritizes evacuation of vulnerable groups in society. During simulated hazard response drills, differences (if any) in the way women and men react to warnings will be investigated. The researchers will also document any gender-specificity in the communication channels that are deployed in this study.

LAST MILE OF THE HAZARD WARNING SYSTEM

The last mile of the hazard warning system (LM-HWS) that takes hazard information to households in vulnerable towns and village is one of the most crucial links of a national early warning system. After a hazard has been detected, relevant information must be communicated to local authorities (police, frontline administrative officials from different levels of government), to religious establishments (like temples and mosques), to local, grass-roots organizations (like Sarvodaya) so that hazard information can be disseminated to every individual household at risk so that individuals can take necessary actions. Consistent with the "all-hazards" approach proposed by LIRNE*asia* in NEWS:SL[6], the last mile hazard information dissemination system should be capable of carrying

5 http://www.oxfam.org.uk/what_we_do/issues/conflict_disasters/bn_tsunami_women.htm

6 National Early Warning System for Sri Lanka: http://www.lirneasia.net/2005/03/national-early-warning-system/

information for all types of hazards like floods, cyclones, earthquakes, dam breaches, epidemics etc., not just tsunamis.

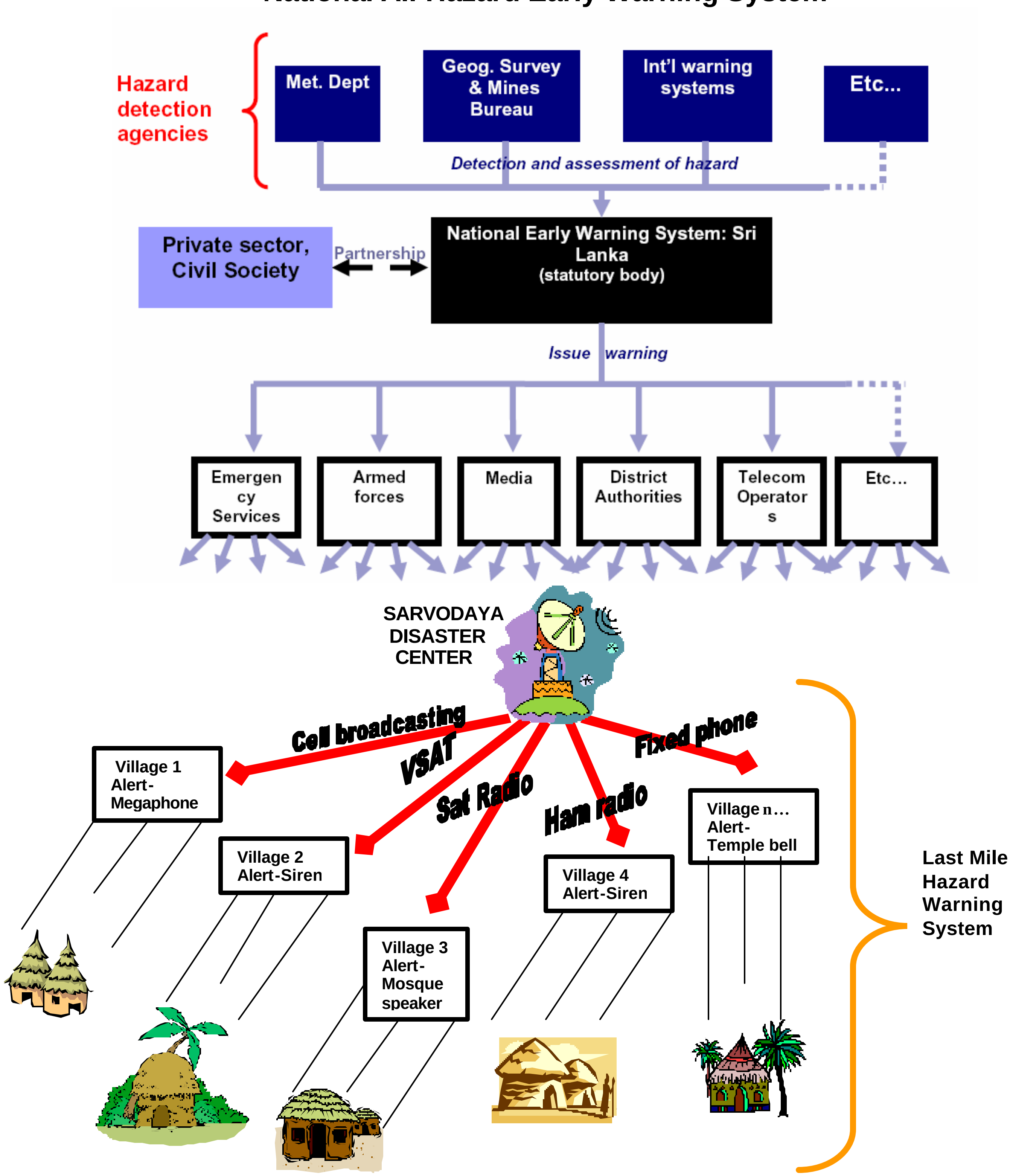
The challenge is to be able to deliver critical information over the last mile--that is to the people at risk no matter where they are. However, hazard information needs to be focused to only those at risk as experience shows that when people are showered with information not directly applicable to them, the results are counter-productive. There are a number of new technologies that provide the opportunity not only to reach the people at risk, but also to personalize and target the message to the vulnerable communities.

As can be seen in Figure 1 below, the LM-HWS is constituted by two communication components, namely the ICT component that hauls information of remotely occurring hazards from the information dissemination hub of Sarvodaya to the village and the local alerting system that draws the attention of all the village residents to the hazard information (remote as well as local). Depending on the village, the alerting system can be a combination of temple bells, public address systems, mosque loudspeakers, sirens, etc. Some of the villages will already have some alerting mechanisms that can be incorporated into the LM-HWS. In some villages new or supplementary alerting mechanisms may have to be deployed in order to have an effective LM-HWS. Community Tsunami Early-Warning Center (CTEC) in Peraliya (South Sri Lanka near Hikkaduwa) have deployed alerting systems in a number of surrounding villages. This project will seek to draw on CTEC's experience in designing appropriate alerting systems for villages with different profiles.

The ICT component of the LM-HWS that will bring hazard information over long distances can be based on different technologies depending on the profile of the village. We have short-listed five ICT technologies below that will be piloted among 32 Sarvodaya villages. We have deliberately left out television and conventional radio from the short-list because the national media are currently unable to target specific villages with hazard information.

Figure 1

National All-Hazard Early Warning System



Fixed Telephone

Among the various ICT technologies, the telephone is relatively ubiquitous although fixed teledensity is still quite low at 5.2 per hundred residents. It is a relatively robust and reliable communication medium although it is vulnerable to congestion during periods of high call traffic that may be generated by people's responses to the disaster. Since fixed telephones rely, for the most part[7], on the physical medium of wires they may be vulnerable to telephone poles being swept off during floods or cyclones.

Despite these drawbacks, the fixed telephone can be an effective hazard information carrier as was demonstrated during the Indian Ocean tsunami in the village of Nallavadu, Pondicherry in Southern India. The entire village of Nallavadu (3600 residents) was saved by a phone call. "One of the former volunteers of this (the Swaminathan Telecentre) programme, Vijayakumar, who now works in Singapore, saw the tsunami warning there. He immediately phoned the village knowledge centre, setting off instant reaction. A warning was repeatedly announced over the public address system and a siren set off. As a result, the tsunami claimed no victims there.[8]" However, neighbouring villages along the coast were not as fortunate and suffered casualties. For this particular project, hazard information will be communicated from Sarvodaya's hub to the selected villages via a fixed phone.

Other than a source of hazard information, the fixed phone can be an integral part of daily life in the village. For example, it can be a source of price information for agricultural produce via the Govi Gnana Seva, it can also be used by the villagers to keep in touch with friends and relatives. It is expected that this technology will be used often and its benefits can be leveraged in other areas in addition to its hazard information dissemination function.

Mobile Telephones-Cell Broadcasting

Cell broadcasting is a service that is already operational in a number of countries. It uses an existing function of cellular networks which allows a text message to be broadcast to all cellular phones of a particular operator in a given geographical area; unlike with SMS (Short-message service) messaging there is no need to know the telephone numbers of the phones. And unlike SMS, cell broadcasting is impervious to network congestion. This makes cell broadcasting ideal for emergency notification since warning and alerts can be targeted to specific vulnerable geographical areas that can range from

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[7] In Sri Lanka, fixed wireless is considered to be fixed telephony for licensing purposes even though it is a wireless service.

[8] *The Hindu*: http://www.hindu.com/2005/01/01/stories/2005010107320100.htm

the area covered by a single cell to the whole network. Cell broadcasting places a very low load on the network; a cell broadcast to every subscriber on the network is equivalent to sending an SMS message to a single phone[9]. This technology has the capability of supporting multiple channels for different message types (severe weather, terrorist attack etc.) and not all subscribers of the network need to receive the same message. Cell broadcasting service can be activated remotely by the network operator.[10] The biggest shortcoming is that it is not connected to an alerting device on the phone. However, research is ongoing in Sri Lanka (and possible elsewhere) on remedying this shortcoming. One of the Sri Lankan developments that focus on java-enabled mobile phones can deliver alerting messages in three languages and siren-like alerting signals.

The other limitation of this technology is that although mobile phone penetration is twice as much as fixed telephones, it is still limited to 11 users per hundred people. Also, English literacy is limited in rural Sri Lanka and unless cell broadcasts take place in the local languages—Sinhala & Tamil, warnings via this medium may not be comprehensible by the vast majority of Sri Lankans. Dialog Telekom, the largest mobile network operator in Sri Lanka, is already experimenting with this technology and preliminary explorations have been made with LIRNE*asia* to pilot test this technology.

The mobile phone like the fixed phone can be integrated into the daily life of the villagers to meet their informational needs and to allow them to keep in touch with their acquaintances. We expect mobile handsets to be used on a daily basis and hence charged and kept in working order to receive the rare hazard information. Also, since mobile phones can be carried in person we expect them to be manned at all times unlike fixed phones.

VSAT-Internet delivered web/e-mail bulletins

Some parts of Sri Lanka, particularly the post-conflict areas, are not reached by telephone networks which make Internet-based warning bulletins via email and the web inaccessible to those communities that have inadequate ICT infrastructure. Internet access delivered to users in remote areas is possible with Very Small Aperture Terminal (VSAT) technology that uses a satellite connection as a high-speed digital link between the user and the Internet backbone. The data travels

9 http://www.cell-alert.co.uk/

10 It must be noted that the active cooperation of one or more mobile operators is necessary for the assessment of cell broadcasting. LIRNE*asia* has had exchanges on this subject with several mobile operators that suggest that this cooperation will be forthcoming.

from the satellite equipment at the customer's location to the satellite using a satellite dish. VSAT is a relatively robust and reliable communication link which is available at a reasonable cost.

The VSAT link will allow Sarvodaya's hazard information dissemination hub to communicate to villages in the local language using e-mail and posting hazard information on its web-based portal. Hazard information can also be stored in a distributed database over the Web by the individual regional hazard information centres. Villages could communicate locally occurring hazards to the regional centres that would record the area and description of the hazard. Sarvodaya can also subscribe to a number of Internet-based hazard warning bulletins issued by entities like US Geological Survey, Pacific Tsunami Warning Center, Joint Typhoon Center etc. to extract relevant information for vulnerable villages.

The VSAT provides a number of additional functions on top of its hazard information dissemination function. A Sarvodaya telecenter will be created to exploit the capabilities that the VSAT offers. In addition to generating email and web-based warnings, the telecenter will provide villagers with daily weather forecasts, medical information from local language portals, and access to e-government services wherever available. The telecenter can also be used to provide basic training to students and adults on PC use. With the use of Wireless Local LAN (WiFi) it may be possible to extend Internet access to the village school and to the local administration. It is expected that the VSAT system will play an important role in the village life.

Addressable Satellite Radio (ASR)

Raytheon and WorldSpace have developed an addressable satellite radio system that can target hazard information to specific radios or large swathes of Sri Lanka depending on the magnitude of the potential hazard. Based on information it receives on developing hazards, the hazard information hub of Sarvodaya can trigger dissemination of specific pre-recorded hazard alerts to vulnerable communities through radios.

The satellite radio is a robust technology that provides both flexibility and scalability. One downside of this system is its high fixed and variable costs. The other is that at present the WorldSpace radio sets have to be kept on to receive messages. LIRNE*asia* has been informed by Raytheon that work is underway to develop a remotely activable radio set.

The addressable satellite radio can also be used as a vehicle for entertainment and information. Bandwidth on the satellite system can be used by Sarvodaya for community radio programs that provide targeted, relevant information and entertainment to the villages. The daily use of the addressable radio set will ensure that the LM-HWS is kept in working order.

Amateur Ham Radio

Amateur ham radio operators have played a significant role in disaster management and relief operations during disasters throughout the world. As was evident during the Indian Ocean tsunami that destroyed electricity and communication infrastructure in the Andamans & the Nicobar islands, ham radio amateurs were the critical link between the islands and the Indian mainland and helped in the coordination of rescue and relief operations.

Ham radios have been primarily used as a backup means of communications in case of disaster such as hurricanes, severe weather, tornados or other emergency situations in the USA. In a few rare cases, they have been used as the first line of warning of severe weather[11]. Ham radio is a low-cost, robust communication system that can be deployed in remote areas of Sri Lanka. A ham radio operator needs to be deployed round the clock at the hazard information hub of Sarvodaya to be able to communicate hazard information to ham operators located in selected villages lacking basic communication infrastructure.

The ham radio's role in the everyday life of the villages seems limited. The specialized mode of communication may limit lay users from incorporating the technology into their daily lives. Unlike any of the other ICTs considered above, ham radio does not lend itself easily to be leveraged in contexts other than hazard or hobby. But more thought will be given to how to integrate this technology into day-to-day life as the project progresses.

Activities

The study can be broken down into components for the purposes of task assignment and ease of implementation.

1. Survey and selection of villages for the pilot study with a mix of topography, extent of infrastructure development and socioeconomic characteristics;
2. Matching information and communication technologies to appropriate village;
3. Deployment of ICTs in different villages;
4. Creating an hazard information dissemination hub;
5. Developing protocols and procedures for local hazard information dissemination and

[11] http://www.scchealth.org/docs/ems/docs/prepare/early_detect.html

evacuation in consultation with the village community;

6. Training of trainers in hazard response;
7. Training a subset of villagers to use and maintain ICT systems;
8. Education & awareness training among residents for identifying hazards and what follow-up action to undertake after receiving hazard information;
9. Focussed assessment of effectiveness of the hazard warning system by conducting simulated alerts and drills;
10. Evaluation of the effectiveness of ICTs in every day conditions;
11. Video recording of lessons learnt from the deployment of various ICTs and dissemination of the same through the media;
12. Writing final assessment of the pilot study and recommendations for more extensive deployment of appropriate hazard warning systems.

Identification of villages

As mentioned earlier, Sarvodaya and LIRNE*asia* will select 32 villages from the 226 tsunami affected Sarvodaya villages that reflect geographic, ethnic, socioeconomic diversity and different levels of infrastructural development. A survey will be conducted of the 226 tsunami villages, identified in the attached Annex A, and a sample of 32 villages will be selected.

Matching technology to village

The characteristics of the selected villages will be identified and appropriate ICTs will be matched to the villages drawing on the ICT know-how of LIRNE*asia* and Gordon Gow and in collaboration with Sarvodaya and village leaders

Supervision of LM-HWS deployment by external vendors

Sarvodaya will coordinate the deployment of the ICTs on the ground with the external vendors and Sarvodaya technicians. LIRNE*asia* and Gordon Gow will supervise the technical implementation of the LM-HWS. The actual deployment will be undertaken by external vendors such as local VSAT installers, Raytheon/WorldSpace, Dialog, etc.

Creating a hazard information hub (HIH)

A hazard information hub will be created in a suitable (disaster resilient) location that has already been identified by Sarvodaya. This will be as part of the SarvodayaInstitute of Disaster

Management[12], a separate building in close proximity to the Sarvodaya Headquarters, that has been newly refurbished with Austrian aid. The HIH will be equipped with communication equipment and reliable and redundant communication links.

Training of villagers to maintain LM-HWS system

Once the LM-HWS is deployed it would need to be maintained and in case of malfunction would need to be serviced and repaired. The objective of this activity would be to create local knowledge and expertise in keeping the deployed technology in working order. In many coastal villages, the women manage the day-to-day activities of the village when the men folk go fishing in the high seas for long durations. Hence, it is necessary that women are also provided training in maintaining and using the last mile hazard warning system. Training would be provided to selected villagers (men & women) to maintain the system and to Sarvodaya technicians the know-how to service the equipment.

Developing protocols for warning & evacuation

Unambiguous protocols need to be developed so villagers know exactly what to do when faced with a potential hazard. Protocols will be developed using participatory methodology relying on the knowledge of the villagers of historical hazard events and contextual information. The needs of the vulnerable groups in society, like women, children, elderly and people with disabilities, will be addressed by the protocols that are developed.

Education & awareness raising

The education component will consist of educating adults and children on the nature of relevant hazards so that they can be sources of early hazard detection and can take appropriate actions. Youths from Shanthi Sena of Sarvodaya will receive training from the trainers to recognize various hazards and how to interpret hazard information. Shanthi Sena members in their turn will be involved in training villager to recognize hazards and also raise awareness of what alerts and warnings mean. The villagers together with their trainers will develop evacuation procedures, paths and safe

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[12] The Sarvodaya Institute of Disaster Management (SIDM) is in the process of being established. The building that will house the SIDM has been refurbished and a library and communication center is being set up within the premises. The SIDM will be a repository of GIS knowledge on Sri Lanka for pre and post disaster coordination The SIDM will operate as the hazard information and coordination hub for managing future disasters.

areas and what mitigating actions need to be undertaken as part of their training.

Assessment of LM-HWS technologies through drills

The effectiveness of the various LM-HWS technologies will be tested by simulating issuance of hazard information and assessing the speed at which the LM-HWS is put into action. A scoring system, as outlined above, will be used to comparatively assess the performance of the ICT components in the various LM-HWS along with effectiveness of training and the characteristics of the villages. The effectiveness of the education and awareness campaign will also be evaluated by the mobilization of the villagers and the speed of evacuation. The ICTs will also be assessed for the extent to which they can be incorporated into the daily life of villagers and leveraged for use in areas other than hazard information dissemination.

Dissemination of lessons learnt throughout the country

A media-based disaster awareness program will be developed to disseminate the lessons learnt from the above activities widely, beyond the Sarvodaya villages. This activity will involve making video programs that capture the step-by-step process by which a village is equipped with the LM-HWS. The video-tapes/DVDs will be distributed to local governments, community organizations, etc. who may wish to adopt a similar grass-roots based early warning system. The findings from the study will be disseminated widely through the mass media and will also be targeted to relevant stakeholders specifically.

Project management

LIRNE*asia* will provide overall project coordination and management through the entire project duration.

Writing of final report with recommendations

LIRNE*asia* will write the final report assessing the viability of various ICT technologies deployed and their suitability for wide spread deployment. The report will document the activities of the project and make recommendations. The final report will be written in consultation with project partners.

SUSTAINABILITY

If this were a pure research/pilot project, the question of sustainability would not be as relevant as would be the case with an implementation project. Because Sarvodaya intends to provide hazard information and related training to all of its 226 tsunami-affected villages, the present project will be folded into the overall tsunami recovery work of Sarvodaya and will therefore be sustained.

This project will evaluate the extent to which ICTs can be leveraged for meeting informational needs of the people in addition to being a mechanism for communicating hazard information. ICTs that can be leveraged in other areas will be more sustainable when the project ends than ICTs that have limited utility.

There is adequate internal capacity within LIRNE*asia* in running village knowledge centers as demonstrated by the *Govi Gnana System* implemented in Dambulla that provides market price information to farmers. Project partner Sarvodaya, has also accumulated expertise in deploying and running a *Nanasala* in Nuwara Eliya that provides myriad information services to villages. Drawing on this experience, sustainability of selected ICTs will be achieved via a multi-pronged approach of mutually beneficial and commercial partnerships, levies of usage fees etc. The continued operation of the selected ICTs will be ensured through a cost-recovery program and through innovative funding mechanisms.

PROJECT SCHEDULE & TASK MATRIX with TIME COMMITMENTS

TASKS	LIRNE*asia*	Sarvodaya	Gordon Gow, LSE	Vanguard Foundation	CTEC	Nalaka Gunawardene associates / Shanti Sena	TIMELINE
Surveying of tsunami affected Sarvodaya villages for sampling							Week 1-4 (Month 1)
Allocation of selected villages to research grid							Week 4-6 (Month 2)
Supervision of ICTs deployment by external vendors							Week 6-14 (Month 4)
Developing protocols for warning & evacuation							Week 5-9 (Month 2)
Creating a hazard information dissemination hub at Sarvodaya							Week 5-12 (Month 3)
Training of trainers in hazard response							Week 10-14 (Month 3)
Training of villagers in hazard response & using ICTs							Week 15-21 (Month 5)
Focussed assessment of ICTs & training through simulated drills							Week 22-46 (Month 12)
Evaluation of effectiveness of ICTs in every day conditions							Week 46-78 (Month 20)
Writing of final report with recommendations							Week 78-86 (Month 22)
Dissemination of lessons learnt							Week 86-94 (Month 24)
Project management							Throughout

INSTITUTIONS AND PERSONNEL:

In order to implement the various components of the last mile hazard information dissemination system, LIRNE*asia* will collaborate with Sarvodaya, Vanguard Foundation, Gordon Gow from the London School of Economics, Nalaka Gunawardene and colleagues with prior experience in disaster communication training (in association with a Tamil speaking trainer to be identified) who will provide training to trainers from Sarvodaya's Shanthi Sena arm[13].

At the completion of the project, the ICTs and related equipment deployed in Sarvodaya villages and at Sarvodaya's hazard dissemination hub will belong to the Lanka Jatika Sarvodaya Shramadana Sangamaya and the relevant village societies/entities as relevant.

LIRNE*asia*

LIRNEasia a regional ICT policy and regulation capacity building organization, incorporated as a non-profit organization under section 21 of the Companies Act, No. 17 of 1982 in 2004 and funded at present by the International Development Research Centre of Canada and infoDev, a unit of the World Bank. The organization is physically located in Colombo but works throughout the Asian region. Its primary functions are research, training and informed intervention in policy and regulatory proceedings. Its current projects include research in India, Nepal, Bangladesh and Indonesia. More information: www.lirneasia.net

Sarvodaya

Sarvodaya is Sri Lanka's largest and most broadly embedded people's organization, with a network covering 15,000 villages and has been operational for almost 50 years. Sarvodaya started relief & rescue operations within two hours after the Dec 26, 2004 tsunami hit Sri Lanka. It is currently involved in rehabilitation and reconstruction in the 226 tsunami affected villages under it. Sarvodaya is the country's largest micro-credit organization with a cumulative loan portfolio of over LKR one billion. The total budget of the Sarvodaya Group exceeds USD 5 million; the number of fulltime employees of Sarvodaya and affiliated entities is 1,500. Around 100,000 youths have been mobilized under Shanti Sena for peace building work. They played a significant role in Sarvodaya villages and camps after the tsunami. For information: www.sarvodaya.org

Dr Gordon Gow, Department of Media and Communications, London School of Economics

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13 Please refer to the last page of this document for the core competencies of the various partners that are relevant to this project.

& Political Science

Gordon Gow is a Canadian who holds a PhD in Communication Studies from Simon Fraser University in Vancouver where his research focussed on technology policy research for emergency communications support and management. Much of the work involved technology assessments for federal and provincial governments in Canada, and his PhD thesis examined and critiqued the development and implementation of Wireless Enhanced 9-1-1 (emergency) service. Currently, his research interests include development of mobile voice and data systems, especially with respect to regulatory concerns such as spectrum policy and management, telecom reform, technical standardization, public safety, and location based services. He is connected to networks of international disaster communication professionals, in his own right and through his former advisor, Professor Peter Anderson (co-author of the NEWS:SL report). Given the cutting-edge nature of the ICT technologies and applications in this project, LIRNE*asia* believes that Gordon Gow's contribution is important for its success. His visits to Sri Lanka will also be used for capacity building at the SarvodayaInstitute of Disaster Management. More information at: http://www.lse.ac.uk/collections/media@lse/whosWho/gordongow.htm

Nalaka Gunawardene, et al.

Nalaka, along with Sandhya Salgado and Buddhi Weerasinghe are Sri Lankan communication professionals who have provided disaster communication training at the Asian Disaster Preparedness Center in Bangkok. More information at: http://www.mediasouthasia.org/nala.asp.

Vanguard Foundation

Vanguard Management Services (Pvt) Limited, floated Vanguard Foundation (under incorporation-www.vanguardfoundationlanka.org), to conceptualize and implement its corporate efforts in the areas of disaster relief, rehabilitation and preparedness. The Vanguard Foundation would promote activities, polices, and market based initiatives that would improve national disaster preparedness, mitigation strategies, and the flow of expertise to meet and deal with a wide variety of national disasters.

Community Tsunami Early-Warning Center (CTEC), Peraliya (near Hikkaduwa)

CTEC was set up after the tsunami of Dec 26 2004, to provide warning to several villages in Peraliya near the town of Hikkaduwa in the south of Sri Lanka. It has seven people on shifts on duty 24/7. CTEC has deployed alerting systems that activate PA systems in two villages from their office. The system runs on wires they hung on electricity poles. CTEC has given mobiles and walkie talkies to all their staff. They have megaphones to use in an emergency. CTEC has marked out some evacuation paths to facilitate orderly flight in case of locally occurring hazards. CTEC holds training sessions to teach people about tsunamis and is in the process of setting up a library.