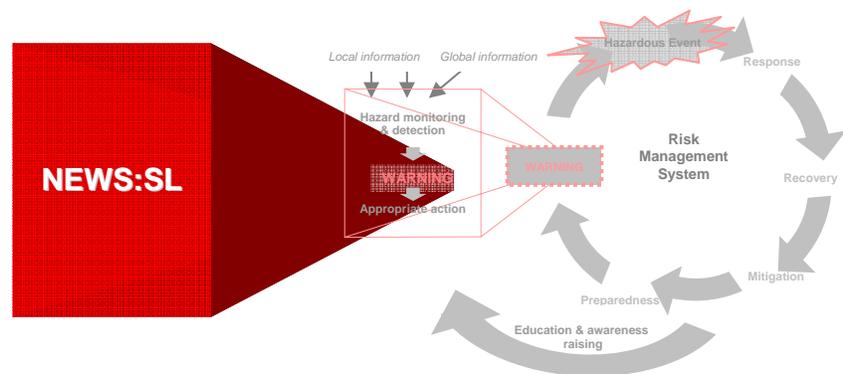


National Early Warning System: Sri Lanka

A Participatory Concept Paper for the Design of an Effective All-Hazard Public Warning System

Version 2.1



Rohan Samarajiva, LIRNEasia, Sri Lanka
Malathy Knight-John, Institute of Policy Studies, Sri Lanka
Peter S. Anderson, Simon Fraser University, Canada
Ayesha Zainudeen, LIRNEasia, Sri Lanka



LIRNEasia

Learning Initiatives on Reforms for Network Economies

17 March 2005

Table of Contents

<i>Background of Concept Paper</i>	<i>i</i>
<i>Acknowledgements</i>	<i>ii</i>
<i>Vanguard Foundation</i>	<i>ii</i>
<i>LIRNEasia</i>	<i>ii</i>
<i>Disclaimer</i>	<i>iii</i>
EXECUTIVE SUMMARY	V
SECTION I: INTRODUCTION AND RATIONALE	8
<i>Vision</i>	<i>8</i>
<i>What is Public Warning?</i>	<i>9</i>
<i>The Critical Need for an Early (Public) Warning System</i>	<i>11</i>
<i>Importance of Partnerships</i>	<i>13</i>
Key Points	15
SECTION II: PARAMETERS OF A NATIONAL EARLY WARNING SYSTEM	16
<i>Best practices in the design of warning systems</i>	<i>17</i>
<i>Toward an Integrated All-Hazards Approach to Public Warning</i>	<i>18</i>
<i>Role of Information and Communications Technology</i>	<i>19</i>
Key Points	24
SECTION III: GOVERNANCE AND IMPLEMENTATION	25
<i>Plan A: Government supply of early warnings</i>	<i>25</i>
<i>Plan B: Non-governmental supply of warnings</i>	<i>29</i>
Key Points	31
SECTION IV: THE WAY FORWARD	32
<i>Summary of Actions</i>	<i>32</i>
<i>Immediate and urgent actions</i>	<i>34</i>
<i>Medium-term actions</i>	<i>34</i>
<i>Continuing Actions</i>	<i>36</i>
<i>Next steps by Vanguard Foundation</i>	<i>36</i>
REFERENCES	38

LIST OF ANNEXES:

Annex 1	Consolidated Input from Consultation Processes
Annex 2	List of Consulted Persons
Annex 3	Agendas- Consultation meetings
Annex 4	News Releases, Selected Media Coverage & Web Coverage
Annex 5	Qualifications of International Expert and Leader of Sri Lankan Team
Annex 6	Timeline of events, 26 December 2004
Annex 7	Sinhala and Tamil Translations of Interim Report Executive Summary
Annex 8	Sarvodaya Network
Annex 9	Dam Safety Issues
Annex 10	Summary Statistics of Tsunami Impact

Background of Concept Paper

The objective of this concept paper is to provide recommendations for the parameters and specifications of a national early warning system appropriate for Sri Lanka, with adequate regional and global linkages capable of conveying warning messages of any scale or type in the event of an impending hazard. Its approach is inspired by the Partnership for Public Warning.¹

This concept paper has been developed in a participatory, consultative and transparent manner, and has received much support from many groups in Sri Lankan society and the media. An active web-based discussion that started on 1 January 2005 and discussions with disaster experts in Hawai'i shape the approach to the problem.² Initial ideas and options developed by local researchers and an international expert on disaster communication were presented at an Expert Consultation held on January 26th 2005 in Colombo (see Annex 1 and <http://asia.lirne.net/index.php?p=272>). The consultation, with the participation of two disaster experts, was organized to obtain broad input from Sri Lankans with disaster management expertise (see Annex 2). The invitees to the consultation included alumni of the Asian Disaster Preparedness Center in Bangkok and those who responded to newspaper advertisements (Annex 1). The Consultation was attended by approximately 60 persons; a substantial number being from government organizations with disaster responsibilities.

An interim concept paper³ was compiled on the basis of ideas and inputs received. It was made available for comment and review 5-19 February 2005. Inputs were also sought from international experts in the field of disaster communication, disaster management, hazards relevant to Sri Lanka, as well as the Sri Lankan business community, media and general public through multiple modes:

- The interim concept paper was made available on the Internet at <http://www.vanguardfoundation.org> and <http://www.lirneasia.net>. Comments and input were received directly through the LIRNEasia website, email and in written form (Annex 1). A small number of face-to-face and telephonic meetings were also held
- A video news conference held at the Distance Learning Center at the campus of the Sri Lanka Institute of Development Administration, with participation from experts from Canada and Hawai'i (February 10 2005, 10.30am). This was conducted in Sinhala and English. (Annex 1,2,3)
- A public meeting hosted by the Chamber of Commerce and Eagle Insurance Limited (February 24 2005, 4.30 pm) (Annex 1,2,3).
- Distribution to over 20,000 Lanka Business Online readers.
- Extensive media coverage (Annex 4).

Further input was sought from experts in disaster preparedness at the Asian Disaster Preparedness Center in Bangkok and International Strategy for Disaster Reduction in Geneva.

Substantive input and recommendations were received, and have been given due consideration and where the relevant, integrated into this concept paper. All input received has been summarized in Annex 1. The extraordinary input we have received and is reflected in the differences between the draft and final reports is testimony to the value of open public consultation, even on esoteric technical subjects. The two shortcomings we readily acknowledge are the Colombo-centric nature of the consultation and the inadequacy of interactions in Sinhala and Tamil. Both were necessarily the results of the ambitious deadline we set for ourselves. In order to compensate, we ensured that the ideas received broad coverage in the media (Annex 4).

¹ A national strategy for integrated public warning policy and capability, 16 May 2003.

² <http://www.partnershipforpublicwarning.org/ppw/docs/nationalstrategyfinal.pdf>

³ http://www.lankabusinessonline.com/new_subcat_display.php?subcatcode=24&catname=Insight&CategoryName=Choice

³ *Specifications of a National All-Hazards Warning System for Sri Lanka*

The executive summary of the Interim Concept Paper was, however translated into both Sinhala and Tamil (Annex 7); the translations were distributed at the Video Press Conference and meeting convened by the Ceylon Chambers of Commerce. While the Sinhala coverage was to our satisfaction, we admit falling short on Tamil coverage and commit to doing more in that area in the future. Our follow up activities on dam safety will commence in Gampola in Sinhala and possibly Tamil. This invitation was a result of the media coverage.

This concept paper was be submitted to the appropriate authorities in government in early March 2005, just over two months to the day from Sri Lanka's greatest calamity, a calamity that killed 1 in 500 of our population and affected one in twenty.

Based on valuable input received after the release of this Concept Paper (on 5 March 2005), the inclusions have been inserted (footnoted where relevant). Annex 2 has also been updated to include several names of Expert Consultation attendees previously not mentioned. These changes have been incorporated resulting in **Version 2.1**.

Acknowledgements

The authors would like to thank the following people for their valuable input and contributions to this paper: Lakshaman Bandaranayake, Harsha de Silva, Damthi Fernando, Sabina Fernando, Divakar Goswami, Catherine Hickson, Amal Jayasinghe Terry Jeggle, Nishantha Kamaladasa, Earl Kessler, Vajira Premawardhana, Vindhya Pusweldeniya, Asantha Sirimane, Luxman Siriwardena, Chanuka Wategama, and all those who have provided input throughout this process – at the Expert Consultation, Chambers of Commerce Presentation, through written submissions, discussions – and the media.

LIRNEasia gratefully acknowledges the prompt response received from the [International Development Research Centre of Canada \(IDRC\)](#) and Professor William H. Melody, Managing Director of [LIRNE.NET](#) with regard to the funding of the research component of this project. The other costs were borne by the Vanguard Foundation.

Vanguard Foundation

<http://www.vanguardfoundationlanka.org/>

Vanguard Management Services (Pvt) Limited, floated Vanguard Foundation, to conceptualize and implement its corporate efforts in the areas of disaster relief, rehabilitation and preparedness. The Vanguard Foundation would promote activities, policies, 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.

LIRNEasia

<http://www.lirneasia.net>

LIRNEasia, a regional ICT [information and communication technologies] policy and regulation capacity building organization, incorporated as a non-profit organization under section 21 of the Companies Act, No. 17 of 1982 of Sri Lanka in 2004 and funded at present by the IDRC 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 processes. Its current projects include research in India, Nepal, Bangladesh and Indonesia that deal with different approaches to network expansion and research on the telecom strategies of the poor.

LIRNEasia aims to improve the lives the people of Asia – by making it easier to make use of the information and communication technologies by facilitating the changing of laws, policies and regulations to enable those uses; by building Asia-based human capacity through research, training, consulting and advocacy.

Disclaimer

Unless otherwise stated, the views and opinions expressed in this paper reflect those of the respective authors. The content contained herein represents neither the views or opinions of the institutions that the authors are affiliated with, IDRC, LIRNE.NET, *infoDev* or the World Bank. All errors and omissions are those of the respective authors.

Partial support for the research in this Concept Paper and the Video Press Conference was provided by International Development Research Centre (IDRC)



Local consultation costs provided by the Vanguard Foundation, Eagle Insurance Company (Ltd) and the Ceylon Chamber of Commerce.

Many hours of volunteer labor provided by many people.

Executive Summary

- 0.1 The 2004 Indian Ocean tsunami that claimed the lives of one in 500 of Sri Lanka's people and displaced one in twenty has highlighted the critical importance of an effective National Early Warning System for Sri Lanka (NEWS:SL). Meeting this need, which has been discussed (and forgotten) after each of our too frequent disasters such as the cyclones of 1978 and the floods of 2003, can no longer be postponed.
- 0.2 Public warning is a system, not a technology. The identification, detection and risk assessment of a hazard, the accurate identification of the vulnerability of a population at risk and finally the communication of information to the vulnerable population about the threat in sufficient time and clarity so that they take action to avert negative consequences constitute the system of public warning. Warning allows people to act in order to prevent hazards from becoming disasters. Effective public warning saves lives, reduces economic loss, reduces trauma and disruption in society and instills confidence and a sense of security in the public. It is an important component of the foundation of a sound economy.
- 0.3 Recognizing that effective warning is just one of the critical parts of a comprehensive *risk management system* that includes mitigation, preparedness, response and recovery, this concept paper focuses on the warning component. Warning is a crucial component of the overall risk management system that failed in the 2004 Indian Ocean tsunami; it needs urgent strengthening for the country to benefit from the proposed improvements in the regional hazard detection systems and to minimize losses from local hazards.
- 0.4 Linkages to local, regional and international hazard detection systems are extremely important for an effective national warning system. For localized hazards such as floods and landslides, seamless connections must exist between the hazard detection systems and the Early Warning System. People are not only the recipients of warning messages from experts, they are also valuable sources of hazard detection and monitoring information. An early warning system without education, planning and rapid action is sub-optimal.

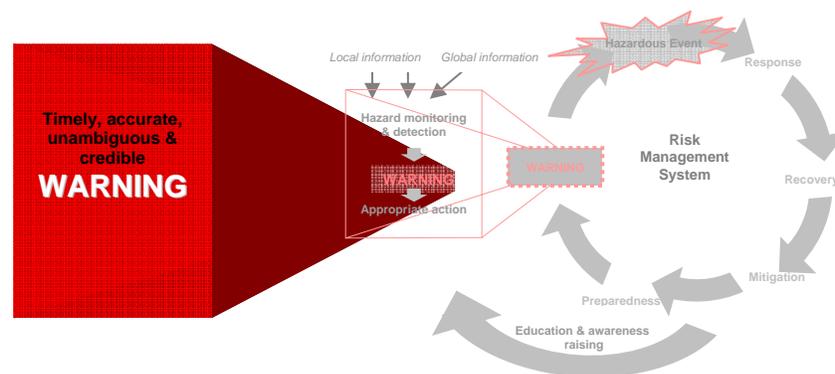


Figure 0.1 Warning as a part of a comprehensive risk management system

- 0.5 It is the core business of government to protect its citizens to the best of its ability. However, in many developing countries, government action is constrained by numerous competing claims on scarce resources and by capacity and organizational-culture problems. Government cannot do it alone; all sectors of society must contribute.
- 0.6 For example, the private sector offers complementary resources and necessary infrastructure (e.g., telecommunications and broadcasting networks) that are needed for disseminating warnings; civil society provides social infrastructure at the grassroots. The use of already existing capacities is not only cost-effective, but ensures the continuity and

maintenance of the system. The cost to the government of implementing a nation-wide warning system is significantly less when other stakeholders contribute to the costs for maintenance, management and service. It is also important that there be adequate oversight of the performance of the vital functions associated with an early warning system; this can only be provided when multiple players are involved.

- 0.7 Sri Lanka should adopt an 'all-hazards' approach, wherein the detection component may differ for each kind of hazard (flood, cyclone, fire, earthquake, epidemic, etc) and may be provided by different entities with subject expertise, but the warning system is capable of carrying warnings for all kinds of hazards. An important element of this is an agreed format of warning messages for all hazards types, as given in the international standard Common Alerting Protocol (CAP)⁴. A common system capable of carrying warning for all types of hazards is not only a superior use of resources, but will also counter a common problem of lack of maintenance of systems that are rarely used. A common warning system is also important from the demand side, enhancing the ease of understanding of warning messages by the recipient.
- 0.8 The telecommunications and electronic broadcasting industries play crucial roles in the effective dissemination of warnings. Action to ensure optimal contributions from the telecommunications network of networks should be ensured through the collective efforts of the operators, facilitated by the regulator. Government should also work collaboratively with the electronic broadcasting industry to ensure effective contributions to early warning at national and local levels.
- 0.9 An early warning system is a pure public good that will be undersupplied by the market. The responsibility for its supply thus falls on government. In the event government undertakes this task in the aftermath of the tsunami, it should adopt a design that provides the necessary conditions for high performance required of a National Early Warning System. These conditions include provisions for the deployment of proper expertise and equipment, adequate levels of funding, insulation from day-to-day political interference, transparency and accountability. The Public Utilities Commission of Sri Lanka Act, No. 35 of 2002 provides a good starting point.
- 0.10 If the government does not wish to create a new agency focused solely on warning, it may wish to consolidate the hazard-warning experts of the existing hazard detection and monitoring organizations along with disaster communication experts in a new entity. Because the current organizations have several other functions and have personnel configurations that may not be optimal for a modern, performance-oriented agency, it would be advisable to build the new entity as a greenfield organization with a clear focus.
- 0.11 A variant of the option of government supply meshes government supply of hazard information and funding with actual operation by a community based organization, as in Bangladesh. The success of this public-private solution rests on the community based entity being perceived as credible and capable of issuing authentic warnings – based on a network of trust established over time at the community level.
- 0.12 Hazard warnings are often based on incomplete information and judgment. In many societies, the final decisions on warnings and especially on evacuations are taken by political authorities, on the basis of independent and professional advice of experts. In Mauritius, the professional heading the warning agency makes the final call. Different options need to be considered taking into account Sri Lanka's political and administrative environment.
- 0.13 In the event government supply of warnings, directly or through a public-private partnership, proves problematic, the alternative is private sector supply, where the warning is bundled with a private good. However, unlike government supply which lends itself readily to an all-hazards approach, non-governmental supply of warnings is likely to be partial in nature. Some forms of non-governmental supply of warnings, undertaken in good faith, may have to be indemnified by government.

⁴ New insertion, 17 March 2005; see background for details

0.14 The solution that is appropriate and feasible for Sri Lanka is likely to be a hybrid, ideally with government leadership on the establishment of an effective National Early Warning System and complementary private sector and civil society initiatives that capitalize on their respective comparative advantages. Prompt action to establish an effective National Early Warning System is the best memorial we can build to the 40,000 valuable lives that were swept away for the lack of a few minutes of warning and a little awareness.

Section I: Introduction and Rationale

Vision

- 1.1 What will Sri Lanka look like the next time a significant hazard strikes us? How will we react? Are we ready to face the next flash flood? Cyclone? Earthquake? Dam breach? Epidemic?
- 1.2 If Sri Lanka takes this opportunity and acts quickly to implement a national early warning system, here's what could happen:

Mid 2007...

This year the Ratnapura district saw the heaviest rainfall in over a decade. However, unlike in the past, damage was minimal, and no human life was lost. The early flood-watch system, run in conjunction with the NEWS:SL [National Early Warning System: Sri Lanka] and local community and business leaders was responsible.

Started almost two years ago, the system noted levels of rainfall approaching higher-than-average levels, sending out 'watch' signals to the local and surrounding areas. Once rainfall levels reached the critical level, the 'watch' became a warning. Awareness created in these areas through media and community programs was clearly demonstrated—especially among those living in previously demarcated 'vulnerable' areas, making preparations for evacuation, should the rain levels increase to flood levels.

Disaster recovery services were on standby. The rainfall continued for days, getting heavier and heavier. While everyone was on guard and ready to evacuate as was necessary last year, the need fortunately did not arise. The mitigation measures implemented over the last year successfully redirected the rainfall away from populated areas. Only one minor land-slide was reported along a main road, but the vigilant townspeople stayed off the roads and no one was harmed....

2016

Twelve years after the great devastation of the tsunami of 2004, history has repeated itself. Stress built up along plate boundaries off the western coast of Sumatra caused the earth to shake violently at 1515 hrs last Sunday afternoon. The quake, originating in the Sunda Trench on the ocean floor, sent tsunami waves sweeping across the Indian Ocean once again.

Sri Lanka was aware of the earthquake immediately through its own basic seismic equipment at the Geological Survey of Sri Lanka, and within four minutes more detailed data was received at NEWS:SL through a bulletin from the International Tsunami Warning System. The bulletin confirmed the earthquake, its magnitude and location and included a tsunami watch message. A second bulletin with a warning five minutes later confirmed increased sea levels, indicating a tsunami heading westwards, and estimated that the tsunami could reach Sri Lankan coasts anywhere within 1-2 hours. NEWS:SL took immediate action, disseminating warnings according to contingency plans for tsunami situations.

The warning was sent out to emergency services, armed forces, district administrative authorities, hotel groups, media, travel operators, telecom operators, transport companies and other disseminators along the coasts. Mobile operators sent out warning cell broadcasts from all their coastal cell-sites; national and community radio suspended scheduled programming and broadcasted the warning; TV sets were remotely activated and warnings disseminated; armed forces took to the streets warning people; the sound of sirens wailing, temple and church bells ringing, temple and mosque loudspeakers and community megaphones announcing could be heard all along the coast. By around 1645 hrs, when the sea began its encroachment of the land, beaches were cleared; coastal

settlements and hotels were evacuated. Media coverage ensured that people stayed away for two-three hours, until the waves subsided and an all-clear was sounded. Although this tsunami was almost as powerful as its predecessor, casualties did not exceed 300, and damage to property has been estimated as significantly less. A week later, Sri Lankan lives are returning to normalcy. Sri Lanka can safely say it has learnt its lesson.

What is Public Warning?

- 1.3 Warning is the communication of information of a hazard or threat to a population at risk, in order for them to take appropriate actions to mitigate any potentially negative impacts on themselves, those in their care and their property.
- 1.4 The occurrence of a hazard does not necessarily result in a disaster. While hazards cannot be avoided, their negative impacts can be mitigated, and hence disasters may be prevented or at least alleviated; the goal of early public warning is to ensure to the greatest extent possible that the hazard does not become a disaster.
- 1.5 A hazard occurs in the physical world; if humans do not live in the vicinity of the occurrence and if it is not observed by humans through sensing devices, the hazard will not only not become a disaster; it will not even be recognized as a hazard. Examples are a landslide under the ocean or in an uninhabited and remote part of a landmass, such as Antarctica. In other words, the occurrence in the physical world will not be represented in the symbolic world within which human interaction occurs. If humans live in proximity to a hazard, it is possible that the physical effects of the hazard will itself constitute the information (warning) about it. The advice that is given to the citizens of Hawai'i about local tsunamis that may be created by proximate earthquakes exemplifies this: "your feet are your signal; if you feel an earthquake, head for high ground." The function of an early warning system is to convey information about a hazard to the humans likely to be affected by it as far in advance of the physical effects as possible. That is, to represent the physical occurrence in the symbolic world as quickly as possible. Electronic media including the telephone and the Internet are critical to this action. So for example, the occurrence of the earthquake off Sumatra was known on the other side of the world in Hawai'i at the Pacific Tsunami Warning Center almost as it ended 500 seconds after 0659 hrs Sri Lanka Time (SLT) and was communicated to warning centers across the Pacific by 0710 hrs SLT.⁵ But where no equipment capable of sensing the event or telecommunications facilities to communicate it exists, the physical occurrence will not be represented in the symbolic world. So the destruction of Aceh and ensuing deaths of around 100,000 people by the earthquake and the following local tsunami did not "exist" as far as the rest of world was concerned for several more hours, the first recorded reports of some form of sea-based hazard being at 0857 hrs SLT or 0920 hrs SLT (See Annex 6). Unless new information comes to light, it appears that the destruction in Sri Lanka reached the media and the users of media prior to news of the decimation of Aceh. This was possibly because the Cease Fire Agreement between the Government and the LTTE had enabled greater communication between non-governmental actors in the East Coast and Colombo and allowed for greater access to telecom facilities, in contrast to the situation in civil-war afflicted Aceh.
- 1.6 When 'time is of the essence,' early public warning delivers credible and unambiguous information that people need to make potentially life or death decisions. Public warning should *at the very least* convey what, where, when and how severe the hazard is and how likely it is to occur. It can also incorporate what actions are appropriate – i.e., stay indoors, get to higher ground, go inland, etc.
- 1.7 The warning must be unambiguous, and communicate succinctly the risks and necessary guidance. The success of a warning can be measured by the actions that people take. It is a public good that is generally delivered through privately-owned communication networks and devices. It is important to note that warning is a system not a technology, constituting the

⁵ Updated NOAA timeline at <http://www.noaa.gov/stories2004/s2358.htm>

identification, detection and risk assessment of the hazard, the accurate identification of the vulnerability of a population at risk and finally the communication of information to the vulnerable population about the threat in sufficient time and clarity so that they take action to avert negative consequences. This final component underscores the importance of education and awareness in the population, so that they may know what the appropriate actions at that time are. The system is only as strong as its weakest link. The dangers of incomplete warnings or inadequate response awareness are exemplified by the tragic deaths of children in Nambiar Nagar, Tamilnadu who rushed to a cyclone shelter when the 2004 tsunami came, only to die in it.⁶

- 1.8 In an 'all-hazards' approach, the detection component will differ for each kind of hazard (flood, cyclone, fire, earthquake, epidemic, etc) and may be provided by different entities with subject expertise. But the warning system is capable of carrying warnings for *all* kinds of hazards to a population at risk. This approach depends on the content of messages being agreed across hazard types, as given in the international standard Common Alerting Protocol (CAP)⁷. A single warning system that is capable of carrying warning for all types of hazards is not only better use of resources, but will be in more routine use; this will counter a common problem of lack of maintenance of systems that are rarely used.
- 1.9 A common warning system is also important from the demand side, the ease of understanding of the recipient. As a recent policy document states: 'A common public warning system with simple instructions for action would minimize the public confusion that occurs during emergencies, especially if the system is in routine use not only for tsunamis, but also for severe weather, fire and other threats.'⁸
- 1.10 It is also important to note that effective warning is just *one* of the critical parts of a comprehensive *risk management system* that includes mitigation, preparedness, response and recovery. While recognizing this, **the focus of this concept paper is warning**: getting timely, accurate, unambiguous and credible information to a population at risk of impending disaster. Warning is perhaps the most important component of the overall risk management system that failed in the 2004 Indian Ocean tsunami, and which needs urgent strengthening in order for the country to benefit from the proposed improvements in the regional hazard detection systems.⁹

⁶ http://news.bbc.co.uk/2/hi/south_asia/4141709.stm

⁷ New insertion, 17 March 2005; see background for details

⁸ Global Earth Observation System of Systems GEOSS, *10 year Implementation Plan: Reference Document*, p. 19

⁹ Abeywickrama, M. I., "No money to repair disaster warning unit," Sunday Leader, 27 February 2005, p. 5.

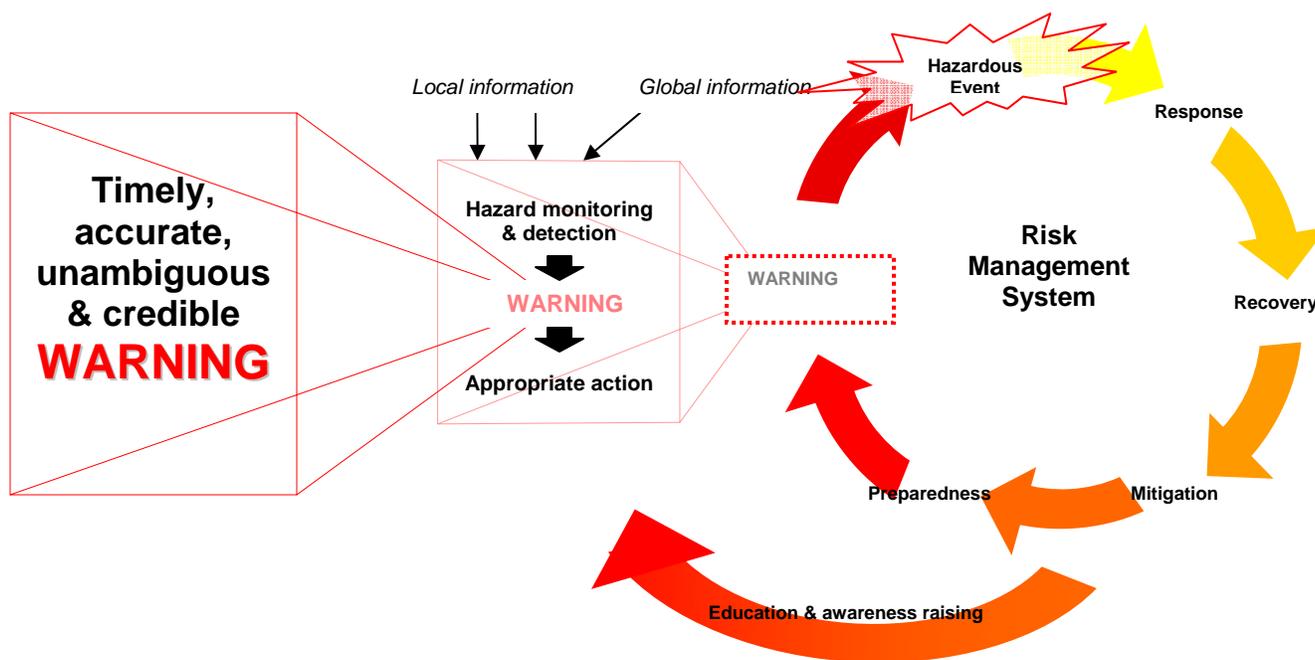


Figure 1.1: Effective warning as a part of a risk management system

- 1.11 Local, national, regional and international linkages of a national system are extremely important. The national warning system cannot stand alone; it must be sufficiently linked to multiple detection and analysis entities –national, regional and global warning systems to be most effective.
- 1.12 For localized hazards such as floods and landslides, seamless connections must exist between the hazard detection systems and NEWS:SL. People are not only the recipients of warning messages from experts, they are also valuable sources of hazard detection and monitoring information. An effective early warning system will capitalize on this source, creating channels for the input of hazard information by the public and the prompt assessment of the veracity of such information.¹⁰
- 1.13 Other key components of a warning system include public education and awareness raising, planning and testing and assessment. An early warning system without education, planning and rapid action is sub-optimal. The reports of the heroic actions of Victor Soya of Kosgoda, a former sailor who had witnessed the Great Chilean Earthquake and tsunami of 1960, who saved an entire village, save two people, based on that knowledge exemplifies what can be done through informed action.¹¹

The Critical Need for an Early (Public) Warning System

- 1.14 Safety and security is necessary for the functioning and continued development of any society. Early public warning thus is essential to any society. In fact, early warning systems could even be considered one of the basic infrastructures of society: *‘...actions are necessary*

¹⁰ Weerabahu, P. K. (2005) and related discussion at <http://www.lirneasia.net/2005/01/adapting-to-an-ict-based-emergency-warning-system/#comments>

¹¹ “The man who saved the people of Kosgoda,” <http://jinasenafund.org/projects/victor.html>

*to assure that ...public warning becomes an essential infrastructure component available to all societies worldwide.*¹²

- 1.15 “Public safety is a fundamental duty of . . . government. . . . Government provides for first responder and emergency management infrastructure to prevent hazards from becoming disasters and to lead the response and recovery from disasters when they do happen. Public safety is a challenge for business and industry. Safety is a key element of sound business practice driven by ethical principles, the marketplace, government regulations, and liability laws. Public safety is also the responsibility of citizens who are expected to take action not only to protect themselves and their loved ones, but also to make society safer through their community actions and their jobs.”¹³
- 1.16 The objective of early warning is to empower individuals, communities, businesses and organizations to make decisions on their actions to ensure their safety as much as possible. People need timely, accurate, unambiguous and credible information in order to decide whether to leave their homes, close their shops, move their boats in or out to sea, or whatever it may be. It is critical that people know what risks they are facing to prepare themselves, their loved ones, their property, belongings and livelihoods. It is critical to the long-term stability and development of any society.
- 1.17 The value placed on timely and effective warnings in averting losses and protecting resources becomes increasingly apparent as countries incorporate disaster reduction policies into their national social and economic development plans establish effective preparedness measures and improve their response capacities.
- 1.18 Early warning is imperative for, amongst others, the following reasons
- *Humanitarian:* The most obvious reason for an early warning system is to avoid needless loss of life and injury, giving people the necessary information to mitigate these risks. This has been demonstrated historically and globally.
 - *Economic:* Effective warning can prevent much economic loss to individuals, businesses and industries. Warning enables these groups to prepare for and mitigate the impacts of hazards that may affect them. Furthermore, the lack of mechanisms for early warnings can harm investor (local and foreign) and business confidence (and affect the tourism industry negatively in Sri Lanka’s case) and hence stifle economic development of a country. Added to this, early public warning can also be a protector of the poor, given that the sectors of the economy most vulnerable to disaster are often the poorest.
 - *Social:* effective early warning allows populations at risk to take necessary actions that will reduce the impact on their lives and property. Not having a warning system can have disruptive effects on a society, causing chaos and confusion during as well as in the aftermath of an emergency, including large scale displacement of people, disease outbreaks, disruption of schooling, etc. Early public warning enables speedier disaster recovery than otherwise. Early warning systems also provide citizens with a sense of security and provide order to society.
- 1.19 Furthermore, peoples’ confidence in the government can easily be broken by the mismanagement of a national disaster, starting from the lack of a warning system. This is summed up in the words of former US President Bill Clinton: “Voters don’t choose a President based on how he’ll handle disasters, but if they’re faced with one it quickly becomes the most important issue in their lives.”¹⁴
- 1.20 Early public warning is needed not just for natural hazards, but for acts of war, accidents, health concerns and acts of terrorism.

¹² *The Internet Society Challenge*

¹³ Partnership for Public Warning, *A national strategy for integrated public warning policy and capability* (2003)

¹⁴ Clinton, Bill (2004) p. 428.

- 1.21 Modern technologies allow for a great deal of prediction and forecasting of hazards, and information and communication technologies (ICTs) provide effective means to provide more access to information, faster.¹⁵ But the potential of these technologies cannot be realized without an effective early warning system to effectively mobilize ICTs to convey this information to the potentially affected public.
- 1.22 The examples of cataclysmic human, economic and social loss as a consequence of a lack of an early warning system are numerous; the recent Indian Ocean tsunami in which more than 40,000¹⁶ perished in Sri Lanka *alone*, perhaps being the most striking in recent memory. In sum, *effective* early public warning saves lives, reduces economic loss, reduces trauma and disruption in society and instills confidence and a sense of security in the public.

Importance of Partnerships

- 1.23 An effective early warning system has to reach all the people at risk. While neither the government nor *anyone* can ensure complete protection of citizens from all hazards, whether through prediction or otherwise, it is the core business of government to protect its citizens to the best of its ability.
- 1.24 From an economic standpoint, the very nature of public warning – a classic public good – tells us that the market will not supply it in socially desirable quantities. Governments have traditionally provided such goods.
- 1.25 However, in the Sri Lankan case, and many other developing countries, government action is constrained by numerous competing claims on scarce resources and by capacity and organizational culture problems. Dedicating large amounts of resources for protection against something that may or may not occur in the unspecified future may not seem like a justified priority. Problems of capacity and will¹⁷ must also be taken into account. The government cannot do it alone; all sectors of society need to contribute.
- 1.26 For example, the private sector offers complementary resources and necessary infrastructure (e.g., telecommunications networks) that are needed for disseminating warnings; civil society provides social infrastructure at the grass roots. The use of already existing capacities is not only cost-effective, but ensures the continuity and maintenance of the system during periods where there are no hazard events. The cost to the government of implementing a nation-wide warning system is significantly less when all stakeholders shoulder the costs for maintenance, management and service.
- 1.27 Despite the occurrence of multiple disasters over the past decades,¹⁸ governments have not been able to ensure an adequate supply of early warnings to the people of Sri Lanka. It is doubtful that a conventional government organization, by itself, will provide the kinds of early warnings that are essential for the progress and well being of Sri Lanka. An effective warning system requires the integration of a diversity of complementary methods to reach the public at risk. Infusion of the private sector's performance orientation and the commitment and caring characteristics of civil society organizations would be critical to the efficacy of a government organization.

¹⁵ See Section 2 for further discussion

¹⁶ See Annex10. Casualty figures are problematic in this disaster: See Jay, Adam and agencies, UN alerts staff of Aceh terror threat, 17 January 2005, which states "A previous figure, provided by the National Disaster Management Centre (NDMC), had the death toll at 30,920, and the number of missing at 6,020. But today, the public security ministry said the current toll was 38,195. . . . The NDMC, which is part of the president's office . . . agreed with the final forecast. 'We are expecting the toll to go over 40,000,' said R.M. Jayasinghe, a director at the centre, 'Maybe after about a month, we will have to decide to alter the missing figure and add it to the deaths.'" *Guardian Unlimited*
<http://www.guardian.co.uk/tsunami/story/0,15671,1392306,00.html>

¹⁷ For instance, one month after the disaster, the government was able to provide relief to only 30 per cent of tsunami victims according to Tilak Ranaviraja, Commissioner General of Essential Services, in "Tsunami circus," *Lanka Business Online*, 2 February 2005,
http://www.lankabusinessonline.com/new_full_story.php?subcatcode=10&subcatname=&newscode=313407085.

¹⁸ Fernando, W.B.J. Sri Lanka Country Report, 1999, Asian Disaster Reduction Center,
<http://www.adrc.or.jp/countryreport/LKA/LKAeng99/SriLanka99.htm>

- 1.28 It is also important that there be adequate oversight of the performance of the vital functions associated with an early warning system; this can only be provided when multiple players are involved.
- 1.29 Successful partnerships can be fostered by identifying the key beneficiaries of a warning system, such as the hotel industry and the insurance industry, in addition to the general public. The government can work with such partners in developing and implementing a warning system. The government can provide authority for the system, while the private and civil society sectors provide the mechanisms to get the warning out as fast as possible to all the potentially affected people. There is also an ongoing role that the private sector, especially the media, can play in education and awareness raising. The tasks of education and trust-building at the community level are best done by civil society organizations.
- 1.30 Authority is something that has to come from the government. The government must take the ultimate responsibility for the issuance of a warning. People need assurance that a warning message is legitimate before making the decision to abandon all their possessions and run for their lives. They cannot afford to waste precious minutes verifying warning messages to ensure that they are making the right decision. False alarms cost money, breed cynicism and undermine the credibility of the warning organization.
- 1.31 The participation of all stakeholders at the community level is also crucial in developing a warning system. Community-level organizations and existing structures and systems can be integrated into the national warning system, to ensure the warning gets across the very last mile (for e.g., through the use of temple or church bells, or public announcement systems, etc.). Community-level organizations can also play a major and highly effective role in awareness-raising. Participation at this level generates buy-in and can also contribute to the continuity of the system. Community-based models in Bangladesh, Nepal and Pakistan have demonstrated this.
- 1.32 Partnership with other regional and global warning systems is a must. Global hazard information must be available to Sri Lanka, and Sri Lanka must make optimal use of what is available, National tsunami and cyclone detection systems make no sense. The key to saving lives from both these hazards is advance warning: in the case of tsunamis, that can only be based on the informed judgments of the best qualified scientists based on data from detection and monitoring equipment located in the Indian Ocean region, the further away from Sri Lanka the better; in the case of cyclones, the critical equipment is located on satellites. These hazard detection and monitoring systems must necessarily function at the regional or international level.
- 1.33 A further point to note is that in order for a public warning system to work to its fullest potential, in addition to the technology, the communication structures, the planning and the education, the people who will be ultimately affected by the impending hazard event have to be receptive to the warning. It was stated by several persons during the consultation process that in Sri Lanka, people do not take seriously the little public warning that exists (e.g., weather reports from the Meteorology Department). This points to the importance of raising awareness among the people and restoring or building credibility among warning organizations.

Key Points

- **The objective of public warning is to prevent a hazard from becoming a disaster by empowering individuals, organizations and communities to make decisions on actions to reduce losses from hazards.**
- **Warning is a critical part of a larger comprehensive *risk management system*, involving the detection and assessment of a hazard, and effective communication of this information to the vulnerable population so that they may take appropriate action.**
- **In an ‘all-hazards’ approach, the detection stage will be different for each type of hazard, but the system to convey an alert or warning to the vulnerable population (i.e., the early warning system) is the same. This is enabled by agreement on the content of messages across hazard types given in the international standard Common Alerting Protocol (CAP)¹⁹. An all-hazards approach is more cost-effective and also will ensure regular maintenance of the system through more frequent use; additionally from the warning recipients’ point of view, will be easier understood through more routine use.**
- **An early warning system for all hazards must have seamless connections with all detection sources –national and international– including the public who can be an important source of information (which NEWS:SL can then promptly verify) especially with respect to localized hazards.**
- **Early warning is crucial for humanitarian, economic and social reasons, ensuring long term stability and confidence in society and can reinforce sustainable development efforts.**
- **Public safety is the core business of government but partnerships with the private sector and civil society can provide access to a larger pool of resources and pre-existing infrastructure, reducing the cost burden on government.**
- **An effective warning system requires the integration of a diversity of complementary methods to reach the public at risk.**
- **Successful partnerships can be fostered by identifying the key beneficiaries of a warning system. Community involvement can greatly enhance the efficacy of the system, especially in education and awareness raising.**
- **Partnership with global and regional detection organizations is needed.**
- **In order for public early warning to be most effective, people must be receptive to it, and take it seriously.**

¹⁹ New insertion, 17 March 2005; see background for details

Section II: Parameters of a National Early Warning System

- 2.1 Warning systems typically involve the installation of a range of instruments and technologies to ensure early detection and monitoring of hazards. They also involve scientific and organizational structures for analyzing the collected data to determine the extent of associated risk exposure, probable impacts, and processes for notifying those at risk in a timely fashion. For tsunamis, these arrangements include the installation of a network of seismometers, sea level gauges and deep sea sensors that provide around-the-clock, real-time data for detecting earthquakes and ocean water movements. Scientists use this data to predict the possibility of tsunami waves and to model their anticipated arrival times and on-shore impacts. Advanced telecommunications networks enable this data to be shared worldwide almost instantaneously and warnings to be transmitted to designated national warning authorities. It is the responsibility of the national authority to determine whether or not to issue a warning, tailor the content of the warning, target those at risk and disseminate the warning message(s).
- 2.2 While advances in science and technology have expanded the possibilities of anticipating the effects of hazards, the actual design and operation of detection and monitoring system components may vary to account for unique characteristics of different hazards. Even with sophisticated technologies, it is often beyond the means of a country to detect and monitor all hazards. Many hazard warnings, in fact, are triggered by affected local residents alerting families, neighbors and local officials.
- 2.3 Regardless of system design, a common goal of all warning systems is to prevent hazard events from becoming disasters. However, it remains a challenge to ensure that warnings can be accessible to, understood by, and acted upon by local communities and the people most directly affected by threats.
- 2.4 In this way, warning must be viewed not simply as a technology, but rather as a unified system constituted by five critical and inter-related elements:
- Hazard identification, risk assessment and vulnerability analysis
 - Detection and monitoring
 - Emergency management structure
 - Local dissemination
 - Public education

Further, in addition to warning the public, an effective warning system also must provide information about how to prevent and protect against disasters and information and knowledge to aid timely relief, recovery and rehabilitation efforts.

- 2.5 For public warning to be effective various pre-requisites first must be in place, including:
- Planning. Before hazard events occur, the appropriate authorities must develop plans and procedures for when and how warnings will be issued.
 - Education. The public must be educated about the nature of hazards and their effects, who and what is at risk, how people will be warned, what the warnings mean and what actions must be taken.
 - Testing and Assessment. Warning systems must be tested regularly, both to ensure that the system works and that the public understands its purpose and messages.

Taking this a step further, an effective warning system must be viewed as an element of international, national and local strategies and programs for ongoing disaster reduction, supported by appropriate legislation and linked to appropriate institutional focal points.

Best practices in the design of warning systems

- 2.6 International best practices reveal a series of key principles that underpin the design of effective warning systems that include:
- 2.6.1 **Relevance.** Relevance is achieved through ongoing education of the public in order to establish a continuous “presence of mind” related to risk and response to warnings.
 - 2.6.2 **Timing.** There are appropriate windows of opportunity to capture the attention of people in order to encourage appropriate action. In the case of quick-onset hazards – such as a locally generated landslide – warning information must be provided well in advance through an education strategy that informs those potentially at risk how to respond to warning signs in the natural environment (e.g., heavy rainfall, earthquake, shifting landscape, etc.). In the case of slow-onset hazards, such as a teletsunami, timing considerations will vary according on the specific community and local response requirements.
 - 2.6.3 **Redundancy.** Redundancy refers to the delivery of warning messages across a variety of technological systems, such that messages are more likely to reach people according to their activities, be they indoor or outdoor, overnight or during the day.
 - 2.6.4 **Clarity.** Clarity is needed in two dimensions. The first is the need for warning messages to clearly convey key pieces of information: the type of hazard, its probability, affected areas, estimated time of occurrence, and instructions for further action. Information may consist of a variety of visual or auditory symbols (both text and non-verbal forms) that are organized in a logical and coherent structure. Clarity also includes the need in some instances to issue warnings that can be understood by many different people across a range of diverse communities, including transient and seasonal populations. Language and cultural barriers are primary considerations.
 - 2.6.5 **Credibility.** Credibility refers to recognition and acceptance of the source of the warning message. A high degree of credibility must attach to the organization that has detected the hazard, the organizations that are conveying the message, and trust in the information about the hazard that is being conveyed, including any instructions for a proactive response. Contradictory messages or misinformation may threaten credibility in both the short and long terms but best practices indicate that unwarranted withholding of information is equally problematic.
 - 2.6.6 **Action-oriented.** The final principle of designing effective warnings is that they should be action-oriented. This means that warnings must alert and provide follow-up information and instructions for a proactive response. A well-designed warning will clearly alert a local population to the hazard and provide for clear instructions on what measures must be taken and under what circumstances. This response orientation also includes an emphasis on all-clear notifications, which may be of significance for tsunami hazards when multiple waves often occur over several hours.

Any system is only as effective as its weakest link

- 2.7 Despite best efforts to design effective warning systems, most systems can fail for any one or more technical and non-technical reasons, including:
- a failure of detecting or forecasting a hazard in time or space;
 - ignorance of prevailing conditions of vulnerability determined by physical, social or economic factors;
 - a failure of the warning system infrastructure;
 - a failure to communicate the threat accurately or in sufficient time;

- a failure of the warned population to understand the message, to believe it or to take suitable action
 - Constrained capacity to respond.
- 2.8 Adequate human, material and technical resources are needed therefore to establish and operate warning systems properly. The temptation to focus on improving the technical identification, detection and modeling of hazards without expanding and enhancing the capabilities and procedures for warning, response management and education is common. Without such improvements, communication from detection agencies to warning authorities to vulnerable communities will remain as the weakest links in the overall warning system.
- 2.9 When reviewing Sri Lanka's tsunami tragedy, these deficiencies become very apparent. Telecommunications and electronic broadcasting systems were available in many areas of the country that could have transmitted warning information in advance of the tsunami waves. These were not used because the institutional arrangements (organizational systems, agreements, protocols) necessary to transmit such messages to emergency authorities and local residents were not in place. Even without a formal system in place, had authorities on one coast communicated the ongoing events to national authorities, many lives on the other coast may have been saved.²⁰

Toward an Integrated All-Hazards Approach to Public Warning

- 2.10 Throughout the Indian Ocean Region much attention is now being paid to the need for advanced warning systems. The need for such capabilities, however, extends beyond tsunamis and is equally important in the contexts of many other hazards such as cyclones, floods and even pandemics.
- 2.11 As countries move forward to develop a new tsunami warning system, they must ensure that such efforts are carefully matched with existing regional and national warning capacities in order to enable interoperability with other warning systems and ensure social and cultural relevance. For instance, international coordination on implementing CAP for all hazards is an essential step toward broad-scale interoperability.²¹
- 2.12 At the domestic level, the great temptation is to invest in an autonomous, special purpose tsunami public warning dissemination network as the Geological Society of India president points out:
- "Seismologists in this country [India] seem to be more worried about impressing the government on the need for massive grants to establish an early tsunami warning system, instead of strengthening the existing systems to warn the public of impending disasters,"²²*
- This temptation should be resisted. Instead, all new and existing warning systems should be incorporated into a single national multi-hazard warning system that is likely to be more effective and sustainable because it will be central to daily life.
- 2.13 For warnings to be available for all Sri Lankans at risk, no matter what they are doing or where they are at any time of day or night, the warning capability must be ubiquitous and accessible. Obviously, no single method will reach all people and an infrastructure is needed to integrate and support multiple methods and channels to disseminate messages as well as educational material. The government cannot provide this on its own. While the warnings may be issued by government mandated authorities, the means to disseminate the warnings are dependent upon private network infrastructures and human resources. Consequently, to ensure universal access to warnings, public/private partnerships are required to develop the

²⁰ See Annex 6: Timeline of Events

²¹ New insertion, 17 March 2005; see background for details

²² *Geologists Take Moral Onus*, Times of India, 1 March 2005, <http://timesofindia.indiatimes.com/articleshow/msid-1036899.curpg-1.cms> Note: The report erroneously states that B P Radhakrishna is the President of the Geological Survey of India

policies for and implementation of a national warning system that leverages and integrates the nation's existing and emerging networking capabilities.

Role of Information and Communications Technology

2.14 The industry and government wide participatory process that led to the Final Report of the Pilot Study on the Use of Telecommunications in Disaster and Emergency Situations in Sri Lanka of January 1999²³ provides a good starting point. The recommendations included:

- Automatic load shedding/filtering system to be considered, with strict adherence to an 80% switch loading level to be mandated by the Telecom Regulatory Commission (TRC).
- A general call prioritization scheme to be studied for implementation across all networks.
- Consideration of a dedicated network for emergency service providers.
- Harnessing the radio amateurs.
- Implementation of free short codes for emergency service access.
- Clarification of the operators' emergency obligations by the TRC.
- The Commission to establish a 24-hour access number for use by telecom operators and disaster management personnel.
- A universal emergency short code to be established.
- The TRC to prepare its own disaster management plan and then require all licensed operators to submit their disaster management plans.
- Preparation of emergency telecom kits by all operators.
- Issuance of special identity cards to designated telecom service personnel to facilitate emergency applications and service restoration
- Prior identification of suitable sites for temporary base stations and other emergency telecom facilities.

In addition, there may be value in looking at the potential of Short Message Service (SMS), cell broadcast and other telecom applications that were not in broad use when the TRC Report was written.

2.15 The key action would be a meeting or a series of meetings of technical personnel from the facilities-based telecom licensees, at which a comprehensive assessment of the industry's performance in the pre-disaster and post-disaster phases will be undertaken. It is understood that such post-situation analyses have taken place at certain companies; the next and important step is a multi-company meeting because the telecom system in Sri Lanka is a network of networks. Ideally this would be convened and chaired by the Telecom Regulatory Commission. Alternatively, the post-situation analysis can be an industry-led.

2.16 If the people themselves are seen as a source of hazard information, it is important that NEWS:SL be designed in a manner that allows for the reception of large numbers of messages and their assessment. Short numbers such as 118 and 119 are critical to this. Ideally, the public would be given one number to call regarding all emergencies, with the receiving entity (an advanced IT based 24/7, 365/year day call center) channeling the information to the correct agencies. It appears that Sri Lanka has quickly gone from a no-short-numbers country to a too-many-short-numbers country. It is advisable that the Telecom Regulatory Commission reviews the assignment of short numbers in association with the

²³ Pilot Study on the Use of Telecommunications in Disaster and Emergency Situations in Sri Lanka (January 1999) Telecommunications Regulatory Commission of Sri Lanka (hardcopy available with LIRNEasia); interim report available at <http://www.reliefweb.int/telecoms/tampere/slcs.html>

relevant agencies to rationalize it. The consultancy report on an emergency calling center that was completed in 1999 would be a good starting point²⁴.

- 2.17 Emergency call centers must be dimensioned to allow for the handling of peaks in calling, both in terms of staff and phone lines. This is another to rationalize the multiple call centers that appear to have been created in association with the Operations Centers that appear to be associated with the Presidential Secretariat, the Prime Minister's Office, the Ministry of Defense, the Ministry of Public Security, Law and Order (119), the Police (118), and each of the three armed services. It is doubtful that all these centers are properly dimensioned and staffed to handle peak volumes and function on a 24/7 basis.
- 2.18 A process to design SMS, e-mail, web and other forms of communication by which the public can effectively communicate with emergency-response authorities and NEWS:SL should be initiated in parallel with the above activities.
- 2.19 It must be noted that the low-levels of telecom access in Sri Lanka and the especially weak penetration outside the Western, Central, Northwestern and Southern (excluding Hambantota District) Provinces shown by the figure below, pose a serious constraint to citizen participation in communicating hazard information. According to the latest survey data only 23.9 per cent of Sri Lankan households have some form of access to telecommunications, fixed or mobile.²⁵ The eSri Lanka Initiative funded by the World Bank to the level of USD 53 million and in particular the Regional Telecom Networks program within it,²⁶ may help alleviate the problem by extending the backbone networks to areas that are subject to chronic congestion and by qualitatively increasing access to ICTs, including plain voice telephony.²⁷

²⁴ Study on the Feasibility of Establishing a Public Access Emergency System in Sri Lanka (October 1999) Telecommunications Regulatory Commission of Sri Lanka

²⁵ Central Bank of Sri Lanka, Annual Report 2003, p. 20.

²⁶ <http://www.icta.lk/Insidepages/ProcurementNotices/Procurement170205.asp>

²⁷ For details, see Samarajiva, R. [Getting from dysfunctional government to effective government: Mapping a path in Sri Lanka](#), *International Journal of Regulation & Governance*, 4(2), 2004: 171-85.

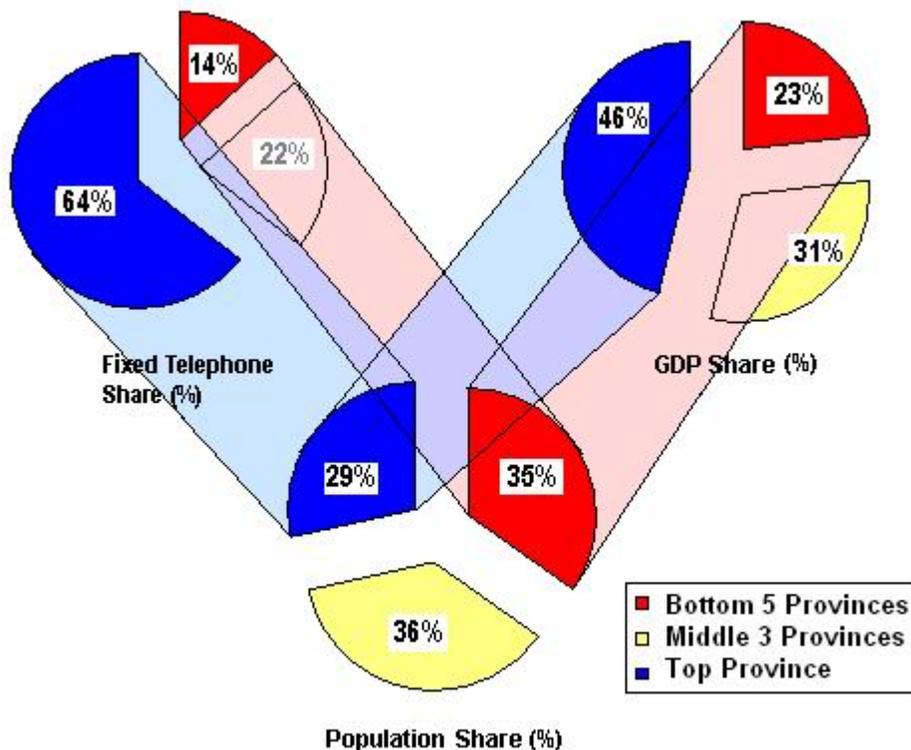


Figure 2.1 : Provincial disparities in telecommunication access in Sri Lanka

Source: TRCSL data, 2003

2.20 The modes of receiving hazard information from the general public can also be used to obtain hazard information from the private sector and from civil society organizations. For example, Sarvodaya is a comprehensive social action organization which has disaster management as one of its 11 priority action areas. It has a well-established nationwide network covering 15,000 villages, 345 divisional units, and 34 district offices.²⁸ All these locations can serve as sources of hazard information for a National Early Warning System. In the same way that the superintendents of tea and rubber estates served important disaster preparedness and management functions in the old days, the now more disaster-aware tourist industry can organize itself to perform functions related to hazard detection as well as warning dissemination, using its widespread presence and communication-equipped vehicle fleets.

2.21 The government organizations that are located throughout the country are a source of hazard information. For example, in each of the 37 police districts in Sri Lanka, there is a 24/7, 365 days/year operations room staffed by an officer of Inspector rank or above. These operations rooms are connected to the Command Center of the Inspector General of Police, which is staffed under the command of an officer of Assistant Superintendent of Police or above again on a 24/7, 365 days/year basis. These centers are connected on a stand-alone, high-security police communications network that is invulnerable to hazard-induced congestion. The government should conduct an internal survey of its offices that function on a 24/7, 365 days/year basis and which may have potential as nodes of a hazard-detection system. It should also conduct a survey of the various stand-alone or leased-line based communications networks operated by government organizations such as the Ceylon

²⁸ <http://www.sarvodaya.org/blog/tsunami-to-deshodaya/about-sarvodaya/>

Electricity Board, the Sri Lanka Ports Authority, and the Railways Department. Based on this information it may be possible to create a hazard detection and warning network that could usefully be connected to the National Early Warning System.

- 2.22 Given the increasing importance of the Internet as a source of information, it may be useful for NEWS:SL to also engage in web scraping: the automated searching of the Internet for information that could be used as leads for, or as corroboration for, hazard information. The use of news reports from Sri Lanka received by the Pacific Tsunami Warning Center to conclude that a tsunami was actually raging across the Indian Ocean is an example.
- 2.23 While information from non-expert sources is valuable, it cannot be used without verification and confirmation. Mechanisms ranging from simple tracking message origination locations to more complex ones such as natural-language processing may be used to extract useful information from the incoming messages quickly. The core of course has to be the application of expert judgment and the correlation of citizen information to other data.
- 2.24 The role of the TV and radio broadcast industry is crucial in any hazard warning system. According to the latest survey data 75 per cent of Sri Lankan households 73.9 per cent have electricity; 77.2 per cent have a radio; and 68.2 per cent have a TV set.²⁹ In the largest single natural disaster that Sri Lanka experienced prior to the 2004 tsunami, the two cyclones of 1978, very effective use was made of radio. Casualties from the cyclone that actually hit the East Coast amounted to only 915 despite 250,000 families being displaced by the wind and massive tidal surges. The difference between 1978 and 2005 is the proliferation of media outlets. At that time the only electronic medium that was available in Sri Lanka was radio broadcasting. The government monopolized radio broadcasting, offering a total of six channels in three languages, all of which got their news from a single news room. The situation is much more complex now, with a plethora of channels available to the viewers and listeners. Effective use of electronic broadcasting for hazard management purposes will require a significant amount of prior coordination and preparation, ranging from the establishment of reliable communication channels between NEWS:SL and the broadcast stations, to the education of media personnel.
- 2.25 It is rarely that hazards affect all the citizens of a country. For example, even with the tsunami, which was by far the largest disaster in Sri Lankan history, only those persons living or traveling through a half-kilometer strip around the country required warnings. It is generally accepted that the communication of public warning is most effective when it is targeted to the potentially affected populations. The BBC-based centralized broadcasting model that rests on the retransmission of centrally produced content throughout the country that has been adopted in Sri Lanka is not conducive to the dissemination of this kind of targeted communication. Urgent consideration should be given to upgrading at least some of the retransmission networks to enable remote access to individual transmitters and/or to enacting legislation to enable the licensing of true community, low-power broadcasting stations for this purpose.
- 2.26 The broadcasting industry in Sri Lanka operates in a rudimentary legal and regulatory environment. The issuance of “licenses” is opaque and arbitrary. The “licenses” are makeshift documents without term and conditions, including any specific conditions requiring the broadcast of emergency messages. While it is likely that all the broadcasters would cooperate in the establishment of a national emergency broadcast system, it would be best if the legal and regulatory system is clarified and regularized as quickly as possible.
- 2.27 The possibilities of remotely activating radio receivers and television sets in the event of a disaster must be explored. In light of these capabilities being available in Japan and the predominance of Japanese branded TV sets in Sri Lanka, the possibilities of low-cost implementation are high.
- 2.28 Multiple redundant means of communication must be used for the dissemination of public warnings. This means that mobile operators should be encouraged to make the wider use of cell broadcasts technically feasible.

²⁹ Central Bank of Sri Lanka, Annual Report 2003, p. 20.

- 2.29 Sri Lanka Telecom Limited, which has historically provided telephone connections to a large number of religious establishments, may be encouraged to explore the possibilities of creating a virtual network capable of disseminating emergency messages to temples, mosques and churches. If this is undertaken as corporate social responsibility project by SLTL, others may be encouraged to provide the necessary training to enable the activation of bells, loud speakers and other local means of warning dissemination from the religious establishments.
- 2.30 It may be worthwhile to explore the possibilities of using non-public and nationwide communication networks such as those operated by the Ceylon Electricity Board in conjunction with WiFi based local access systems to activate sirens and otherwise disseminate public warnings.
- 2.31 Any use of the facilities of private communication systems for the purpose of disseminating public warnings carries the risk that the warnings may be inaccurate, that they may be tardy, ambiguous, or otherwise faulty. This would open up these private parties to the risk of litigation, or at least public opprobrium.³⁰ While the latter may be seen as a natural means of accountability, it would behoove the government to enact legislation providing indemnification to public-warning actions undertaken in good faith by private-sector firms.

³⁰ It is common in US legislation to insert a specific “good Samaritan” clause to shield from liability a third party who takes certain specified actions in good faith. See for example: http://www.soumu.go.jp/joho_tsusin/policyreports/english/group/telecommunications/rules_report2_e.html

Key Points

- **Early warning systems consist of instruments to detect and monitor hazards, scientific and organizational structures for analyzing the collected data and a national authority to assess the input from the scientific community and to determine whether to issue a warning and disseminate warning messages.**
- **The warning system is not simply a technology but rather a unified system constituting hazard detection and assessment, emergency management structure, local dissemination and public education.**
- **For public warning to be fully effective a number of pre-requisites need to be in place, including planning of when and how warnings will be issued, education of the public on the nature of hazard and what the warnings mean and finally a regular testing of the warning system to ensure it works and public understand warning messages.**
- **The key principles of an effective warning system are relevance, timing, redundancy, clarity, credibility; messages emanating from a warning system should be action-oriented.**
- **Any warning system is only as effective as its weakest link. Although telecommunications and electronic broadcasting technology were widely available in Sri Lanka at the time of the 2004 tsunami, the lack of institutional arrangements meant that warning messages were not transmitted to emergency authorities and local residents.**
- **In order to ensure universal access to warnings, public/private partnerships are required to develop the policies for, and implementation of, a national warning system that leverages and integrates the nation's existing and emerging networking capabilities.**
- **Past study by the Telecom Regulatory Commission on the use of telecommunications in disaster and emergency situation could form the basis for defining the role of Information and Communications Technology (ICT) in a national emergency warning system.**
- **In order to be able to receive and act on hazard information provided by the public, it is necessary to rationalize use of short numbers (e.g., 118/119), dimension emergency call centers to handle large call volumes, and integrate communication technologies such as web broadcasts, SMS, and e-mail into an early warning system.**
- **Civil society organizations and private sector groups that have a national presence can function as sources of hazard information and also play a role in warning dissemination.**
- **Government organizations that are located throughout the country and operate on a 24/7, 365 days/year basis and have reliable communication networks, like the police department, can be integral to a hazard detection and warning network connected to NEWS:SL.**
- **The radio and TV broadcast industry will play a crucial role in any hazard warning system since they reach 77% and 68% of the population, respectively. However, it would require prior coordination and preparation, ranging from the establishment of reliable communication channels between NEWS:SL and the broadcast stations, to the education of media personnel.**
- **Private sector firms using their communication networks for disseminating hazard warnings must be indemnified from risk of litigation for actions taken in good faith.**

Section III: Governance and Implementation³¹

- 3.1 Public warning is a unified system not merely a technology³². It constitutes the detection and risk assessment of a hazard, vulnerability analysis of the target population to whom the warning needs to be directed, and the communication of timely, credible, and unambiguous information on an impending threat to designated respondents (such as the emergency services, district administrative authorities, community level organizations, telecommunications operators, broadcasting services, hotel groups, etc.)
- 3.2 The lack of a unified and streamlined all-hazards early warning system cost Sri Lanka one in every 500 of its citizens and affected one in twenty families in the Indian Ocean tsunami of December 26, 2004.
- 3.3 Ensuring the safety of its citizens is the core business of government. In accordance with standard economic principles, an all-hazards early warning system is a public good that is both non-rivalrous (consumption by one economic agent does not prevent consumption by another) and non-excludable (a user cannot be excluded from consuming the good without significant effort) in nature. Given these characteristics and the related “free-rider” syndrome, pure public goods will not be supplied by the market. Goods with significant public-goods-characteristics tend to be undersupplied.
- 3.4. The two classic solutions to the problem of funding the supply of public goods are taxation and the bundling of a public good with a private good. In the former case, the government may itself supply the public good or it may pay a non-governmental entity to supply the public good. (e.g. the contracting out of garbage collection in the Colombo Municipality to private firms, the operation of the cyclone warning system by the Red Crescent Society in Bangladesh) .In the latter case, a market-based supplier may supply the public good (e.g., a port operates the adjacent lighthouse and covers its costs from port charges). The workability and the pros and cons of these different modes of supply are closely linked to the degree of the “public good” element in the activity and the prevalent governance values and culture. This section presents the options of government supply through public private partnership as Plan A, Plan A Variant and the option of private supply as Plan B. Plan A includes two options within it.

Plan A: Government supply of early warnings

- 3.5. Given that all citizens and residents benefit from public warnings, irrespective of their income category, warnings are a classic candidate for financing through taxation. Whilst this option does not necessarily require direct government supply, the principal-agent problem of ensuring that the private supplier (agent) executes the wishes of the government (principal) is quite difficult in the case of supplying hazard warnings, where spikes of intense action will interrupt long periods of inactivity. The response to these problems is the internalization of the principal-agent problem, whereby the government directly supplies the service.³³ In addition, the consequences of warnings (e.g., unnecessary evacuations can have tremendous costs socially as well as individually) are such that citizens require them to be issued with the imprimatur of the state. Therefore, in most if not all countries, government directly supplies hazard warnings.

³¹ This section is authored by Rohan Samarajiva and Malathy Knight-John.

³² “In fact, technology is perhaps the easiest part of the solution. The challenge is to structure the available technological components beneath an umbrella of public/private sector cooperation and coordination and with policies and procedures in place to ensure rapid and effective operation of the system. Partnership for Public Warning, *A national strategy for integrated public warning policy and capability*, 16 May 2003, p. 4. <http://www.partnershipforpublicwarning.org/ppw/docs/nationalstrategyfinal.pdf>

³³ The internalization of the principal-agent problem does not eliminate it; it simply converts it into a different form.

- 3.6 In countries with well-endowed and efficient governments, the direct supply of hazard warnings by government is effective. Periodically, there may be concerns about quality and cost, but overall the government manages the internalized principal-agent problem and ensures that effective hazard warnings are produced by its employees. Sri Lanka failed in this regard as evidenced by the total lack of warning on December 26,, 2004, even when the Naval Base in Trincomalee experienced the tsunami effects more than 30 minutes prior to it hitting the western coastal belt,³⁴ In the polite terminology of the international donor agencies, “the early warning system needs to be strengthened in the light of recent disaster experiences.”³⁵ Previous experience with floods and other hazards further supports this conclusion.³⁶
- 3.7 As such, a proposal that early warnings be directly supplied by the government has to include design elements and safeguards that would ensure high levels of performance. One model would be that of the Public Utilities Commission of Sri Lanka (PUCSL) that has already been adopted and enacted by government.³⁷ An adequate model would have to include provisions for:
- Deployment of proper expertise and equipment;
 - Adequate levels of funding;
 - Insulation from day-to-day political interference and resilience to regime change;
 - Accountability and transparency; and.
 - Slotting in of multiple hazard risk management systems in a modular fashion

Figure 3.1 below depicts an institutional design option (based on the PUCSL template) for an all-hazards early warning system.

³⁴ See Annex 7: Timeline of events. In an interview with Ranjith Ananda Jayasinghe in the *Lankadeepa* (Sinhala daily) of 26 January 2005, Mr.Lalith Weeratunge, Secretary to the Prime Minister and senior civil servant in charge of the immediate response to the tsunami, conceded that more could have been done with the information on the sea coming into shore on the East Coast.

³⁵ Asian Development Bank, Japan Bank for International Cooperation and World Bank, Sri Lanka 2005 post-tsunami recovery program: Preliminary damage and needs assessment, Annex 15, paragraph 11 (February 2005).

³⁶ E.g., Champika Liyanaarachchi, “Disaster management: Preventive side nil,” *Daily Mirror*, 21 May 2003.

At:
<http://www.dailymirror.lk/2003/05/21/opinion/1.html>

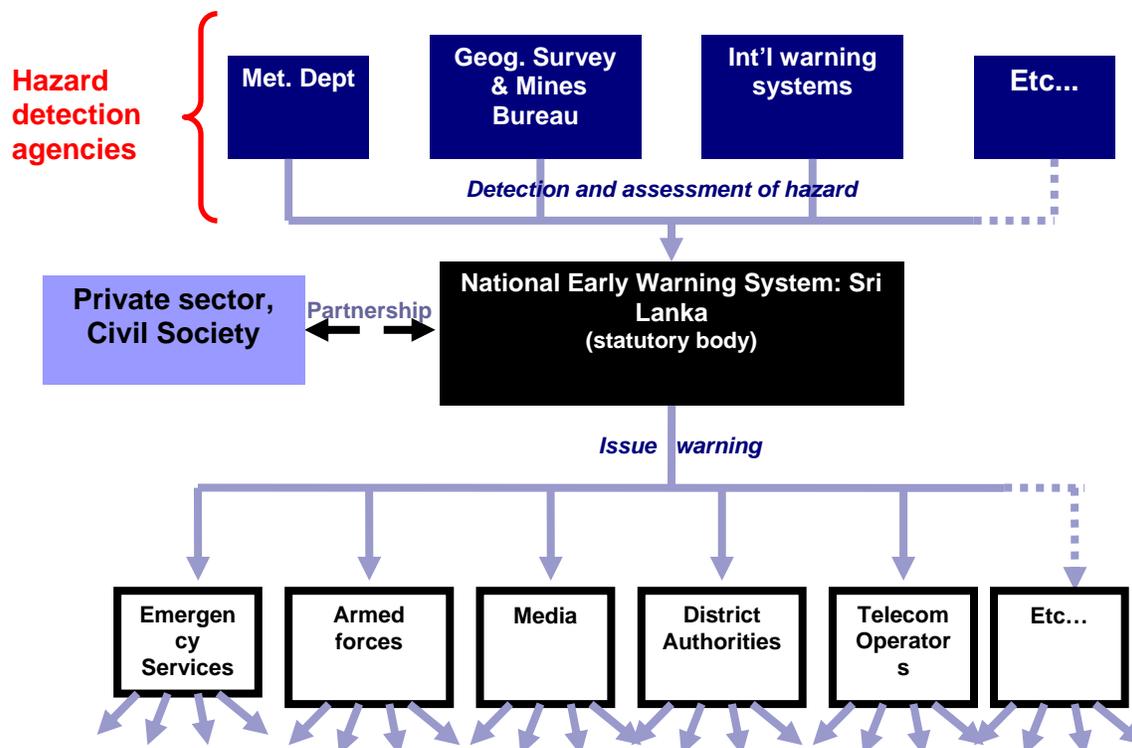


Figure 3.1 Institutional design option for government provision of early warning

- 3.7.1. **Access to Data:** An effective all-hazards early warning system would require access to timely and accurate hazards data (e.g., readings from seismographs and tide gauges). In some cases, this would require the acquisition and maintenance of equipment by the organization managing the system, including the periodic upgrading of the equipment as technology advances. In other cases, it would require the means to obtain hazard data from regional or international entities such as the World Meteorological Organization, namely the ability to enter into agreements with these entities and access to robust telecommunications links.
- 3.7.2. **Professionalism:** Most importantly, the warning center would require expert personnel who can interpret the data because in almost all cases the likelihood of a hazard is not perfectly foretold by the data; professionals must exercise judgment on the basis of incomplete information in order to generate timely warnings. The essential requirements are adequate and predictable funding and the existence of an environment conducive to the exercise of professional judgment. In the case of Sri Lanka, this means the ability to pay the expert personnel at market rates (likely to be higher than those of government employees), to procure equipment and services without undue delay, and a degree of insulation from the vagaries of budgetary allocations. Because differential compensation schemes create friction, it would also be necessary to insulate the organization from the rest of government. This necessitates an independent early warning agency.
- 3.7.3. **Funding:** If the funds do not come from the general budget and the Parliamentary appropriations process, they will have to come from some form of levy. While it is tempting to identify a few industries such as tourism and insurance that most directly benefit from the existence of a credible and effective National Early Warning System and to impose levies upon them for funding the supply of warnings, this option has significant negatives associated with it. It is preferable for the funds to be drawn from multiple sources such as industries that have the greatest incentive to prevent a hazard from becoming a disaster, from government and from donor agencies.

- 3.7.4 **Independence:** As in the case of the PUCSL, this would require a strong statute that provides for the appointment of the key decision makers by the Constitutional Council. Generally, it may be advisable to have a collegial decision making body, with a majority of members from the private and civil society sectors, for the overall functioning of the center. Warning-related functions should be delegated to a single person for quick action and accountability. It may also be useful to specify the qualifications of the key decision makers in the statute itself and prescribe staggered appointments to ensure bipartisanship and resilience to government change.
- 3.7.5 **Organizational Transparency and Accountability:** Freedom from political oversight and government rules may lead to abuse. Therefore, it is essential that the above freedoms be balanced by significant safeguards in terms of transparency and accountability. For example, it must be possible to remove the key decision makers for specified and proved misconduct. The financial and procurement activities of the Center must be more transparent than in a conventional government department. There must be significant accountability requirements, not only with regard to finances but also with regard to performance.
- 3.7.6 **Performance Accountability:** The question of performance accountability requires special attention. Hazard warnings are often based on incomplete information and judgment. If the warnings are issued too hastily, considerable costs in terms of evacuations, looting, etc. will be incurred and the populace will resist responding to future warnings. If warnings are not issued in a timely manner, there can be massive losses to lives and property. In many societies, the final decisions on warnings and especially on evacuations are taken by political authorities, who can be held accountable through the ballot box. They, of course, take these decisions on the basis of independent and professional advice of experts. In Mauritius, the professional heading the warning agency makes the final call. Different options need to be considered taking into account Sri Lanka's political and administrative environment.
- 3.8 If Plan A is implemented and government supplies early warnings, it is important that adequate attention be paid to the internal organizational structure of this national early warning center. It may be necessary to stipulate certain internal organizational design elements even in the enabling statute, for example requiring cross-functional task teams that would facilitate a lean entity, publication of procedures and manuals within set periods, etc.³⁸
- 3.9 If the government upon consideration does not wish to create a new agency that is solely focused on warning, in addition to the current hazard detection agencies such as the Department of Meteorology, it may wish to consolidate the hazard-warning experts of the existing organizations along with disaster communication experts in a new entity (figure 3.2 below). Because the current organizations have several other functions (e.g., the functions of the Geological Survey and Mines Bureau of Sri Lanka are almost all oriented to commercial activity and not to hazard detection³⁹) and have personnel configurations that may not be optimal for a modern, performance-oriented organization, it may be advisable to build the new entity as a greenfield organization, taking only the most qualified and motivated personnel from the old organizations, preferably based on open competition.

³⁸ Precedent exists in the Public Utilities Commission Act, No. 35 of 2002.

³⁹ <http://www.gsmb.slt.lk/>

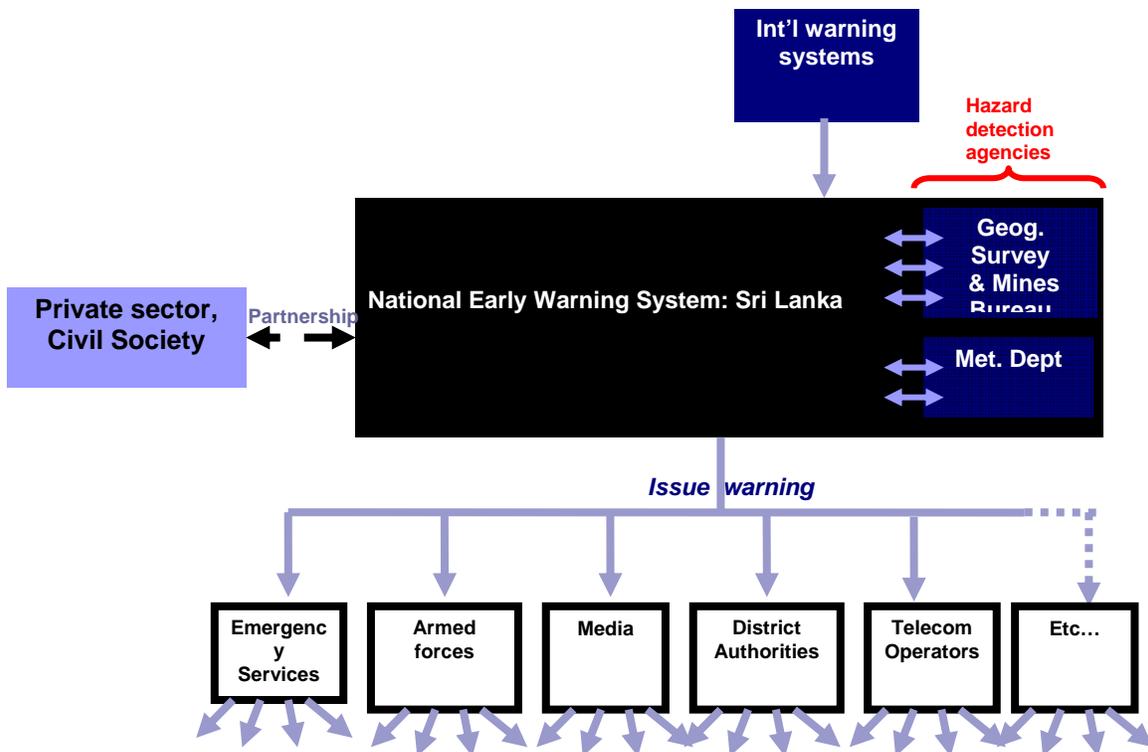


Figure 3.2 Alternative institutional design for government provision of early warning

3.10 A variant of Plan A meshes government involvement in terms of supply of national weather information and some contribution to funding with community based awareness programs has been successfully used by the Bangladesh Red Crescent Society to operate a cyclone warning system. The key to the success of this model is that the community based entity be viewed as credible and capable of issuing authentic warnings – based on a network of trust established at the community level. It is possible for such a model to be implemented in Sri Lanka, with an entity such as Sarvodaya that has widespread and long-standing national geographical coverage (See Annex 8) coming in as the “grass roots” partner. In this model, the government would be the principal and the civil society organization the agent. The relationship would have to be governed by a formal legal instrument, either legislation or regulations made under a statute, to govern the nature and extent of the delegation and accountability.

Plan B: Non-governmental supply of warnings

3.11 The above discussion has demonstrated the necessity, but also the difficulties of ensuring the efficacy and efficiency, of a public warning system operated entirely by government in Sri Lanka. The alternatives are non-governmental supply or public-private partnerships – a variant of which is discussed in Section 3.10. Non-governmental supply of warning would have to be bundled with a private good. However, unlike in the case of a government-led initiative which lends itself readily to an all-hazards approach, a non-governmental supply of warnings is likely to be partial in nature, reflecting the incentive structures of the particular interest group/entity affected by a hazard or disaster.

- 3.12. A case in point is that of the tourism industry that may take upon itself the responsibility of establishing a credible warning system for the benefit of its guests, employees and immediate neighbors funded through a levy or simply the bundling of “free” warning services with priced tourism services. Such a warning system is likely to focus on the particular hazards that threaten particular hotels. So, for example, the beach hotels may collaborate on cyclone and tsunami warnings, while those in the interior may focus on floods and landslides. Such a system will of course not have nationwide coverage.
- 3.13 Given the insurance industry’s inherent incentives to reduce the loss of life, and limit injury and minimization of property losses, it is perceived as a possible candidate to contribute towards the operation of a national public warning system. Whilst its incentive structures may cause the over supply of warnings, this bias is likely to be corrected by the consequences of false warnings: a lowered response rate from the public. What is more problematic in this regard however, is the very low percentage of Sri Lankans who are insured, even relative to countries such as India. As such, the industry may hesitate, justifiably, from imposing the costs of supplying warnings that benefit the entire population to a miniscule minority who insure themselves and their property.
- 3.14 In the unlikely event that the private sector does take on the task of supplying nation-wide all-hazard warnings, the government will still have to enable that activity by:
- Allowing the private sector entity to obtain hazard data from international and regional inter-governmental organizations such as the World Meteorological Organization and a future Indian Ocean Tsunami Warning Center
 - Enacting indemnifying umbrella legislation for actions taken in good faith by the private-sector warning center. This would be modeled on the “Good Samaritan” clause that is found in US law (e.g., Communications Act of 1996). This clause applies to actions taken by private parties who have not been formally delegated government functions. Indemnification protects private entities that take altruistic actions in good faith from claims for compensation. Acts falling outside the scope of good faith and negligence would not be covered by indemnity.
- 3.15 Again, however, given the procedural delays in getting legislation approved it may be prudent - at least in the interim period - to go for a partnership where industries that benefit from an effective public warning system and grass-roots entities that have a stake in terms of maintaining a sustainable “trust” relationship at the community level supply some parts of the public warning, with some funding from the state, the private sector and charitable entities. Although this is an interim solution, the learning from this process could contribute to the design of an effective national early warning system.

Key Points

- **Systems and institutions are more important than technology for an effective public warning mechanism**
- **Hazard warnings are a public good that will not be supplied by the market. It has to either be provided by government through taxation (Plan A), through the delegation of the warning to a non-governmental entity (Plan A Variant), or by private sector entities that will bundle it with private goods (Plan B).**
- **Plan A: The government supplies or commissions the supply of warnings. The requirements for government provision of hazard warnings in Sri Lanka would include sufficient design elements and safeguards to ensure the deployment of the proper expertise and equipment, adequate levels of funding, insulation from day-to-day political interference, transparency and accountability; modular design to handle multiple hazard risk management systems. If Plan A is implemented and government supplies early warnings, it is important that adequate attention be paid to the internal organizational structure of this national early warning center.**
- **If the government does not wish to create an entity focused solely on early warning, it may consider creating a national early warning center that includes some of the hazard detection and monitoring expertise currently located in government organizations. However, it would not be advisable to simply fold in the existing organizations because they have other functions and legacy problems.**
- **Plan A Variant: The government can partner with a grass-root level organization with widespread and long-standing national geographical coverage to provide the warning system. The government's contribution could take the form of provision of different kinds of hazard information and funding. Government should also provide indemnifying legislation.**
- **Plan B: Non-governmental supply of warning would be bundled with a private good. Industries that have a direct stake in timely and effective public warning, such as the Insurance and Tourism industries can be mobilized to provide this, with the support of the government in providing indemnifying legislation and authority to obtain national and international hazard data, for example. Given the incentives, it is unlikely to yield an all-hazards warning system and not one that provides nationwide coverage. Access to national hazard data as well as indemnifying legislation would have to be provided by the government.**

Section IV: The Way Forward

Summary of Actions

Recommended Action	Responsible Actor	Completion of Action
1. Designate one of the government operations rooms as the central disaster warning operations room (CDWOR)	GoSL	For immediate action
2. Provide critical contact information to <ol style="list-style-type: none"> all relevant regional and international organizations that are capable of and willing to supply hazard information emergency response entities around the country media and public 	CDWOR	For immediate action
3. Provide mobile phones to designated hazard decision makers who do not already use them	TRCSL	For immediate action
4. Convene an officials' committee to consider and respond to the recommendations made in this concept paper.	GoSL	26 April 2005
5. Establish permanent early warning system for Sri Lanka <ol style="list-style-type: none"> Possibly coupled with establishment of comprehensive emergency response capability in all districts 	Officials' Committee	26 December 2005
6. Conduct an industry-wide assessment on performance of network of networks during and after the 2004 tsunami. <ol style="list-style-type: none"> produce a list of time-bound actions to improve the performance of the telecom network of networks in disaster situations 	TRCSL	26 May 2005
7. Submit a report on the current use of short number codes for public service purposes including <ol style="list-style-type: none"> schedule of actions leading to assignment of a short code for emergencies review and response to relevant 1999 TRC consultancy report 	TRCSL	26 June 2005
8. Act promptly to meet Sri Lanka's obligations under the Tampere Convention on Emergency Telecommunications	TRCSL	For immediate action
9. Rationalize existing multiple operations/command rooms and dimension them to function effectively under peak calling conditions and on a 24/7, 365 days/year basis	Task force to be established	26 June 2005
10. Conduct internal survey of government organizations apt for hazard detection and	GoSL	26 May 2005

Recommended Action	Responsible Actor	Completion of Action
monitoring and/or have congestion-resilient private telecom channels.		
11. Review performance of electronic broadcast licensees in 2004 Tsunami and produce report on possible contributions of electronic broadcast licensees to effective public warning	GoSL	26 July 2005
12. Investigate the possibilities of inserting disaster alert and warning message from radio and TV retransmission towers 13. Investigate feasibility and the costs and benefits of remote activation of radio receivers and TV sets	Technical committee to be established	
14. Design licensing scheme for low-power radio stations (allocating appropriate frequencies and including specific early-warning obligations)	GoSL	
15. Activation of all mobile base stations capable of issuing cell broadcasts	Mobile Operators	For immediate action
16. Develop virtual network for dissemination of disaster alerts and warnings through telecom facilities provided to religious establishments a. supplement with awareness raising	Sri Lanka Telecom	Ongoing, but should commence immediately
17. Advance the adoption and adaptation of new technologies with potential for disaster communication a. investigate potential of communication systems such as those used by CEB and SLPA for early warning	Special interest group within Telecom industry to be established	Ongoing, but should commence immediately
18. Incorporate disaster preparedness and warning into eSri Lanka activities where possible	ICT Agency	Ongoing, but should commence immediately
19. Initiate disaster preparedness programs, including examination of possible contributions from each industry	Chambers of industry and commerce	Ongoing, but should commence immediately
20. Identify actions and potential contributions for an early warning system, as well as for building community level awareness a. Organize a civil society summit for this purpose	Civil Society Organizations	Ongoing, but should commence immediately
21. Enact indemnifying legislation for those who act in good faith to provide early warning	GoSL/Officials Committee to be established	[for consideration]
22. Promote disaster education among school children	National Institute of Education	Ongoing
23. Ensure Sri Lanka is well represented at regional and international disaster related events	GoSL	Ongoing
24. Media and emergency responders' workshop based on case studies	Vanguard Foundation	By June 2005

Recommended Action	Responsible Actor	Completion of Action
25. National Convention on Disaster Preparedness	Vanguard Foundation	26 June 2005

Immediate and urgent actions

- 4.1 It is understood that it will take time for legislation to be enacted, new organizations to be established or old ones reorganized, for hazard detection equipment such as the tsunami detection devices placed under the sea and so on. Even this concept paper, compiled at breakneck speed, took two months. However, the people's fears are real and there is no guarantee that hazards similar to the tsunami of December 26th, 2004 will not occur in the near future. There have been a number of panics, caused by rumors and unguarded talk from persons in authority. Therefore, the issue of an interim warning arrangement that was raised in the course of the consultation has to be responded to.
- 4.2 The government must immediately designate one of its many operations rooms (listed, perhaps incompletely, in Section II, paragraph 2.17), as the central disaster warning operations room. That CDWOR must be operational 24/7 and 365 days/year under the supervision of a senior official, preferably from the Armed Forces, and subject to stringent record-keeping and accountability standards.
- 4.3 The contact telephone, fax, e-mail addresses must be provided to the Pacific Tsunami Warning Center at Ewa Beach, Hawai'i, USA, to the World Meteorological Organization and any other relevant regional and international organizations capable of and willing to supply hazard information. Telephone and fax numbers and e-mail addresses, different from the above, must be provided to the emergency response entities around the country such as the 37 Police Operations Rooms and the District Secretaries. Preferably, different fixed and mobile numbers (capable of receiving SMS) must be made available to the media and to the general public. These numbers should be monitored constantly and records maintained.
- 4.4 The CDWOR must have a list of designated hazard decision makers (e.g., Head of the Meteorological Department for cyclones, Head of the Geological Survey and Mines Bureau for earthquakes and tsunamis) and their contact numbers. If these individuals do not currently use mobile phones, they should be provided with them. In the event the CDWOR receives a credible hazard warning, it will immediately contact the relevant decision maker for a decision. It will also maintain constant contact with the Presidential Secretariat, the Prime Minister's Office and other designated agencies.
- 4.5 The CDWOR will also maintain a list of telephone/fax numbers for regional emergency response entities (District Secretaries and Police Operations Rooms) and media. In the event a hazard decision maker rules that a warning or alert should be issued, these numbers will be used to quickly transmit that information.
- 4.6 Once the operational procedures have been set in place, the CDWOR should be given wide publicity. This will help assuage the fears and uncertainties of our people, especially those who were directly affected by the tsunami.

Medium-term actions

- 4.7 As soon as possible and before the 26th of April 2005, government should convene an officials' committee to consider and respond to the recommendations made in this concept paper. The terms of reference of the committee should include the holding of a public consultation to consider both this concept paper and the officials' response

- document, which should be publicized on the web and otherwise. It should be mandated that the officials' committee come up with a time-bound plan to have a permanent operational early warning system for Sri Lanka by the first anniversary of the tsunami tragedy on 26th December 2005. This may or may not be coupled with the establishment of a comprehensive emergency response capability in all districts. The committee should also engage in international coordination on implementing CAP for all hazards as an essential step in the all-hazards approach and moving toward broad-scale interoperability with international systems.
- 4.8 The Telecom Regulatory Commission should be directed by the Minister to convene a series of meetings of all facilities-based operators (and others if considered necessary), to conduct an industry-wide situation assessment on how the network of networks performed during and after the tsunami of 26th December 2004. This may include a review of the recommendations of the Final Report of the Pilot Study on the Use of Telecommunications in Disaster and Emergency Situations in Sri Lanka 1999 and should result in a list of time-bound actions to improve the performance of the telecom network of networks in the event of a future disaster. The meetings should be concluded, and the final report submitted, by May 26th 2005 at the latest.
 - 4.9 The TRC should also be directed to submit a report on the current use of short number codes for public service purposes that includes a schedule of actions leading to the assignment of a short code for use in emergencies by the general public and organizations. This should include a review and response to the consultancy report entitled "Study on the Feasibility of Establishing a Public Access Emergency System in Sri Lanka" of October 1999. These actions should be completed by June 26th, 2005.
 - 4.10 The TRC should also act promptly to meet Sri Lanka's obligations under the Tampere Convention on Emergency Telecommunications
 - 4.11 The government should convene a joint task force of heads of existing operations/command rooms and selected representatives of the Business Process Outsourcing/Call Center industry with the mandate of rationalizing the existing multiple operations/command rooms and dimensioning them to function effectively under peak calling conditions and on a 24/7, 365 days/year basis. These actions should be completed by June 26th, 2005.
 - 4.12 Government should conduct an internal survey of government organizations that have the potential to serve as nodes in a hazard detection and monitoring network and/or have private telecom channels that are relatively shielded from disaster-induced congestion. This report should be completed by May 26th, 2005.
 - 4.13 Government should convene a forum of electronic broadcast licensees to review their performance during and after the 2004 tsunami and identify actions that can contribute to a greater contribution to effective public warning in a future hazard event. The forum should be the basis of a report that will include a schedule for the implementation of actions such as the formulation of standard alert or warning messages. This report would include standard formats of alert and warning message that will be read out on radio and TV. This report should be completed by July 26th, 2005.
 - 4.14 Government should establish a technical committee to investigate the possibilities of inserting disaster alert and warning message from broadcast retransmission towers. Because the government radio and TV stations have the largest coverage in the country and are taxpayer-funded they should be mandated to make the necessary modifications to convey targeted disaster alert and warning messages to targeted areas.
 - 4.15 The same committee should be mandated to investigate the feasibility and the costs and benefits of remote activation of radio receivers and TV sets.
 - 4.16 Government should initiate a participatory process to design a licensing scheme for low-power radio stations, setting apart appropriate frequencies and including specific early-warning obligations.

- 4.17 All of the mobile base stations capable of issuing cell broadcasts should be activated as soon as possible.
- 4.18 Sri Lanka Telecom Limited, which has historically provided telephone connections to many of the country's religious establishments, should be encouraged to develop those connections into a virtual network for the dissemination of disaster alerts and warnings as part of their corporate social responsibility initiatives. This should be supplemented by awareness raising and training to ensure that the temples, mosques and churches will retransmit the alerts and warnings to those in the vicinity.
- 4.19 The telecom industry is encouraged to establish a special interest group and dedicated website to advance the adoption and adaptation of new technologies with potential for disaster communication. This interest group may also investigate the potential of using communications systems such as those operated by the Ceylon Electricity Board and the Sri Lanka Port Authority for early warning purposes. The TRC may also wish to create an advisory committee on this subject under its statute.
- 4.20 The ICT Agency should be encouraged to specifically incorporate disaster preparedness and warning into the various eSri Lanka activities, including the Regional Telecom Networks and the Vishwa Gnana Kendra programs.
- 4.21 The various chambers of industry and commerce should be encouraged to initiate disaster preparedness programs, with particular committees and industry-focused groupings such as tourism and insurance taking a more proactive role. These activities should include examination of the form of contribution each industry could make to NEWS:SL.
- 4.22 Civil society organizations with an interest in disaster preparedness and management should convene a Civil Society Summit on the subject to identify actions that they can take to contribute a more disaster-resilient society, including the provision of inputs to NEWS:SL, the dissemination of alert and warning information and the building of awareness at the community level.
- 4.23 In conjunction with the officials' committee in paragraph 4.7, government should consider enacting legislation to provide indemnity to private sector and civil society actors acting in good faith to provide early warning to the citizens and residents of Sri Lanka.

Continuing Actions

- 4.24 The efficacy of warning rests on an informed and educated populace. The participants of the consultative process were of one mind on the importance of education. The current leadership role assumed by the National Institute of Education in promoting the inclusion of disaster education among school children should be supported by all parties.
- 4.25 Print and electronic media have a special role to play in ensuring that Sri Lankans become and continue to be disaster literate.
- 4.26 Government should ensure that Sri Lanka is represented by competent and well informed officials at various regional and international meetings designing the regional and international hazard detection and monitoring systems and that inputs be obtained for these discussions through a consultative process that is open to a broad range of stakeholders.
- 4.27 Action to educate ground-level officials on all aspects of disaster preparedness, including the modalities of evacuation, must be a continuous activity. Building a sense of professional pride among emergency responders should be an objective of all actions taken in this area.

Next steps by Vanguard Foundation

- 4.28 Following the conclusion of this report, the first major project of the Vanguard Disaster Preparedness Center (VDPC), a series of articulated actions leading up to

- greater media and emergency-responder awareness of disaster warning will be undertaken as a direct follow up to this work.
- 4.29 Based on the rich information supplied in the course of the consultative process, VDPC has decided to conduct a pilot study on a potential local hazard, different in form from a tsunami. The key document is attached as Annex 9. Additional offers of assistance from three continents have been received. Most importantly VDPC has been invited to participate in a community level initiative at Gampola, an area in the shadow of major dams. The findings of this project will be of value in itself because the implementation of the likely institutional remedies involves only a few organizations. In addition, VDPC will use this project as a case study for the media and emergency-responder workshop.
- 4.30 Also based on information supplied by experts in the course of the consultation, VDPC intended to investigate the possibilities of implementing a mechanism for giving timely flood warning to the densely populated areas in the lower reaches of the Kelani River. This too will serve as a case study for the media and emergency-responder workshop, in addition to filling an obvious gap in the disaster warning system.
- 4.31 The final step of the process will be a workshop on early warning regarding the major hazards endangering Sri Lanka. The intended audience is media and emergency-response personnel (District Secretariats and Police Operations Rooms). Raising the awareness of the major hazards and of the early warning system is the major objective. Establishing closer relations between media and emergency-response personnel is another objective. Using the local case studies, including the tsunami, and adaptations of templates used in other countries, the workshop will also enable the participants to develop locally appropriate disaster alert and warning message templates in the three official languages.
- 4.32 The activities of the VDPC in the coming months will build up to a National Convention on Disaster Preparedness, tentatively scheduled for 25-26 June, 2005, to mark the half-year anniversary of Sri Lanka's greatest disaster. This event will supplement many of the actions listed above, in that it will provide an opportunity for the announcement of the results and will serve to focus our effort so we do not forget the 40,000 valuable lives that were swept away for the lack of a few minutes of warning and a little awareness.

References

Abeywickrama, M. I., "No money to repair disaster warning unit," Sunday Leader, 27 February 2005, p. 5.

Anderson, Peter S. & Gordon Gow (2004). Tsunamis and Coastal Communities in British Columbia: An Assessment of the B.C. Tsunami Warning System and Related Risk Reduction Practices. Ottawa: Public Safety and Emergency Preparedness Canada. At: http://www.ocipep.gc.ca/research/resactivites/CI/2003-D001_e.asp

Asian Development Bank, Japan Bank for International Cooperation and World Bank (February 2005) Sri Lanka 2005 post-tsunami recovery program: Preliminary damage and needs assessment, Annex 15, paragraph 11.

Central Bank of Sri Lanka, Annual Report 2003

Champika Liyanaarachchi, "Disaster management: Preventive side nil," Daily Mirror, 21 May 2003. At: <http://www.dailymirror.lk/2003/05/21/opinion/1.html>

Clinton, Bill: My Life, (New York: Random House, 2004)

Fernando, W.B.J., Sri Lanka Country Report, 1999, Asian Disaster Reduction Center, <http://www.adrc.or.jp/countryreport/LKA/LKAeng99/SriLanka99.htm>

Global Earth Observation System of Systems (GEOSS), *10 year Implementation Plan: Reference Document*, p. 19
<http://earthobservations.org/docs/GEO204%20Final%20Draft%20Reference%20Document.pdf>

The Internet Society Challenge, <http://www.isoc.org/challenge>

National Science and Technology Council (2000). Effective Disaster Warnings, Report by the Working Group on Natural Disaster Information systems, Subcommittee on Natural Disaster Reduction. Washington, DC. At: <http://www.fema.gov/nwz00/effectivedoc.shtml>

Partnership for Public Warning (2002). Developing A Unified All-Hazard Public Warning System, Report by The Workshop on Effective Hazard Warnings, Emmitsburg, Maryland November 25, 2002. McLean, VA. At: http://www.partnershipforpublicwarning.org/ppw/docs/11_25_2002report.pdf

Partnership for Public Warning (2003). A National Strategy for Integrated Public Warning Policy and Capability. McLean, VA. At: <http://www.partnershipforpublicwarning.org/ppw/docs/nationalstrategy.pdf>

Samarajiva, R. Getting from dysfunctional government to e(ffective) government: Mapping a path in Sri Lanka, International Journal of Regulation & Governance, 4(2), 2004: 171-85.
<http://www.teriin.org/online/ijrg/dec04/paper4.pdf>

Telecommunications Regulatory Commission of Sri Lanka (1999). Final Report of Pilot Study on the Use of Telecommunications in Disaster and Emergency Situations in Sri Lanka. Colombo.

Telecommunications Regulatory Commission of Sri Lanka (1999). Study on the Feasibility of Establishing a Public Access Emergency System in Sri Lanka. Colombo.

Times of India, *Geologists Take Moral Onus*, 1 March 2005,
<http://timesofindia.indiatimes.com/articleshow/msid-1036899,curpg-1.cms>

United Nations (1995). Secretary General's Report on Early Warning Capacities of the United Nations Systems with Regard to Natural and Similar Disasters, Presented to the Fiftieth Session of the United Nations General Assembly, October 1995. A/50/526. New York.

United Nations (2004). Inter-Agency Secretariat of the International Strategy for Disaster Reduction and German Committee for Disaster Reduction. Early Warning as a Matter of Policy: Conclusions of the Second International Conference on Early Warning, 16-18 October 2003, Bonn, Germany. Bonn. At:
<http://www.unisdr.org/ppew/info-resources/docs/EWCII-conclusions.pdf>

United Nations (2005). International Strategy for Disaster Reduction, Platform for the Promotion of Early Warning. Bonn. At <http://www.unisdr.org/ppew>

Vordzorgbe, Seth D. (2003). Synthesis of the Findings of the Early Warning Regional Consultations in Africa, Asia, the American Hemisphere and Europe. of the Second International Conference on Early Warning, 16-18 October 2003, Bonn, Germany. Bonn At:
<http://www.ewc2.org/upload/downloads/SynthesisOfTheFindingsOfRegCons.pdf>

Weerabahu, P. K. "Adapting to an ICT based Emergency Warning System," Ceylon Daily News, 25 Jan 2005 <http://www.dailynews.lk/2005/01/25/fea12.html> and related discussion at <http://www.lirneasia.net/2005/01/adapting-to-an-ict-based-emergency-warning-system/#comments>