Total Disaster Risk Management

Good Practices 2008

Foreword

The present report provides an overview of several natural disasters that occurred in the world in 2007. The Chuetsu Offshore Earthquake was a powerful M6.6 earthquake that occurred on the 16th of July in Japan. Eleven deaths and at least 1,000 injuries have been reported, and more than 300 buildings were completely destroyed. And there was an M8.0 earthquake that occurred on the 15th of August in the Pacific Ocean off Peru, and it claimed more than 500 lives. The huge tropical cyclone Sidr hit Bangladesh on the 15th of November and left in its wake approximately 3,200 deaths, 800 buildings lost, 35,000 injured and more than 7 million people affected. Such huge calamities tell us that we still have a lot to learn about reducing the impact of natural disasters.

In the meantime, we are looking into how the implementation of the Hyogo Framework for Action (2005 ～ 2015) is progressing, and it is widely agreed that education aimed at disaster reduction should become an integral part of the sustainable development of societies. The follow-up to the Hyogo Framework Priority for Action must bring us close to information-sharing and effective enhancement of education aimed at reducing the risk of disaster at the community level.

At the current state of progress of the HFA, the Asian Disaster Reduction Center (ADRC) will not only continue to support the development of scientific capability against disasters, but will also pay attention to information-sharing and education aimed at disaster prevention. The ADRC has collaborative status with the United Nation Office for the Coordination of Humanitarian Affairs (UN-OCHA) Kobe and the International Recovery Platform (IRP), and it also works closely with many stakeholders in Asia. The ADRC and these partner organizations have formulated a holistic approach to disaster risk reduction known as Total Disaster Risk Management (TDRM).

"Total Disaster Risk Management: Good Practices" is a user-friendly handbook on the concept of TDRM and its good practices, and it was published for the UN World Conference on Disaster Reduction that was held on 18-22 January 2005 in Kobe, Japan. The enclosed "Good Practices 2008" contains good practices submitted by ADRC member countries to share knowledge among relevant stakeholders in order to contribute to global disaster risk reduction.

Furthermore, it would be our great pleasure to continue receiving a broad range of good practices from you. I hope this publication will further promote the TDRM approach and contribute to efforts to build a safer world.

March 2008

Koji Suzuki

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Executive Director

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Contents

"Terra non Firma"--an Entertainment Tool for Raising Earthquake Awareness of Pre-and Primary-School Children in Armenia

Armenia

Armenia is one of the most earthquake disaster-prone countries in the world. The disaster that struck Armenia in December 1988, when over 6,000 children died, is a tragic example of why more effort is needed to secure the safety of children before disasters strike. One of the most essential elements in disaster risk reduction strategies is education and awareness. Educated and aware children are active members of society who will be able to take effective action and help reduce casualties during a major earthquake. Knowledge about earthquakes should be acquired from childhood. Such knowledge will not only prevent panic among children, but it will also help them avoid a stress and to the right things in a time of crisis. Children must realize the fact that they live in a seismically active zone, though it shouldn't complicate their daily lives, since nowadays they can learn how to protect themselves from the deadly impact of a natural disaster.

Public education and preventive behavior are important parts of seismic risk reduction for the Armenian National Survey for Seismic Protection (Armenian NSSP). As part of its seismic risk reduction activities, the Armenian NSSP together with the Ministry of Science and Education and a preschool in the city of Yerevan has developed and staged a theatrical performance entitled "Terra non Firma," in which children learn the basics of seismic behavior and protection techniques through interactive education-play.

The performance is targeted at kindergarten and primary-school children and gives them information like what an earthquake is, how to prepare for an earthquake and what to do before, during and after an earthquake.

- Scenario

The Spirit of the Forest warns the forest animals about one of the devastating natural calamities--earthquakes. He tells them to fix and strengthen their shelters and nests. Noticing that the animals are not listening, he decides to teach them a lesson through Mother Terra by causing slight quake. The animals who ignored the Spirit's advice suffer various injuries and property losses. Panic sets in and injured animals cry for help. Hearing the cries for help, the sniffer cubs [sniffer dogs?] rush to the rescue with their stretchers and first-aid kits. Having been punished, the forest animals explain to each other the earthquake behavior rules and promise to follow the advice of the Spirit of the Forest. The performance finishes with a song dedicated to Planet Earth and the sun shining again in a blue sky.

In the writing of the scenario of the performance, animals typical of the fauna of Armenia were chosen and the cast involved children from the ages of 4 to 8.

"The Great Hanshin-Awaji Earthquake Sugoroku"
Training in N 189 school, Yerevan

After the scenario was prepared and then approved by the specialists of the NSSP, the most musically gifted children were chosen and the headmistress was appointed director of the performance, and nuns on the teaching staff began rehearsals with the children. During rehearsals, the children were very excited about the opportunity of learning about one of Earth's natural calamities, and earthquakes became less frightening to them. They even taught their parents and friends what they had learnt at school. The rehearsals lasted more than 4 months, as there were so many questions that they wanted to know about.

A special song dedicated to Planet Earth was composed, and a musical arrangement and sound effects were added to the performance. The dressmaker made wonderful costumes for more than 8 animals, town criers, the Spirit of the Forest, Mother Terra and beautiful birds.

The premiere of the performance was attended by specially invited guests from the Ministry of Science and Education, local authorities, principals of kindergartens and primary schools as well as the representatives of mass media. All the invited persons showed a high interest in the project and expressed their willingness to cooperate in the field of seismic risk reduction.

When the film "Terra non Firma" was released, it was duplicated and given to the local authorities of the 12 Yerevan city districts for distribution among the pre-and primary schools. A video of the performance will be used as an educational tool for kids in special programs to teach them how to cope with natural disasters.

Because of the innovative nature of this project, there were no obstacles to the reproduction and dissemination of materials throughout the region. Meanwhile, the main goal for the future is to provide a video of the performance to all kindergartens and primary schools in all the marzes (prefectures) of the Republic of Armenia as educational material for disaster risk reduction.

Children are singing the song "Earth Planet"

- Background	Earthquake Disaster Children-centered Risk Reduction
- Objective	Empower kids with earthquake awareness
- Term/ Time Frame	9 months
- Activities undertaken	Development and implementation of an entertainment-type educational tool
- Major achievements	Raising of earthquake preparedness level
- Total budget	US$5,000
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Ministry of Home Affairs, Government of India – United Nations Development Programme Disaster Risk Management Programme (2002-2007)

India

- Main Story

The Government of India is executing/implementing the GoI-UNDP Disaster Risk Management Programme (2002-07). The Programme aims at assisting the Central Government and 17 States in mitigating disaster risk primari1y at 169 multi-hazard-prone districts identified on a susceptibility map (1st edition) prepared by the BMTPC under the Ministry of Urban Development. The Programme seeks to demonstrate a sustainable model for mainstreaming disaster risk management at all levels (Village/Gram Panchayat/Block/Ward/Urban Local Bodies/District and State levels) with a focus on district-and community-1evel activities.

The project is implemented with 100% external aid of US$34 million mobilized through a multi-donor framework, which includes the UNDP, USAID, European Commission, AUSAID, and ECHO. The main objectives of the Programme are:

i) Training and capacity building at the community 1evel and training of Disaster Management Committees (DMCs) and Disaster Management Teams (DMTs) at the District, Block, Gram Panchayat and Village levels, as well as at the Urban Local Bodies (ULBs) and Ward levels in cities.

ii) Assisting the States in the development of state-and district-level Disaster Management Plans as well as development of Disaster Risk Management and Response Plans at the Village, Ward, Gram Panchayat, Block, and Urban Local Body levels.

iii) Training and capacity development of Panchayati Raj Institutions (PRIs) for disaster risk reduction.

iv) Enhanced capacity building for women in first-aid, shelter management, water and sanitation, rescue and evacuation at the community 1evel.

v) Training and capacity development of other stakeholders (National Cadet Corps/Nehru Yuva Kendra Sanghatan/National Service Scheme volunteers, non-governmental organizations, community-based organizations and school teachers) for an integrated approach to disaster risk reduction and response.

vi) Development of training manuals for different target groups on disaster prevention, mitigation, preparedness and response.

vii) Implementing the Urban Earthquake Vulnerability Reduction Project (UEVRP), a sub-component initiative, in 38 cities having a population of half a million or more and located in seismic zones III, IV and V, including duties such as training engineers, architects and masons, making policy-makers and administrators sensitive to issues, and raising awareness of school teachers, students and other stakeholders.

viii) Strengthening Emergency Operation Centres (Control Rooms) at state and district levels for the timely dissemination of warnings and rapid response.

ix) Developing and updating Web-based electronic inventories of human and material resources under the India Disaster Resource Network (IDRN).

x) Disseminating disaster-related information and raising awareness of people at the community level to instill a culture of disaster mitigation and preparedness.

xi) Providing specialized support to the Ministry of Home Affairs and States in the Programme for setting up and strengthening institutional and administrative systems for disaster risk management.

The programme has been implemented since August 2002 and is likely to conclude in December 2008.

The UNDP, in consultation with the concerned state governments, has been compiling a record of “Good Practices” at various villages on the basis of search and rescue and first-aid training received by volunteers in the villages.

Landslide Hazard Mitigation in Indonesia

Indonesia I

Rain-induced landslides are one of the most common types of natural disasters, and they frequently occur in Indonesia as well as in the Asia-Pacific Region. During the period 1990 – 2007, 1,215 landslides occurred in Indonesia. Because of those landslides, 2,886 people lost their lives, 1,215 people were injured, and 14,849 people lost their homes. Normally, landslides occur during the rainy season, bringing a sudden flow of debris that leaves many victims in its wake. The majority of landslides during this period occurred in January (197 events).

Coordination of Landslide Mitigation Efforts

Basic disaster management concepts and basic knowledge of landslide phenomena were introduced in Indonesia to improve the understanding and awareness of its citizens, and to motivate and empower them to develop effective disaster management measures and public education programs. The development of a mitigation system is therefore a crucial step towards the marshaling of human resources to guarantee the sustainability of life and the environment in areas susceptible to landslides.

The Center for Volcanology and Geological Hazard Mitigation, the Geological Agency, and the Department of Energy and Mineral Resources have devised the following mitigation strategies for reducing the number of fatalities and the socio-economic impact caused by landslides.

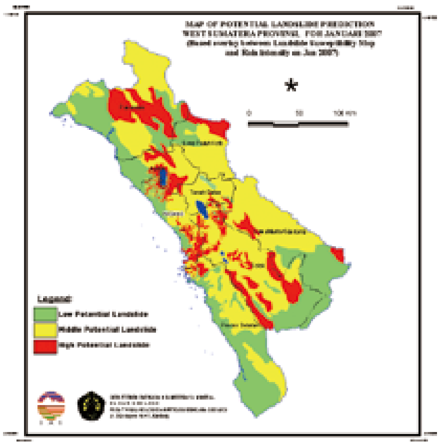
a. Landslide Susceptibility Mapping

Maps on a scale of 1:100000 show areas susceptible to landslides based on regional data. These maps were prepared using the Ilwiss 3.3 program and Map Info version 8. These maps identify areas that are highly susceptible to landslides and the factors controlling susceptibility.

b. Early Warning System.

The main function of the early warning system is to provide a potential landslide map prepared by overlaying landslide susceptibility maps and monthly rainfall forecasts. These maps are sent out monthly to local governments located in landslide hazard areas, and they can be uploaded at http://www.vsi.esdm.go.id every month.

Figure 1. (a) Landslide located in Padang, West Sumatra, killed 14 people and destroyed 5 houses (January 4, 2007). (b) Landslide prediction map for January 2007 showing that Padang landslide was located in area of high potential for landslide.



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c. Monitoring Landslides

Landslides are monitored in order to understand landslide behavior in terms of direction, intensity, and velocity of land movement. The landslide monitoring facility in the CVGHM office uses GPS, extensiometers, and piezometers.

d. Socialization

Basic disaster management concepts and basic knowledge of geohazard phenomena were introduced in Indonesia to improve the understanding and awareness of its citizens, and to motivate and empower them to develop effective geological hazard disaster management measures and public education programs. Socialization is therefore a crucial step towards the marshaling of human resources to guarantee the sustainability of life and the environment in areas susceptible to geohazards.

e. Quick Response Team

Quick response teams will visit hazardous areas and provide technical recommendations aimed at preventing landslides and reducing their impact.

Problems Facing Indonesia

Landslide hazard maps for geological disaster management have already been published and issued to the public, and mitigation efforts are underway. Unfortunately, disasters are still occurring in Indonesia and casualties remain high. This is because: (1) the number of settlements and public activity in medium –and high-susceptibility areas are still growing; (2) Landslide Susceptibility Maps and the Early Warning System are not being optimally used as a database for land use planning and regional development based on geohazard threats; and (3) geohazard management is not formally a part of the early education curriculum in schools.

- Background

Rain-induced landslides are one of the most common types of natural disasters, and they frequently occur in Indonesia. The majority of landslides during the period 1990-2007 occurred during the rainy season from November to March.

- Objective

To minimize the loss of human life and the socio-economic impact caused by landslides.

- Time Frame

This is an ongoing project, especially the Early Warning System for landslides. The Center for Volcanology sends Landslide Susceptibility Maps and Tables of Landslide Potential Areas to local governments every month.

- Activities undertaken

Collecting forecast data of monthly rainfall from geophysical and meteorological agencies; preparing landslide prediction maps by overlaying Landslide Susceptibility Maps and monthly rain forecasts; continuing to monitor landslides and map areas susceptible to landslides in Eastern Indonesia.

- Major achievements

Ninety percent of landslides have occurred in areas designated to have a medium or high potential of landslide occurrence. Unfortunately, local governments and communities in the landslide hazard areas have not been responsive and lack awareness of the Early Warning System, so the number of human victims and the socio-economic impact caused by landslides remain high.

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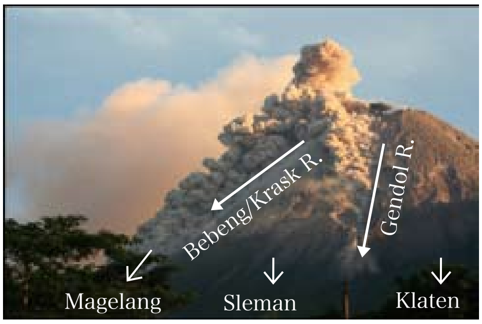
The Effectiveness of the Role of Communities in Hazard Mitigation Applied to Merapi Volcano

Indonesia II

Background

Mount Merapi (2968m) is a frequently erupting volcano whose last eruption occcured on June 14, 2006, after 5 years of repose. During the last eruption, there were 2 casualties who were trapped in a bunker that was covered by a pyroclastic flow. Even though mitigation measures have been put in place, improper procedure can lead to death. When the siren was sounded to signal people to evacuate, two volunteers preferred to stop and enter a bunker, which lead to their death. In the 2006 eruption, volcanic activity continued from April 2006 to November 2007. The peak of eruption occurred on 14 May 2006. During that day there were 3 pyroclastic flow events (at 8:14 am, 11:33 am and 3:15 pm) with PF distances of 5, 7 and 5 kilometers. The last eruption was different from previous eruptions, because it was characterised by rapid changes in morphology and a high magma extrusion rate. Between 1961 and 2001, Mount Merapi eruptions were predominantly directed to the southwest, except in 1994 and 1997. Fast morphological change at the summit due to intensive crack formations led to rapid growth of a lava dome. This rapid growth of lava dome also effected a change in pyroclastic flow direction. During the crisis, the pyroclastic flow direction changed from southwest to south-southeast. These changes affected not only the communities living around Merapi, but also their mitigation efforts. The communities living around Merapi can be grouped into those that have experienced eruptions and those that have not.

Pyroclastic flow events on 15 May 2006 were predominantly directed toward the Krasak River (Magelang,



Pyroclastic flow events on 15 May 2006 were predominantly directed toward the Krasak River (Magelang, southwest) and subsequently changed direction toward the Gendol River (Sleman and Klaten, south-southeast). Potentially threatened areas are shown by arrows.

southwest) and subsequently changed direction toward the Gendol River (Sleman and Klaten, south-southeast). Potentially threatened areas are shown by arrows.

During the 2006 Merapi eruption, 3 regencies received the impact of the eruption, namely, Magelang (west-southwest flank), Sleman (south-southeast flank) and Klaten (southeast-east flank). Of these, Magelang is the most experienced community in relation to Merapi eruptions, and Klaten is the least experienced community. Sleman experienced the 1994 eruption, which caused 69 casualties, and it responded well to the 1997 eruption.

Concept and Planning

Recently, the Indonesian Government issued Government Regulation UU 24/2007 related to hazard mitigation. In the regulation it is mentioned that governments (central and local) are responsible for the management of hazard mitigation. Mount Merapi is an active volcano with a high frequency of eruptions, about once in 2-7 years. It is located in in a dense populated area, making it an even greater hazard. Besides knowledge and awareness, the participation of the community is nessescary in responding to a disaster. Community involvement starts with the formulation of community-based hazard mitigation measures. The main idea is that each member of the community living in a hazard zone should be capable of helping himself/herself and other people in facing the hazard. In a previous stage, information about volcano-related hazards was disseminated through members of the Hazard Mitigation Office (Slatlak/ Satkorlak). This effort was not as effective as expected due to insufficient involvement by the community. Therefore, the Volcano Technology Research Center (BPPTK), working under the Center for Volcanology and Geological Hazard Mitigation (PVG), proposed a program called Wajib Latih (Compulsory Training) regarding hazard mitigation to be applied in the communities around Mount Merapi as a study case.

The program is divided into 3 steps, namely, Concept and Planning, Implementation, and Evaluation. In the Implementation Stage, the program has been carried out by BPPTK-PVG, together with local governments, community organizations, local communities, and international organizations.

Implementation

Funding for the Implementation Stage was provided by the NZAID to the local goverment of Sleman. The Sleman Regency is part of Yogyakarta Province. The aim of the Compulsory Training Program is to build a community-based hazard mitigation program so that each individual in the community will be involved in hazard mitigation and account for hazard mitigation risk. As the competence of the community increases, the impact of disasters can be reduced. On the other hand, Compulsory Training will contribute to instrumental monitoring in the long term. With this training, it is assumed that the communities around Merapi already have knowledge and awareness of volcano-related hazards.

In the beginning Compulsory Training will be given to representative members of each community, who will then train others in their areas. This program has been carried out since the beginning of 2008 in the following areas: Sleman and Klaten Regencies (south and east flank) and Magelang and Boyolali Regencies (west and north flank). The program is scheduled to be completed in 2013.

Evaluation

By 2014, the people living around Mount Merapi should be ready to perform hazard mitigation actions. During its implementation, the program will be evaluated and improved. Continuous evaluation is necessary to achieve better and stronger community-based hazard mitigation efforts. At the moment, the Local Authority of Yogyakarta Province proposed to have the Center of Excellence for Disaster Management in its area. This means that the Authority should take the lead in implementing the hazard mitigation program. Good coordination of institutions, the public, non-governmental organizations and scientists will be neccessary. On the other hand, the building of efficient hazard mitigation facilities is essential. These facilities include modes of transportation, roads, lifelines, permanent evacuation centers and evacuation routes, which should be prepared in advance.

Well-trained and skilled volcanologists will also be needed to provide a good early warning system and accurate predictions.

- Background

A volcano with a high frequency of eruptions located in a densely populated area forced institutions involved in hazard mitigation to build a community-based hazard mitigation program.

- Objective

To build communities that can independently respond to hazard mitigation.

- Term/Time Frame

The concept and module were prepared in 2007. The program started in 2008 and is expected to be completed in 2013.

- Activities undertaken
Compulsory Training Program for people living in hazard areas.

- Major achievements
Program still in progress.

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The Role of the Quick Response Team During Volcanic Crises in Indonesia

Indonesia III

Indonesia is one of the largest volcanic areas in the world. There are 129 active volcanoes in Indonesia. Seventy-nine of them erupted in historical times (type A). Recently, there has been a significant increase in volcanic activity at almost the same time. From 2006 to 2007, 8 volcanoes were raised to activity Level 2, 4 volcanoes to Level 3, and 6 volcanoes to Level 4.

Volcanic crisis refers to the time from the beginning until the end of increasing volcanic activity. Indonesia applies four levels of activity, namely, Level 1 (Normal), Level 2 (Waspada/Alert), Level 3 (Siaga/Anticipation), and Level 4 (Awas/Warning). Increasing seismic activity and other parameters and the observation of changes around the crater are the criteria for raising volcanic activity from Level 1 to Level 2. Level 2 rises to Level 3 when seismic activity becomes intensive. This condition is supported by other monitored data and the observation of significant changes, possibly followed by eruptions. Level 3 changes to Level 4 when the main eruption occurs, with the initial eruption mostly composed of ash and vapor. This can be followed by a strombolian eruption (such as Krakatau).

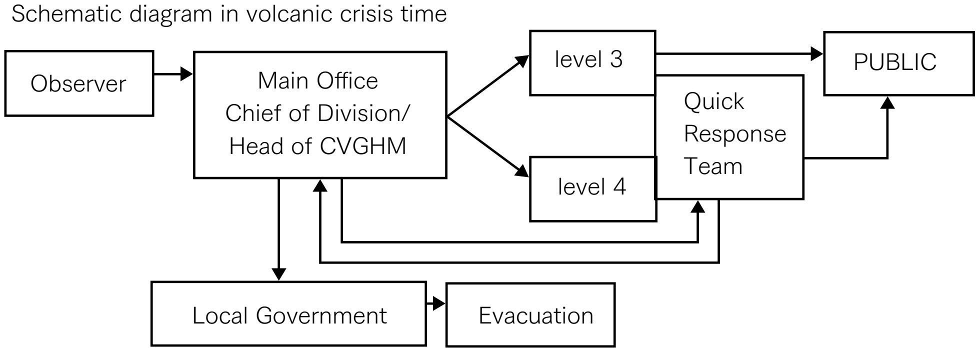
During Level 3 (Siaga/Anticipation) activity, the Head of the Center for Volcanology and Geological Hazard Mitigation (CVGHM) internally informs the Quick Response Team. The task of the team is to closely watch and thoroughly analyze volcanic activity. This team consists of multi-disciplined researchers who are responsible to the Head of the CVGHM. To coordinate with hazard mitigation officials and local governments, the leader of the team may represent for the Head of the CVGHM when there is an abrupt increase in activity levels. The team is also responsible for preparing routine evaluations and daily reports. It also gives recommendations to local governments and hazard mitigation officials. In addition to existing data analysis work, the team also confirms evacuation routes and locations with hazard mitigation officials.

Raising the activity level from Level 3 to Level 4 (Awas /Warning)) is decided by the Head of the CVGHM based on information and suggestions from the Quick Response Team. In an emergency situation, the team leader can inform the public about the change in the volcanic activity level and immediately report to the Head of the CVGHM. This information is very important for the main office in order to recommend to the local governments that they start evacuation procedures (Diagram 1).

Up to now the Quick Response Team has been performing a valuable task in supporting and implementing the hazard mitigation system.

Schematic diagram of Volcanic Activity
Level 1 (Normal) and level 2 (Alert)

Schematic diagram in volcanic crisis time



The following table shows events prior to volcanic eruptions handled by the Quick Response Team during the period 2006 – 2007.

No.	Name of Volcano	Precursor		Explanation
		Period (stage 3 and 4)	Indication	
1.	Karangetang, North Sulawesi	July 12, 2006 – February 12, 2007	Visual and seismic changes and deformation	Pyroclastic flow, 1,500 people evacuated
		August 11 – November 23, 2007	Visual and seismic changes and deformation	Big eruption, pyroclastic flow, 574 people evacuated
2.	Soputan, North Sulawesi	December 14, 2006 – November 23, 2007	Visual and seismic changes	On August 14, 2007, and October 25, 2007: ash eruption and pyroclastic flow
3.	Talang, West Sumatera	September 9, 2006 – January 27, 2007	Visual changes, temperature of fumarole, seismic changes, and deformation	Ash eruption
		March 17 - April 23, 2007		
		November 29 -Desember 14, 2007		
4.	Merapi, Central Java	April 26 – November 12, 2006	Visual and seismic changes and deformation	Big eruption, pyroclastic flow, 2 (two) victims
5.	Batutara, East Nusa Tenggara	March 22 – April 12, 2007	Visual changes	Ash eruption
6.	Gamkonora, North Maluku	July 8 – July 24, 2007	Visual and seismic changes and deformation	Big eruption on July 9, 10,000 people evacuated
7.	Kelud, East Java	September 29 – November 8, 2007	Visual changes, temperature of crater lake, seismic changes, and deformation	Effusive eruption and lava doming, 12,500 people evacuated
8.	Krakatau, Lampung	October 23 –up to now	Visual and seismic changes	Ash eruption
9.	Lokon, North Sumatera	Desember 9, 2007 – February 28, 2008	Visual and seismic changes and deformation	Ash eruption

Up to now the Quick Response Team has been performing a valuable task in supporting and implementing the hazard mitigation system.

- Background

Indonesia is one of the largest volcanic areas in the world. There are 129 active volcanoes in Indonesia. Seventy-nine (79) of them erupted in historical times (type A). Recently, there has been a significant increase in volcanic activity at almost the same time.

- Objective

To provide accurate information about volcanic activity and to support decision-makers during a volcanic crisis.

- Term/Time Frame

Volcanic crisis period

- Activities undertaken

The Quick Response Team is responsible for preparing routine evaluations and daily reports, coordinating and giving recommendations to local governments and Satlak/Satkorlak PB (management hazard officials). In addition to existing data analysis work, the team also prepares evacuation routes and locations. When volcanic activity reaches Level 4, the team may inform the public about the change.

- Major achievements

Karangetang (July 12, 2006 – November 23, 2007), Soputan (December 14, 2006 – November 23, 2007) , Talang (September 9, 2006 – Desember 14, 2007), Merapi (April 26 – November 12, 2006), Batutara (March 22 – April 12, 2007), Gamkonora (July 8 – July 24, 2007), Kelud (September 29 – November 8, 2007), Krakatau (October 23 – to present), Lokon (Desember 9, 2007 – February 28, 2008).

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Disaster Planning by Residents Based on Awareness of their Own Situation: Disaster Drills in the Shakemachi Neighborhood of Harunasan-machi (Takasaki, Gunma)

Japan I

Description

The Harunasan Disaster Preparedness Committee is a volunteer group organized mainly by the residents of the Shakemachi district of Harunasan-machi, a part of the municipality of Takasaki in Gunma Prefecture. Shakemachi is closely tied to the Haruna Shrine, whose priests live in the community, and inns and other services for pilgrims have been the mainstay of the community for several centuries.

Shakemachi currently has 70 residents in 31 households. The priests of the shrine live there, and about half the households operate shops selling local food and gift specialties. Shakemachi is a venerated historic site with many designated cultural properties, including three pilgrims' inns that are Tangible National Cultural Properties and the shrine itself which is an Important National Cultural Property. The community has worked together for centuries to protect these resources, and a proactive attitude toward disaster preparedness is a local tradition.

Shakemachi, Harunasan-machi

A disaster drill is held each June, just before the rainy season, mainly on the grounds of the Haruna Museum where an avalanche warning system is installed. A cliff-collapse warning is issued and the residents start preparations for evacuation, then an avalanche warning is issued and the residents begin moving to the evacuation site (the Museum), and finally the warnings are lifted.The drill begins with an announcement over an avalanche warning public-address system by the locally selected disaster prevention captain. A special feature of the drill is that it begins with each household using a simple rain gauge to check the rainfall level, accustoming the residents to monitoring the area around their own homes for heavy rainfall which can be a precursor of a landslide. Each household records and checks the data, and maintains a Household Evacuation Plan and Chart for its site, as a guide and check sheet for evacuation procedures.

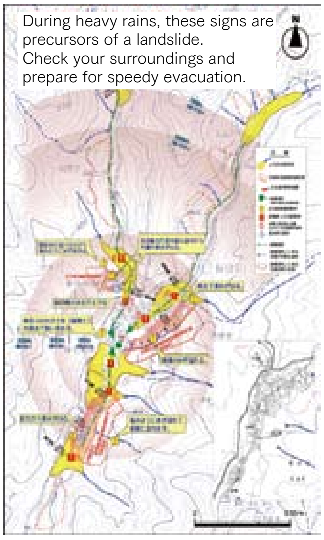


Fig. 1 Disaster Prevention Map

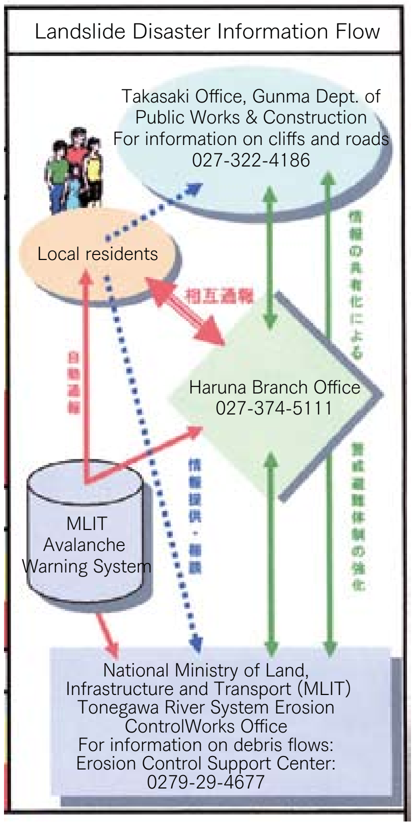
The Evacuation Plan and Chart (Fig. 1) is a kind of disaster preparedness map. It shows the precursor event monitoring stations in Shakemachi and their records in an easy-to-grasp format. It also lists landslide and mudslide danger zones identified by the prefectural government, as well as hazardous streams and slopes along evacuation routes. It is designed specifically to avoid harm during the initial stages of the evacuation procedure, with detailed information on the hazard points along the evacuation route.

Chart 1 is a list of the procedures. There are three phases: (1) collection of meteorological data, (2) preparations for evacuation, and (3) the start of evacuation, and they are presented together with a check sheet of the corresponding rainfall levels and precursor events, all on a single page. Each household uses the chart to keep track of its own site data and figure out when it is time to start evacuating.

Background

The Harunasan Disaster Preparedness Committee was established in response to Typhoon No. 10 of August 2, 1982. Sweeping across Japan from the Atsumi peninsula on the southern coast to the Japan

Sea in the north, Typhoon 10 caused severe rain and windstorms across central and northern Honshu, leaving a total of 95 persons dead or missing. Shakemachi suffered major damage, including an avalanche that struck the approach path and the Kaguraden building of the Haruna Shrine and felled a “thousand-year-old” cedar tree. In June 1983, an avalanche warning system was installed in Shakemachi by the Tonegawa River System Erosion Control Works Office of the Ministry of Construction (now the Ministry of Land, Infrastructure and Transport). That Office then advised local government entities (including the Harunasan District Authority, the former municipality of Harunamachi, and Gunma Prefecture) as they developed evacuation procedures based on the avalanche warning system.
The Disaster Preparedness Committee, chaired by the chairman of the Harunasan District Authority, was then formed as a voluntary association of Shakemachi residents, and has continued to support the implementation of the evacuation procedures for some 25 years.



Flow of Disaster Information

Purpose
To enable local residents to accurately monitor the constantly changing natural conditions and judge when to prepare for and carry out evacuations.

Period of Operation
1983 until the present, continuously

Primary Activities
- Installation of the avalanche warning system
- Establishment of the Disaster Preparedness Committee as a volunteer organization of Shakemachi residents
- Development of evacuation procedures based on the warning **system**
- Preparation of a Disaster Preparedness Map of Shakemachi, showing the landslide and mudslide danger zones identified by the prefectural government, hazardous streams and slopes along evacuation routes, and the precursor event monitoring stations in Shakemachi with their records in an easy-to-grasp format.
- The Disaster Preparedness Committee developed the Household Evacuation Plan and Chart (disaster preparedness map, rainfall and hazard checksheet, and evacuation procedures) and distributed it to residents.
- Each household uses the Household Evacuation Plan and Chart to record and evaluate rainfall levels and precursor events.

Main Achievements
- Having participated in the drills each year for many years, the local residents have gained confidence in their own abilities to assess disaster risks and avoid them.
- By working closely with the local fire department during the drills, the residents have brought their communication to a new level and strengthened their system of community cooperation.
- The cooperation system and communication skills that were strengthened through the disaster drills have been an important stimulus to the Shakemachi community, and as part of the community

vitalization program started in 2003, monzen soba, a noodle dish that was part of the area's cuisine in centuries past was revived as a local specialty product.
- Received the 2006 Chairman's Grand Prize for Community Disaster Preparedness, from the Institute for Fire Safety and Disaster Preparedness

Disaster drill

For More Information

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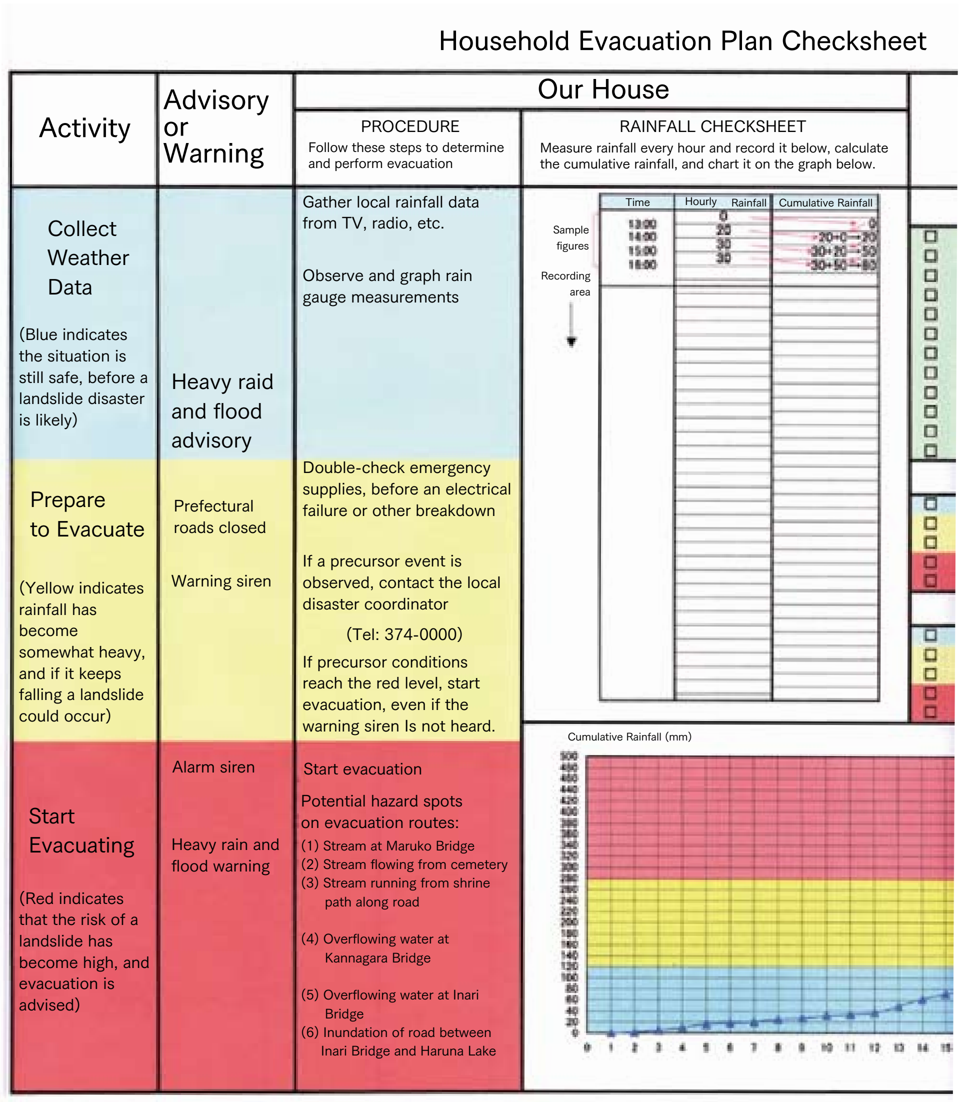
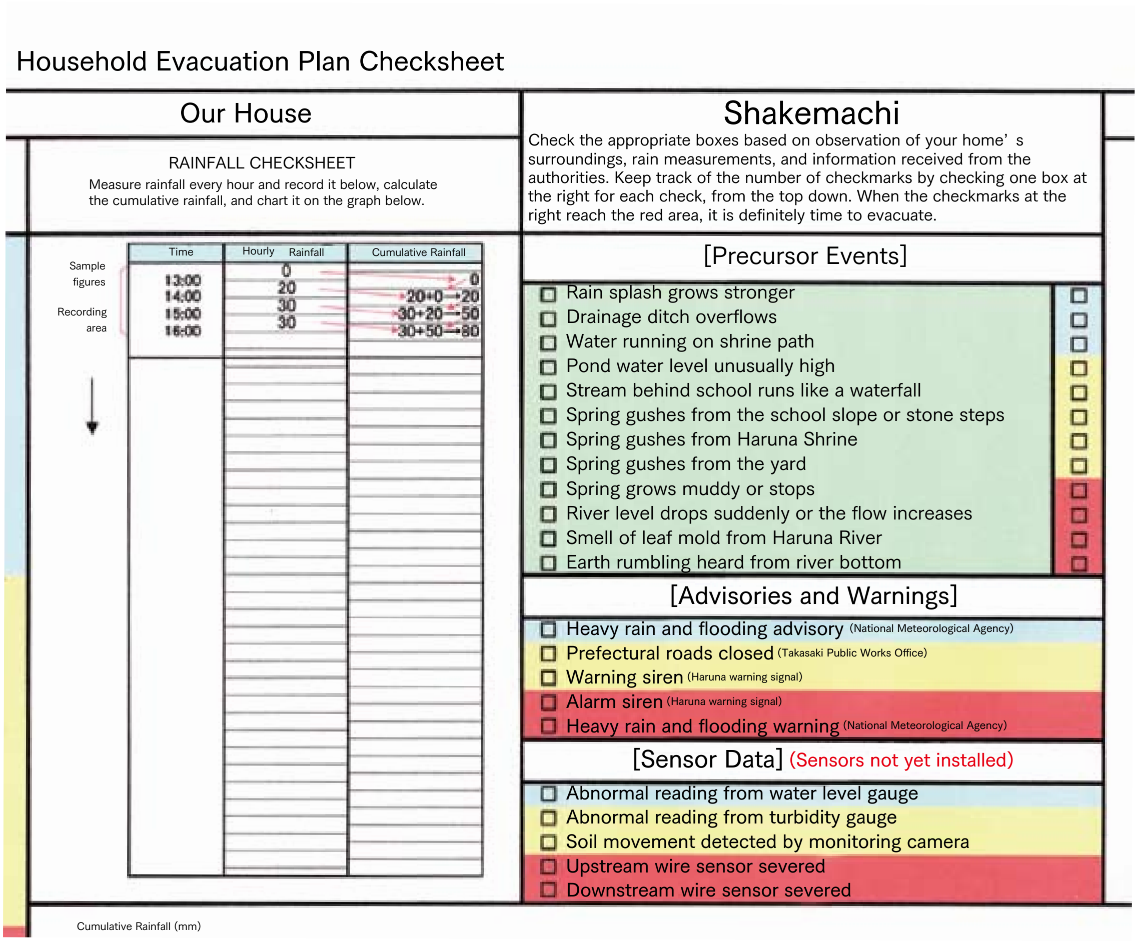


Household Evacuation Plan Checksheet

Activity	Advisory or Warning	Our House: PROCEDURE Follow these steps to determine and perform evacuation	Our House: RAINFALL CHECKSHEET Measure rainfall every hour and record it below, calculate the cumulative rainfall, and chart it on the graph below.
Collect Weather Data (Blue indicates the situation is still safe, before a landslide disaster is likely)	Heavy raid and flood advisory	Gather local rainfall data from TV, radio, etc. Observe and graph rain gauge measurements	Time / Hourly Rainfall / Cumulative Rainfall Sample figures: 13:00 0 0; 14:00 20 20+0→20; 15:00 30 30+20→50; 16:00 30 30+50→80 Recording area
Prepare to Evacuate (Yellow indicates rainfall has become somewhat heavy, and if it keeps falling a landslide could occur)	Prefectural roads closed Warning siren	Double-check emergency supplies, before an electrical failure or other breakdown If a precursor event is observed, contact the local disaster coordinator (Tel: 374-0000) If precursor conditions reach the red level, start evacuation, even if the warning siren Is not heard.	
Start Evacuating (Red indicates that the risk of a landslide has become high, and evacuation is advised)	Alarm siren Heavy rain and flood warning	Start evacuation Potential hazard spots on evacuation routes: (1) Stream at Maruko Bridge (2) Stream flowing from cemetery (3) Stream running from shrine path along road (4) Overflowing water at Kannagara Bridge (5) Overflowing water at Inari Bridge (6) Inundation of road between Inari Bridge and Haruna Lake	Cumulative Rainfall (mm)

Table 1 Evacuation Plan and Chart Evacuation Procedure



Household Evacuation Plan Checksheet

Our House

RAINFALL CHECKSHEET

Measure rainfall every hour and record it below, calculate the cumulative rainfall, and chart it on the graph below.

	Time	Hourly Rainfall	Cumulative Rainfall
Sample figures	13:00	0	0
	14:00	20	20+0→20
Recording area	15:00	30	30+20→50
	16:00	30	30+50→80

Cumulative Rainfall (mm)

Shakemachi

Check the appropriate boxes based on observation of your home' s surroundings, rain measurements, and information received from the authorities. Keep track of the number of checkmarks by checking one box at the right for each check, from the top down. When the checkmarks at the right reach the red area, it is definitely time to evacuate.

[Precursor Events]

- ☐ Rain splash grows stronger
- ☐ Drainage ditch overflows
- ☐ Water running on shrine path
- ☐ Pond water level unusually high
- ☐ Stream behind school runs like a waterfall
- ☐ Spring gushes from the school slope or stone steps
- ☐ Spring gushes from Haruna Shrine
- ☐ Spring gushes from the yard
- ☐ Spring grows muddy or stops
- ☐ River level drops suddenly or the flow increases
- ☐ Smell of leaf mold from Haruna River
- ☐ Earth rumbling heard from river bottom

[Advisories and Warnings]

- ☐ Heavy rain and flooding advisory (National Meteorological Agency)
- ☐ Prefectural roads closed (Takasaki Public Works Office)
- ☐ Warning siren (Haruna warning signal)
- ☐ Alarm siren (Haruna warning signal)
- ☐ Heavy rain and flooding warning (National Meteorological Agency)

[Sensor Data] (Sensors not yet installed)

- ☐ Abnormal reading from water level gauge
- ☐ Abnormal reading from turbidity gauge
- ☐ Soil movement detected by monitoring camera
- ☐ Upstream wire sensor severed
- ☐ Downstream wire sensor severed

Table 2 Evacuation Plan and Chart Check Sheet

Disaster & Women Information Network in Japan
- A Webpage Developed by a NPO in Kobe, Hyogo, Japan -

Japan II

The "Women's Net Kobe," founded in 1992, is a voluntary group established under a NPO "Supporting Center for Women and Children" helping women and children to ensure their rights and provide a forum for learning and networking. The actions taken after the Great Hanshin Awaji Earthquake in 1995 include distribution of relief supplies, counseling on the phone, and organizing public seminars for women in the stricken areas. These activities clearly brought out the difficult situations that many women were exposed after the devastating earthquake.

Since then, the "Women's Net Kobe" has been scaling up creative solutions to these problems faced by women in disasters, despite the lack of institutional resources and policy support. It encourages engaging women as leaders and innovators and proposes vital policy and program agendas for the empowerment of women.

The homepage "Disaster & Women Information Network in Japan" (http://homepage2.nifty.com/bousai/), developed by the "Women's Net Kobe," encourages women to be actively involved in disaster reduction and recovery planning. The homepage has 14 topics as lessons learnt from the experiences of the Great Hanshin Awaji Earthquake: " Elderly women living alone," "Single mothers," "Shelter/temporary housing," "Family," "Job," "Women's health," " Pregnant Women and Mothers with Newborn Infants," "Violence against Women," "Child abuse, " "PTSD and mental care," "Minorities," "Media," "Volunteers," and "Others." Each topic originates ideas to be proposed to policy makers and local governments.

Some examples are: "I wished there had been clinics for women, preferably with midwives." "At least a woman leader should have been appointed in each shelter. I now believe that in post-disaster situations women should participate in the operation of shelters and layout of living spaces within shelters. In preparing relief plans for disaster victims, gender-sensitive viewpoints should be incorporated in both shelter operation and designs as well the stockpiling of relief materials."

The Coordinator of "Women's Net Kobe" says, "After a major disaster, people are forced to lead a stressful life due to the deteriorated living environment and many women experienced various hardships after the Great Hanshin Awaji Earthquake. Drawing the lessons from these experiences, I would like to continue protecting the rights of women and children as well as promoting women's involvement in key activities of disaster reduction and recovery.

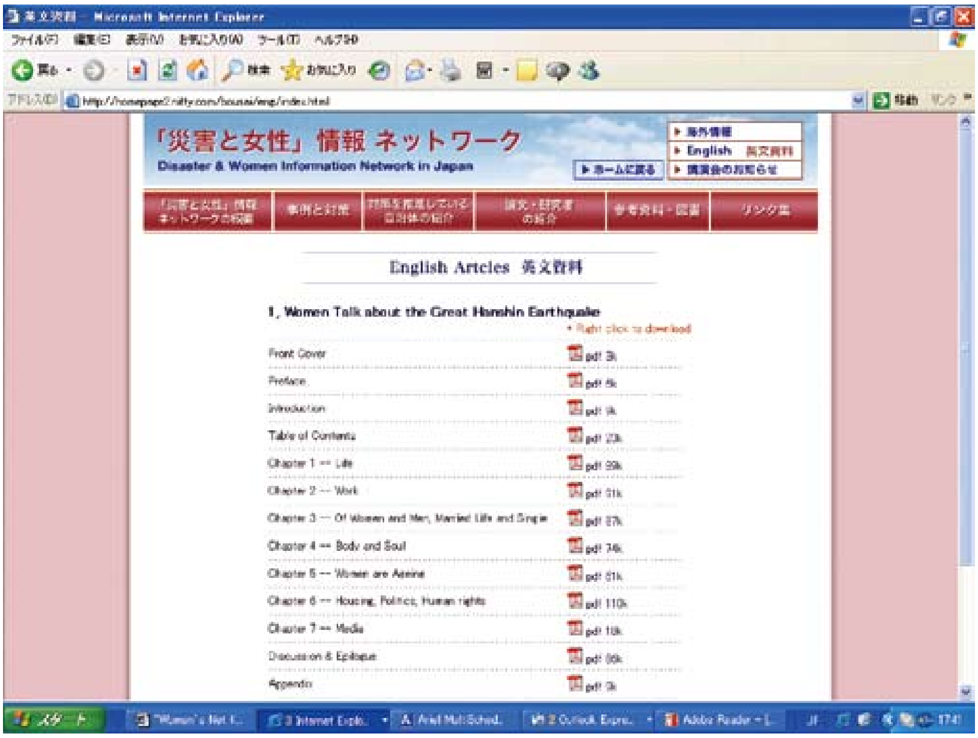
The publication "Women talk about the Great Hanshin Earthquake" was translated into English from Japanese and is posted on the website: http://homepage2.nifty.com/bousai/eng/index.html

- Background

The need to review and analyze the situation of women in disasters and to develop an Internet homepage dedicated to the issue was identified.

- Objectives

To disseminate and share the information on the topic "disaster and women"; to develop a network of people and organizations addressing the issue; and to encourage women to take part in disaster reduction and recovery planning.



- Term/Time Frame

April 2006 – March 2007

- Activities Undertaken

The project reviewed and analyzed the situation of women in disasters and developed an Internet homepage dedicated to the issue, based on the experiences of many women in the Hanshin-Awaji Earthquake.

- Major Achievements

Dissemination of information useful for disaster reduction and recovery through the Internet webpage.

- Total Budget

About JPY 3 million

- Contact details

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Successful Flood Prevention Measures in Myanmar

Myanmar

Dyke failure has been prevented in Myanmar through the multi-level participation of state and local authorities in flood prevention measures, and by using the Myanmar traditional technique of protecting dykes called the dyke called "Yaing Khway." would be introduced. This technique prevented flooding during the monsoon season of 2004 in the Hinthada District of Ayeyawady Division, saving 5 million people and 500,000 acres of farmland from the ravages of flooding.

There are 26 townships in Ayeyawady Division, and Hinthada and neighbouring districts are located in the low-lying area of the Ayeyawady River. One of the major rivers of Myanmar, the Ayeyawady River starts in the northern part of the country, Kachin State, and flows south to the Andaman Sea on the Ayeyawady Coast. Floods usually occur in the low-lying regions traversed by the river, as the combined waters of tributaries and creeks cause the river water level to rise. Because of this, a 106-mile-long earthen dyke was built many years ago to prevent flooding in the Hinthada District. This dyke is regularly maintained and annually reinforced by the Department of Irrigation, Ministry of Agriculture and Irrigation, using heavy machinery--and not just human labor--to strengthen the embankment.

Floods occurred in Kachin State, the origin of the Ayeyawady River, and in Khamtee region, as the upper part of the Chindwin River overflowed its banks in July 2004. According to past experience, a flood in those regions causes the Ayeyawady River in Hinthada township to reach its danger level 7-10 days later, allowing local authorities and relevant departments to start flood preventive measures and the Department of Meteorology and Hydrology to issue water level information and daily rainfall data.

Under the guidance of the Ayeyawady Division Peace and Development Council, a total of 35,000 volunteers from local authorities, concerned departments, armed forces personnel, police departments, NGOs, students and members of local communities were mobilized to participate in flood prevention activities.

Those who participated in flood prevention worked on a rotation system. Four-member flood-monitoring teams were camped every 1/6th of a mile along the 106-mile-long dyke, and they had to work around the clock. Supervisory committees of different levels were also formed. Monitoring stations were equipped with modern communication equipment such as walkie-talkies, radios, and mobile phones, and loud speakers were prepared to issue warnings to the public at a moment’s notice.

The four members of each team were divided into two pairs who walked along the dyke in opposite directions from their camp and inspected the dyke every half hour. When they met the pairs from the neighboring camps, they turned back to their camp and checked the dyke again.

They checked for weaknesses in the dyke and for the formation of holes. Once these were found, they were immediately reported to the responsible person or expert.

The water level of the Ayeyawady River at Hinthada during the monsoon season of 2004 rose above the danger level, so flood patrols were carried out for one month. During that period, 261 holes were found along the 106-mile-long dyke. These holes had the potential to cause the dyke to fail, but they were controlled by Yaing Khway, a Myanmar traditional method of preserving dykes.

A Yaing Khway, or “small well”, is made of bamboo or mangrove poles, bamboo matting, and sand. The basic concept behind the Yaing Khway is to control the flow of water through a hole in a dyke by containing it inside a ring of bamboo matting and sand. This prevents water flowing through the hole from pushing away soil and making the hole wider, causing the dyke to collapse.

A Yaing Khway is made by driving bamboo or mangrove poles into the ground around the hole in the dyke, forming a ring of sufficient diameter, and then laying bamboo matting inside the ring of poles. A second ring of bamboo or mangrove poles and bamboo matting is then constructed around the first one, and the area between the two rings is filled with the sand. The height of the poles and bamboo matting is determined by the height of the dyke and the location of the hole. In this way, the water flowing through the hole slowly rises inside the Yaing Khway until it reaches the level of the river, when it stops rising. The water is therefore controlled and does not continuously flow and erode the soil. A cross section of a Yaing Khway and a photograph are shown in Figs.1& 2.

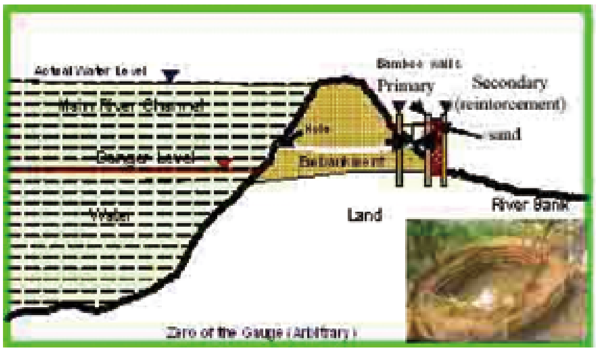

Fig.1 Cross Section of dyke and Yaing Khway, or “small well”

Fig.2 Dyke protected by a Yaing Khway

In 2004, flooding was successfully prevented in the Hinthada District by a combination of factors: good management, the active participation of local inhabitants and NGOs, and the effectiveness of the Myanmar traditional Yaing Khway method. During the 1991 monsoon season, the Hinthada dyke could not be maintained as it was in 2004. The dyke at Htain Ngu collapsed and flooding occurred throughout the area, affecting nine townships, 359,976 people and 260,147 acres of crop land. Based on the lessons and experience gained from that severe flood disaster, the people and local authorities of Hinthada district were able to make the necessary adjustments, and they have since had remarkable success over flooding.

Application of SABO Technology to Control Debris Flow and Landslides: Experience from Mugling-Narayanghat Highway Disaster

Nepal

The Mugling-Narayanghat Highway is an important section of the national highway network because it links the capital, Kathmandu, to Terai and India. The highway is 36 km long and runs along the left bank of the Trisuli River, a major tributary of the Narayani River Basin. The road corridor passes through fragile geo-physical formations of the Lesser Himalayan Zone and Siwalik Zone and crosses about 30 streams and rivulets. Similarly, this section is intersected by several tectonic zones that range in size from regional to local. The elevation of the road corridor area ranges from 200 m to 900 m above mean sea level. The area has a sub-tropical climate and evergreen forests. In Winter temperatures range from 6 to 25 degrees Celsius, while it is 25 to 40 degrees in summer. The average annual rainfall in the area is about 2650 mm.

With a cloudburst rainfall of 446 mm in 24 hours on 31 July 2003, numerous landslides, debris flows, slope failures, and rockfalls were triggered along the Mugling-Narayanghat road corridor. This disaster not only blocked the highway for several weeks but also damaged two bridges, nine culverts, 8.6 km of road pavement, 494 m of retaining walls, and 1480 m of embankment. Emergency measures were taken to open the road by clearing about 200,000 m3 of debris coming from hillsides and streams crossing the highway. However, the highway was far from being fully operational, causing acute shortages of food and fuel in the capital city that affected 2 million people. Realizing the seriousness of the problem and its future socio-economic impact on the nation, the Department of Water-Induced Disaster Prevention (DWIDP) in close coordination with the Department of Roads (DOR) took the initiative towards solving this problem before it became larger. This initiative culminated in to a three-year project known as the "Mugling-Narayanghat Water-Induced Disaster Prevention Project (MNWIDPP)," which received grant assistance from the Government of Japan.

The main objective of the project is to mitigate and prevent water-induced disasters along the Mugling-Narayanghat Highway and to secure the safety of highway traffic. With the technical assistance of the Japan International Cooperation Agency (JICA), the Project has identified 13 major disaster sites, two of which are outside the road corridor. One of these is the Ruwa Khola debris flow near the Marshyangdi Hydropower Station in Tanahun district, and the other is the landslide near Manakamana Temple in Gorkha district. With a detailed survey and investigation of identified disaster sites, the Project has focused on Sabo technology for debris flow control and slope stabilization. A series of Sabo dams, check dams, and river toe walls and gully stabilization works, landslide protection works and bioengineering works are the main structural works designed to cope with debris flow and slope failure. The major countermeasure works of this project are described as follows.

Sabo dams at Ruwa Khola: To safeguard the Marsyangdi Power Station and the highway bridge, two concrete Sabo dams were constructed at Ruwa Khola at chainage points 0+275 and 0+460. These Sabo dams performed very well during the monsoon season and protected the power station and the Prithivi Highway bridge.

Photo 1: Sabo dam at Ruwa Khola at Ch 0+460

Sabo dams at Khahare Khola: Two Sabo dams were successfully completed at Khahare Khola at chainage points 0+220 and 0+310. These Sabo dams functioned well during the floods of

2006 as floodwaters carrying debris flowed over these structures without inflicting any damage on highway bridges and nearby houses.

Check dams at Gaighat Khola: A series of gabion check dams (10 check dams and 5 retaining walls) was constructed at Gaighat Khola at Ch 18+940 km. To prevent downstream scouring, a gabion-launching apron with a plain concrete capping was designed. Bio-engineering works such as bolster construction; slope trimming; and bamboo, tree and grass plantation were also carried out, along with structural countermeasure works. The performance of these check dams has been satisfactory in reducing stream gradients and stabilizing slopes.

The Project is scheduled to be completed by July 2008 and the countermeasure works completed to date have demonstrated satisfactory performance in minimizing road damage in the rainy season. With the implementation of the project, the frequency of road blockages due to debris flow, landslides, or by slope failure has been significantly reduced.

Photo 2: Sabo dam at Khahare Khola at Ch 0+220

Photo 3: Check dams at Gaighat Khola at Ch 18+490 km

- Background

Mugling-Narayanghat Highway is the bottleneck section of the national highway network of Nepal, and it was severely damaged by intense rainfall on 31 July 2003. The highway was blocked for several days due to the damage of two bridges, nine culverts, 8.6 km of road pavement, 494 m of retaining walls, and 1480 m of embankment. The DWIDP took the initiative to retrofit this road section with the grant assistance from the Government of Japan. With the technical assistance of JICA, the Project has focused on Sabo technology to cope with 13 major disaster sites that have been identified.

- Objective

The main objective of the Project is to mitigate and prevent water-induced disaster along this section of the road and to secure the safety of highway traffic.
Time Frame: Initially planned as 2004-2007, later extended up to 2008.

- Activities undertaken

Construction of Sabo dams, check dams, toe protection retaining walls, and bioengineering works in 13 disaster sites, including Ruwa Khola, Khahare Khola, Jugedi Khola and Das Khola.

- Major achievements

With the implementation of Sabo technology for controlling debris flow and landslides, fewer number of water-induced disasters have been observed in monsoon season. In general, the project has had a significant positive impact on highway traffic safety.

- Total budget

NRs 302.5 million (US$4.76 million)

- Contact details

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Safety and Security System for Hazmat Transport Vehicles in Singapore

Singapore

AN EMERGING THREAT

The threat of terrorists using hazmat such as highly flammable materials or hazardous chemicals for terror attacks is real and not without precedent. On 11 Apr 2002, terrorists drove a truck carrying liquefied natural gas and ignited the cargo in front of a synagogue in the Tunisian island of Djerba, killing 21 people and injuring 30. Between May and Aug 2002, terrorists attempted to attach remotely triggered bombs to Israeli fuel tankers with plans to detonate them at targeted locations. And in January 2007, Iraqi insurgents adopted a new and ominous strategy of attacking and blowing up trucks carrying toxic chemicals such as chlorine in heavily populated areas. One such attack destroyed a truck and ruptured a chlorine tank, releasing highly toxic fumes that sickened 150 civilians. The attack was followed a day later by a second similar attack that killed 5 and hospitalized 55 who had inhaled the poisonous gas.

THE SECURITY CHALLENGES

Given the current heightened security tensions after the September 11 terrorist attacks, vehicles transporting hazardous materials (hazmat) on the road can potentially be hijacked by terrorists to be used as weapons of mass destruction for their terrorist acts. They may try to hijack and blow up a vehicle transporting bulk quantities of flammable or toxic substances, thereby causing serious damage and harm to lives and property. As Singapore has a vibrant industrial sector where large quantities of hazmat are moved around by road transport daily, hazmat transportation does pose a security threat. To tighten security regarding hazmat transportation and enhance security on the roads, the HTVTS system was introduced.

The system, known as the Hazmat Transport Vehicle Tracking System, or HTVTS, is also able to remotely immobilise a hazmat transport vehicle in the event of an emergency. The key objective of the HTVTS is to reduce hazmat transportation vulnerabilities, and to prepare a system that will protect against, deter and respond to intentional or unintentional violations involving hazmat transport vehicles.

The Fire Safety Petroleum and Flammable Materials Regulations were enacted in Feb 2004 to allow the Singapore Civil Defence Force (SCDF) to track and immobilise hazmat transport vehicles. Figure 1 shows the different types of hazmat transport vehicles that travel on Singapore's roads. All these vehicles are required to have an authorized workshop install a tracking and immobilising device.

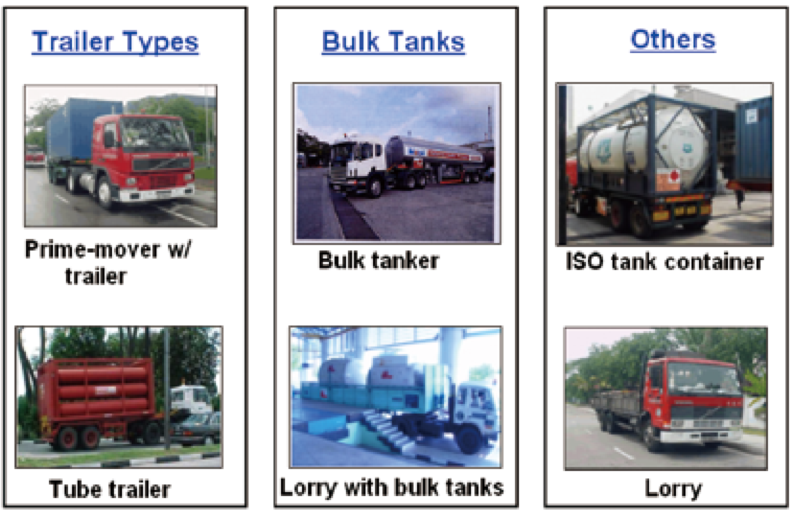

Figure 1.
Different types of hazmat transport vehicles

The HTVTS tracking system gives the SCDF an overall picture of the movement and location of all hazmat transport vehicles in Singapore on a 24/7 basis. This traffic is centrally monitored by an SCDF officer in the Operations Centre Control Room via proprietary interface software. The operator at the monitoring console is alerted by an alarm if a vehicle enters a restricted zone or deviates from an authorised route. The SCDF also sets specific sensitive areas as restricted zones using a "geo-fencing" feature and monitors these geo-fenced zones for unauthorised entries.

The immobilising system employs "Limp Mode" technology, which controls the throttle in order to restrict fuel injection and prevent acceleration. This system slows a vehicle gradually and safely without interfering in its power steering and braking systems. Using a process similar to the action of deceleration, the vehicle is safely slowed to 10km/hr before it comes to an eventual stop. The hardware used by the HTVTS to monitor and track the location of vehicles is the Geo-Location Platform (GLP) device (see Figure 2).

Figure 2. GLP tracking device

In addition to the HTVTS, all drivers of hazmat transport vehicles are required to have a valid HazmatTransport Driver Permit (HTDP) (see Figure 3), which allows drivers to be screened for security reasons. Upon successful screening of the driver's profile, he is required to attend a one-day Hazmat Transport Driver Course. The course covers subjects such as hazards identification, the safe transportation of hazardous goods, transport emergency response plans and the basics of fire-fighting and spill/leak mitigation. If the driver passes the test at the end of the course, he is issued an HTDP. The HTDP also contains fingerprint data and other biometric data, as well as personal particulars such as driver's name and identification number, company name and address, and the validity period of the permit.

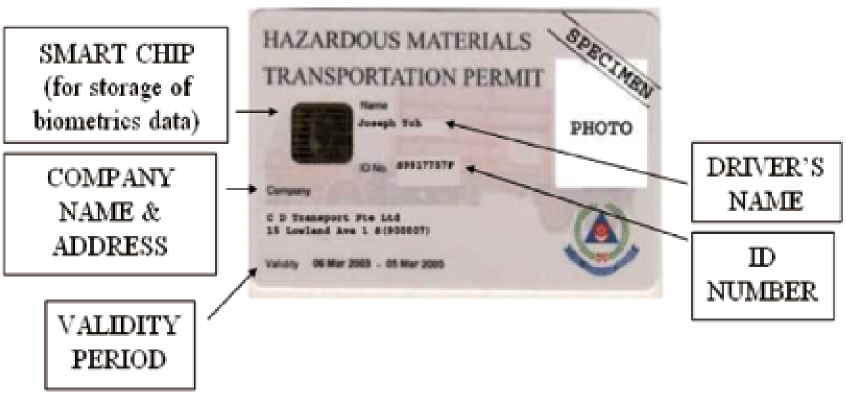

Figure 3. Particulars of driver printed on the permit

Figure 4.
Vehicle with orange-colored licence plate

To ensure that other road users are able to recognise hazmat transport vehicles, tracked vehicles are required to carry orange-colored licence plates (see Figure 4).
These tracked vehicles must adhere to their respective, authorised routes and hours of transportation (daylight hours) at all times. Failure to do so will result in a violation, which is detected and registered by the HTVTS.

CONCEPT OF OPERATIONS

Once the HTVTS detects a violation and activates the alarm, the operator in the control room activates the immobiliser on the vehicle that is violating the transportation rules to avoid a possible security threat. The operator then notifies SCDF enforcement officers and the Singapore Police Force (SPF), who respond to the incident and determine whether it is a security violation. See Figure 5 for the overall concept of the how system works.

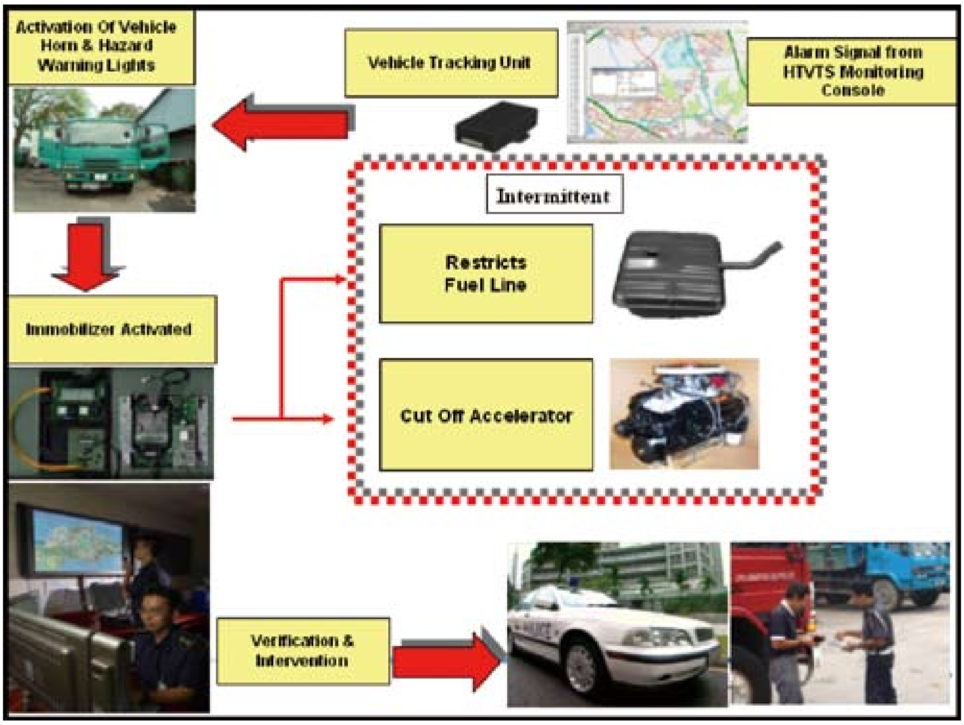

Figure 5. HTVTS operational concept

EFFECTIVENESS OF OVERALL SYSTEM

Before the HTVTS was introduced, the SCDF could not locate or track the movement of vehicles transporting flammable or hazardous cargoes. They also had no way of determining whether a vehicle had been hijacked by an unauthorized person or, in the worst-case scenario, a terrorist using the vehicle to inflict damages on sensitive installations or buildings. In addition, due to limited manpower and resources, the SCDF was unable to ensure absolute compliance of hazmat transport vehicles on the roads.

With the introduction of the HTVTS, the SCDF can now locate and track the movement of all hazmat transport vehicles. The SCDF operator can see the location and movement of all tracked vehicles in real-time, and he can also 'poll' the vehicles to determine a specific vehicle's current status or information such as company name, contact person, and vehicle type. Any vehicle that travels on an unauthorised route, encroaches into a restricted zone or travels during an unauthorized time of day will automatically activate the alarm at the monitoring console to alert the operator. The operator will be able to advise and guide enforcement officers on patrol to effectively track and locate the errant vehicles. With the implementation of the second phase of the system, the immobiliser feature will allow the operator to remotely slow down and eventually stop errant vehicles, preventing them from advancing any further to their destination before the arrival of the enforcement officers.

This system ensures the compliance to the regulated hazmat transportation routes and times, and allows enforcement officers to conduct regular enforcement checks efficiently. The added security measures not only enhance the safety and security of hazmat transportation in Singapore, but also deter terrorists from hijacking these vehicles and using them as weapons to compromise the security of sensitive installations and government buildings. The system plays a critical part in supporting the nation's layered defence strategy to safeguard the population.

CONCLUSION

Since its implementation, the HTVTS has been effective in detecting vehicles that do not conform to hazmat regulations and has improved the overall efficiency of enforcement officers in locating and addressing errant drivers who violate regulations. The number of drivers violating the rules has also decreased steadily since the system was implemented, implying that more and more drivers are conforming to the authorised routes and transportation times. The implementation of the immobilisation phase will achieve the desired objective of tightening up the security of hazmat transportation in Singapore.

CONTACT DETAILS

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Community Capacity Building for Minimising Adverse Tsunami Impacts in Sri Lanka: Experience of Disaster Management Centre, Sri Lanka

Sri Lanka I

Main Story:

In the aftermath of the 2004 tsunami, an immediate concern was whether the vulnerable communities in coastal areas had been adequately made aware of how to act if another tsunami hits the country.
As a solution the government decided to initiate Community Awareness Programmes to minimise adverse tsunami impacts in the coastal areas through the Disaster Management Centre (DMC).

The strategy adopted by DMC was to establish District Disaster Management Coordinating Units (DDMCUs) to work with the district administrative system in the tsunami-affected districts and implement a massive community awareness programme. A decision was taken to deploy about 225 officers and instructors from the Sri Lanka Army, Navy and Air Force and Police Special Task Force (STF) to these District DM Units.

As their immediate role was to conduct awareness programmes to community groups, they had to be trained as trainers. The training covered an overview of DM, community-based disaster management, raising community awareness and community mapping.

The training was followed by the formation of the DDMCUs in 9 tsunami-prone districts - Colombo, Gampaha, Kalutara, Galle, Matara, Hambantota, Puttalam, Trincomalle and Ampara. Senior-level military/police officers were placed as coordinators in each of the districts with 20 - 25 junior officers as assistant coordinators to assist them in these activities. Officers from the Air Force were deployed to 2 districts, from the Navy to 1 district, from the Police to 1 district, and from the Army to the remaining 5 districts.

For the community awareness programmes to be effective, officials of the district administrative bodies, including district-, division-and village-level officials, had to be given knowledge about tsunamis and the proposed community awareness programmes, as their support was essential for the success of the programme. The need to establish district-, division-and village-level Disaster Management Committees and Sub Committees was stressed at these awareness workshops.

The District DM Coordinating Units organised and implemented the following activities:

- Initial Awareness Programme aimed at the community, including the distribution of tsunami leaflets, information on how warnings will be disseminated and, where possible, the preparation of map sketches showing safe evacuation shelter locations and safe evacuation routes
- Second programme (as needed) to complete the preparation of community maps
- Mock evacuation drills with simulation of warnings.

It was clear that the strategy adopted by the DMC to employ personnel from the military forces was extremely effective and successful. This was vividly seen during the tsunami alert on 12 September 2007, during which people in coastal areas were effectively evacuated to safe shelters identified earlier in the community awareness programmes. From this it is evident that the public and the government can be confident that communities in vulnerable coastal areas will be able to be evacuated in a timely and effective manner in the face of a future threat. The success can be attributed to several factors, namely,

i. Effectiveness of community capacity-building programmes
ii. DM training imparted to the officials of District Coordinating Units on how to raise awareness and work with communities, and

iii. The deployment of officers and instructors from the Military Forces and Police Department to the District Coordinating Units, which achieved maximum results.

Tsunami hitting the Galle District in December 2004

Community members developing a community map at a Hazard Mapping Workshop in Galle District in January 2006

Tsunami evacuation drill in Gampaha district

Tsunami evacuation drill in Colombo district

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Background:

Sri Lanka is affected by several types of natural hazards. The more significant ones according to frequency of occurrence and severity of impact include floods, cyclones, droughts, landslides and coastal erosion. More localized hazards such as lightning strikes, epidemics and hazards related to environmental pollution also affect pockets of the population from time to time. The Indian Ocean tsunami of December 2004 highlighted the vulnerability of Sri Lanka to such low-frequency but high-impact events.

In May 2005 in the aftermath of the 2004 tsunami, the Sri Lanka Disaster Management Act was enacted by Parliament. Consequently, in July 2005, the Disaster Management Centre (DMC) was established as the lead agency on disaster risk management in the country, under the National Council for Disaster Management (NCDM).
To achieve maximum results, the government decided to staff the district units with military personnel, which turned out to be a wise decision.

Objective:
Creating awareness among vulnerable communities to minimise the impact of tsunamis on coastal areas of the country

Time Frame:
Phase 1: November 2005 to December 2005
Phase 2: January 2006 to March 2006

Activities undertaken:
i. Training of Trainers (ToT): As the immediate role of trainers was to conduct awareness programmes for community groups, the objective of training was to provide them with:
- A knowledge of disaster management (DM)--both general and specific to tsunamis--adequate for conducting the awareness programmes
- An understanding of community-based preparedness activities such as community mapping, identifying safe evacuation shelter locations and safe evacuation routes, preparing an evacuation plans, and conducting evacuation drills
- The methodology for conducting the different activities of the awareness programme to obtain good community participation.

To cover the total target group, six 3-day Training of Trainers (TOT) courses were immediately organised. Owing to the urgency of commencing the community awareness programmes, these courses had to be completed at the earliest possible time. With this in view, 3 resource teams were established for each day of the course and each day's sessions were organised in such a manner that each resource team would undertake the sessions of the relevant day in one course and move on to the next course the following day (as in the Line-of-Balance technique).

The course was designed to cover the following :
- Overview of DM and related terminology and current state of DM in Sri Lanka
- Paradigm shift in managing disasters from traditionally dominant approach, i.e., shift from emergency management to risk management and considering the community as a resource and not a victim
- Community-based approaches and community-based disaster management
- Introduction to and consideration of community-based risk assessment and community perception of risk
- Community-based vulnerabilities and capacity assessment
- Tsunami hazards - early warning methods; early warning dissemination; and evacuation
- Community awareness and community-level planning for evacuation
- Group activities for community involvement in developing plans for tsunami warning dissemination and evacuation, consisting of:
  i) an outline of the Community Awareness Programme agenda;
  ii) community involvement in preparing map sketches showing safe evacuation shelter locations and safe evacuation routes;

iii) organisation of tsunami evacuation drills for the community;
iv) group presentations and discussions.

The training methodology adopted consisted of lectures using Power Point presentations, video presentations, discussions encouraging two-way communication, group activities, and role playing. Local languages were used as the medium of communication.

ii. The training was followed by the formation of the DDMCUs in 9 tsunami-prone districts - Colombo, Gampaha, Kalutara, Galle, Matara, Hambantota, Puttalam, Trincomalle and Ampara – with senior level military/ police officers as coordinators in each of the districts and around 20 junior officers as assistant coordinators to assist them in these activities.

iii. Development and printing of tsunami leaflets in English, Sinhala and Tamil (one million copies) for distribution during the awareness programmes.

iv. Organisation and implementation of,
- Initial Awareness Programme for the community, including warning dissemination system and, where possible, the preparation of map sketches showing safe evacuation shelter locations and safe evacuation routes
- Second programme (as needed) to complete the preparation of community maps
- Mock evacuation drills with simulation of warnings.

Major achievements:

- Effective awareness creation among vulnerable coastal communities for evacuation in a timely and effective manner in the event of a future threat
- Village-level community maps showing safe evacuation routes in the event of a tsunami

Total Budget:

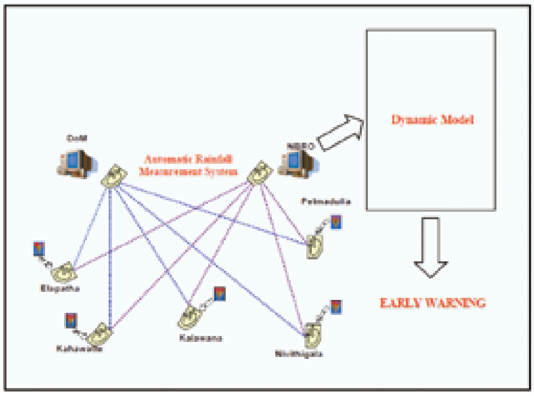
Funds allocated by the DMC for Phases 1 & 2 totaled approximately 20,218,500 Sri Lanka rupees (US$225,000).

Internalisation of Disaster Safety Message in a Community: A Case of Safety from Landslides

Sri Lanka II

Main Story

In 2007, the Disaster Mana andslide early warning system on a demonstration basis with the idea of replicating the system depending on its success. The National Building Research Organization (NBRO) and the Department of Meteorology also collaborated in this project. Automatic rain gauges were located at five selected locations in Ratnapura District, and the rainfall data were fed via SMS directly to a dynamic computer model developed by NBRO. This allowed early warnings of possible landslides to be disseminated to specific locations.



Landslide Early Warning System Diagram


Map of the 5 Divisional Administration Areas

One part of this project was community capacity-building through participation in hazard mapping,identification of safe routes and safe areas and participation in mock drills.

During these community activities, it came to light that most escape routes became flooded within a few hours of the start of rain, even before an early warning could be issued. At Elapatha, a structural intervention appeared necessary to cross the flood-prone passage across a waterway, so a suspension bridge was constructed at the appropriate location.

A visible sign of concern for its safety, the bridge catalyzed the community to pick up on the safety message. The community members formed their own organisation and conducted mock drills on their own to make sure all community members became aware of which evacuation route to use when an early warning was issued. The last mile took ownership of its safety.

The lesson learnt is that concrete measures, and not just awareness creation, can facilitate the internalization of a safety message through the conviction brought about by visible on-site action on the part of the Disaster Management Centre.


Traditional communication systems in villages

Public Announcements through Radio, TV


Evacuation Drill

Information for readers to search

Background

Almost all landslides in Sri Lanka that have been investigated to date are known to be rain-induced. Therefore, this project was proposed to investigate the possibility of interpreting landslide events interms of the rainfall patterns immediately preceding the slide event. Statistical information on threshold values of rainfall that trigger landslides are obtained by analyzing rainfall patterns and can be deployed as regional early warning indicators.

This rainfall value is not the same throughout the country due to the differences in existing soil characteristics and climatological patterns in different areas of the country. Therefore, a complete study of the rainfall patterns in landslide-prone areas and their records of landsides will help to predict reasonable threshold values of rainfall and use them as a tool for landslide forecasting.

Threshold values of rainfall in most parts of landslide-prone districts have been already identified, but using these values to forecast landslides is not yet feasible due to the following reasons:

a. Lack of community awareness about the rainfall threshold value
b. Lack of facilities to measure rainfall, especially at the village level.

Therefore, proper awareness of critical rainfall values and quantitative measuring of rainfall are useful for forecasting landslides, especially at the village level. By providing villages with simple rain gauges and the training necessary to use them, they can assess their risk by analysing rainfall records during a rainy period.

Objectives:

- Establishment of an early warning mechanism for landslides (with the idea of replicating it at the national level in the future)
- Strengthening the dissemination of early warning mechanisms to communities, with community participation
- Frequent coordination between the expert organisations and communities for prompt action before and after a disaster.

Time Frame: 2 years commencing January 2006

Activities undertaken:

i. With UNDP assistance, 5 automatic rain gauges manufactured by ITI have been installed at selected locations in Kahawatta, Pelmadulla, Nivithigala, Elapatha, and Kalawana Divisions.
ii. The real-time rainfall readings taken at the above stations are received by both NBRO and the Met Dept. NBRO is using this data to issue early warnings based on the threshold values.

iii. Programmes have been conducted to create awareness among the communities in the above areas about the advantages of the early warning system in safeguarding them from landslides. Evacuation areas have also been identified and community groups have been appointed to take care of the installed rain gauges.

iv. A computer-based early warning model is being developed by NBRO for issuing early warnings at the national level.

Major achievements:

- Community participation in the dissemination of early warnings to communities
- Internalisation of disaster safety message in a community through concrete mitigation measures
- Ability to read rainfall gauges in real time and issue early warnings in time, and availability of rainfall data for further research

Some problems noted:

Some problems were noted and are being corrected at present:

- Rainfall readings taken from the rain gauges are disseminated through SMS. However, on certain days, the required automatic modem registration does not happen with the current SMS service, and as a result NBRO and Meteorology Department are not receiving the rainfall data.
- Monthly cost of SMS service is high

Total Budget:

Funds allocated were approximately 250,000 Sri Lanka rupees (US$25,000)

Community–Based Landslide Watch Network in Thailand

Thailand

1. Background:

Thailand is located in a tropical monsoon zone. It covers an area of 513,115 km2 and has a population of 65 million. Thailand is comprised of 76 provinces and is geographically divided into 5 regions: Northern, Northeastern, Central, Eastern and Southern. The Northern, Southern and Eastern Regions are predominantly high mountainous areas while the Central Region is mainly lowlands with high mountains on its western border. The Northeastern Region is a high plateau with mountains on its southern and northern borders.

From historical data, landslide disasters have usually occurred in the Northern and Southern Regions. A landslide disaster occurred in Katoon, Nakhon Si Thamarat Province in 1988, killing and injuring 230 people and damaging a lot of houses, infrastructure facilities, and agricultural crops. The total cost of damages was estimated around 1 billion Baht (US$25 million). Then there were no landslides for 12 years from 1989 to 1999. After that, there were landslides and flash floods in Phetchabun Province in 2000 and in Phrae and Phetchabun Provinces in 2001, followed by nearly annual occurrences since then.

The Department of Mineral Resources (DMR) realized that landslides would cause a lot of problems in the future, so it undertook several research and study projects on landslides. In addition, DMR established community-based landslide watch networks, including local networks, and a landslide monitoring center called as the Geohazards Operation Center in Bangkok. Presently DMR utilizes the center as the contact point to coordinate with the networks and relevant agencies.

2. Objectives

Landslides are natural hazards that cannot be prevented, and they generally happen in remote mountainous areas far from help. In such areas, and in bad weather, communication often breaks down and road access may be cut off, making it impossible for government agencies to help local people. The best way to solve the problem is to improve the self-protection capability and landslide awareness and knowledge of the people in vulnerable areas.

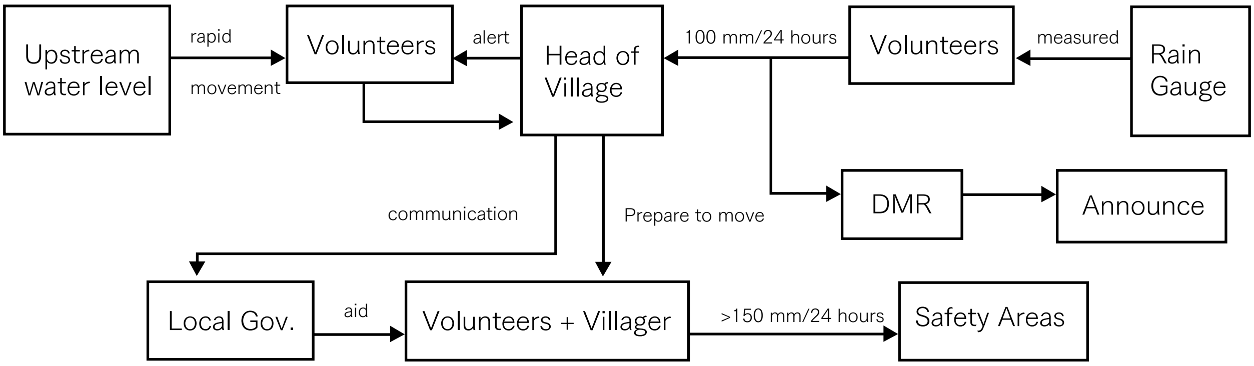
3. Network Establishment

To establish a network, DMR personnel talk to local communities, especially the heads of villages. They explain landslide hazards in the surrounding area and point out evidence of past landslides, such as big boulders, landslide deposits and signs of flooding. Then the DMR personnel will ask the head of a village to choose 6 – 9 villagers who will volunteer to participate in training. Normally, the training is organized for groups of villages which are located in the same catchment area. The volunteers are trained by DMR personnel and learn about landslide behavior and how to use a rain gauge. They are also taught about signs of potential landslides and how to recognize them. Then an observation site, or check point, is selected by the DMR personnel and volunteers. Ideally, the check point should be located on a hill near a stream or river flowing to the village so that the volunteers can observe the water level and debris. When they hear a rumbling sound from the mountains or notice a rapid change in the water level, they send signals to warn the people in their village and other downstream villages. In the training course, evacuation routes and assembly areas for each village are also worked out.

In conjunction with local warning networks in landslide risk areas, DMR established the Geohazards Operation Center in Bangkok and in the central part of Thailand. The center is a national facility and is mainly responsible for monitoring landslides and coordinating with the local networks.
When a heavy rain is confirmed or the estimated rainfall is higher than 100 mm/day and it is still raining, the center will disseminate watch bulletins. The bulletins are also issued in special cases when a tropical

cyclone is approaching. Usually, 60 bulletins/year are sent by facsimile to television and radio stations as well as relevant agencies. Recently, the networks in risk areas have started providing information by telephone and Short Massage Service (SMS) via mobile phone. After they receive the information, the local networks will man their check points to watch for signs of landslides and prepare to issue warnings.

Warning Network Flowchart



The local networks can also phone the center to get information about the weather or to report landslide and flash-flood information. Because of the importance of this information, the center distributes it to other networks and uploads it to the DMR Website.

4. Achievements

The first local network was established in 2003. In all of Thailand, there are presently 8,536 volunteers working in networks linking 1,092 communities or villages in 22 provinces. Due to the good performance of the networks, DMR has strong support from the Thai government to establish local networks in the other 29 provinces. DMR also arranges workshops to upgrade all networks every year, and to keep in touch with local communities and inform them about new technologies and to re-encourage them. In 2007, DMR established networks in 12 of the provinces that were not on networks.

6. Conclusion

To mitigate the impact of landslides, DMR establishes community-based watch networks, which include local warning networks and the Geohazards Operation Center. The local watch networks use village volunteers working as guards at check points to observe signs of landslides. They are only on duty when heavy rain is approaching or they are receiving landslide watch information from DMR. They were trained to have knowledge of landslide behavior and warning and evacuation procedures. They were also trained to measure rainfall and how to coordinate with DMR. To maintain the networks, DMR plans to upgrade them every year. Local villages and communities can therefore play important roles in the landslide watch networks for their own safety and that of and others.

7. Contact Details

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