BUILDING COMMUNITY RESILIENCE TO DISASTERS IN UPLAND AREAS OF VIET NAM:

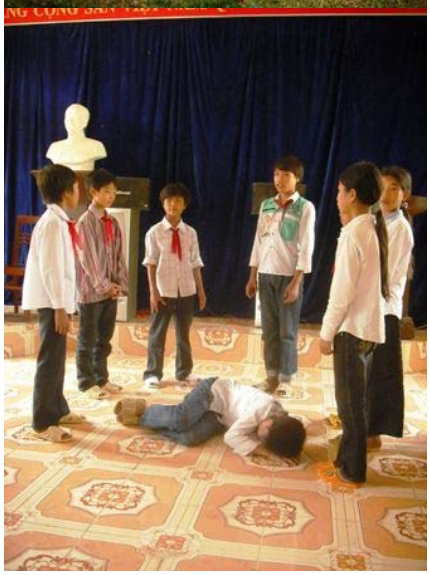
LESSONS LEARNT

EUROPEAN COMMISSION
Ủy ban Châu Âu
Tổ chức Hỗ trợ Nhân đạo

CECI
CENTRE FOR INTERNATIONAL STUDIES AND COOPERATION
Trung tâm Nghiên cứu và Hợp tác Quốc tế

ACTED
Tổ chức Nhân đạo, Hợp tác và phát triển Pháp

in Lao Cai Province and Kon Tum Province, Viet Nam



Lessons Learnt

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TABLE OF CONTENTS

ABBREVIATIONS

BCRD	Building Community Resilience to Disasters in Upland Areas of Viet Nam Project
CBDRM	Community Based Disaster Risk Management
CFSC	Committee for Flood and Storm Control
DMC	Disaster Management Centre
DRR	Disaster Risk Reduction
ERR	Emergency Response and Rescue
EWS	Early Warning System
GIS	Geographic Information System
GPS	Global Positioning System
HVCA	Hazard, Vulnerability and Capacity Assessment
IEC	Information, Education and Communication
MARD	Ministry of Agriculture and Rural Development
MOLISA	Ministry of Labour, Invalids and Social Affairs
MONRE	Ministry of Natural Resources and the Environment
NGO	Non Governmental Organization
NRC	Netherlands Red Cross
NSDPRM	National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020
PMB	Project Management Board
ToT	Training of Trainers
SCA	Save the Children Alliance
VND	Vietnamese Dong

1. KEY LESSONS LEARNT BY BCRD PROJECT

1. Few agencies have worked with ethnic minorities within upland areas in Viet Nam on Disaster Risk Reduction (DRR). The project learnt the importance of **piloting**, testing, closely monitoring, reiterating, conducting refresher courses, repeating events, and only expanding those activities that proved to reduce the impact of disasters. Such an approach takes considerable time and patience, as well as openness to explore what worked, what didn't work, and why.

2. It is important to work within **current strategies and structures** to increase ownership and sustainability of DRR activities. Working with local government systems (province, district, and commune) helps increase officials' capacities to do DRR work, whilst engagement with mass organizations helps reach their membership in remote and scattered communities.

3. Involving all local **layers of government** (province, district, and commune) is crucial due to the different roles they play in advocating for and rolling-out the project (provincial level), in supporting and mentoring (district level), and in training and implementation (commune level).

4. Awareness-raising activities must be done in the **local ethnic language.** This can be achieved through using local district and commune trainers who know the language in addition to Vietnamese. Awareness-raising tools should use more pictures representative of the target area and less text, with trainers available to explain the picture messages.

5. **Learning-by-doing** is the preferred method to teach people about DRR. In particular the simulation drill of a disaster happening where emergency equipment and teams are tried and tested helped save lives during Typhoon Ketsana (Storm No.9, 2009).

6. Using **fun activities** helps attract and engage people during awareness-raising events. Evening cultural events, drama, songs, quizzes, and competitions are popular ways of raising awareness amongst ethnic minority communities.

7. Early **warning services** such as rain gauges need to be simple and reliable as well as easy to maintain and operate if local authorities are to use and rely on such services.

8. Investment in appropriate **communication services** within upland areas (such as wireless systems) can prove beneficial to disseminate disaster warning messages as well as for DRR awareness-raising purposes.

9. The use of **participation** was new for the ethnic communities as well as for district and commune trainers. The project had to invest considerable resources in teaching participatory techniques before engaging in DRR activities.

10. **Digital hazard maps** are useful tools for archiving disasters and for planning purposes. The government's scheme to relocate households out of hazardous areas made use of the hazard maps. Communities however found digital hazard maps too complex to understand, with signboards in high risk areas being a more understandable awareness-raising tool.

2. DOCUMENT PURPOSE

This document presents the lessons learnt from the implementation of *Building Community Resilience to Disasters (BCRD) in Upland Areas of Viet Nam*, a Community Based Disaster Risk Management (CBDRM) project working with ethnic minority communities in the upland areas in Viet Nam.

The purpose of this document to record and disseminate experiences, results, and best practice derived from the project activities. The document is written for Government, NGOs, and other development practitioners who are specifically interested in Disaster Risk Reduction (DRR) within upland areas and with ethnic minorities.

In particular, this document describes the practices and lessons learnt from three interlinked DRR areas:

1. Awareness-raising on disasters in ethnic minority communities.
2. Early Warning Systems (EWS) in upland areas.
3. Hazard mapping in upland areas.

For each topic, the following information is provided:

1. Background description of the DRR area.
2. Why the project worked on this area.
3. How the project implemented this area.
4. What the project learned from implementation.
5. How this implementation compares with how other organizations work on this area of DRR.

3. PROJECT BACKGROUND

3.1. DISASTER PROFILE OF VIET NAM AND ITS UPLAND AREAS

Viet Nam suffers from many different types of natural disasters[1], as demonstrated by Table 1 below[2]:

Table 1: Summarized Table of Serious Natural Disasters in Viet Nam from 1900 to 2009

		# of Events	Killed	Total Affected	Damage (000 US$)
Drought	Drought	5	-	6,110,000	649,120
Epidemic	Unspecified	1	16	83	-
	Bacterial Infectious Diseases	1	598	10,848	-
	Parasitic Infectious Diseases	1	200	-	-
	Viral Infectious Diseases	7	368	17,823	-
Flood	Unspecified	7	836	1,150,175	13,400
	Flash flood	9	293	213,603	59,200
	General flood	36	3173	19,887,410	1,946,925
	Storm surge/coastal flood	6	804	4,353,316	749,000
Mass movement wet	Avalanche	1	200	38,000	-
	Landslide	4	117	1,073	2,300
Storm	Unspecified	9	298	36,780	1,035
	Local storm	7	144	4,450	10,100
	Tropical cyclone	63	18119	41,908,049	3,269,270

Within upland areas in Viet Nam, **flash floods** and **landslides** are the most prominent natural hazards[3]. These types of disasters do not register high damage figures in comparison with the general floods or tropical cyclones that affect Viet Nam's coastal areas. These lower damage figures can be primarily ascribed to the lack of assets, or the existence of low value assets, within upland areas as a result of the high rates of poverty that exist there. The number of people affected and killed by these flash floods and landslides and the impact in deepening poverty means that they warrant attention, and that interventions are required in order to help save both lives and livelihoods.

Flash floods and landslides are particularly complex and difficult to manage in terms of emergency mitigation, preparedness and response for a number of reasons:

[1] A **disaster** is any event, natural or man-made, which threatens human lives, damages private and public property and infrastructure, and disrupts social and economic life. Disasters are seen as the consequence of inappropriately managed risk. (UNISDR Terminology http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm)

[2] In order for a disaster to be entered into the CRED database at least one of the following criteria has to be fulfilled: 1) 10 or more people reported killed; 2) 100 people reported affected; 3) a call for international assistance; 4) declaration of a state of emergency. From http://www.emdat.be/ as of 4 November 2009

[3] A **hazard** is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (UNISDR Terminology http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm)

- The occurrence and severity of flash floods depends on numerous factors including rainfall, river and stream levels, soil water saturation, erosion and other variables, making forecasting and early warning more challenging than for other types of hazards.
- Flash floods can trigger or result from landslides and mud flows, causing a series of dangerous events that are difficult to predict. Although landslides are highly localized, they can be particularly hazardous due to their frequency and difficulty in predicting their occurrence.[4]
- Local populations receive very limited if no warning before such a disaster occurs, and may be unable or unaware of how to protect themselves and their assets.
- The communities affected are often in remote areas with poor road access. The occurrence of landslides and mudflows can further impede road access and residents can be cut-off from external supports during disasters.

Figure 1: Multiple Landslides in Tu Mo Rung Commune, Kon Tum Province during Typhoon Ketsana (Storm No.9, 2009).

3.2. LAO CAI AND KON TUM PROVINCES

3.2.1. Hazard profile

Lao Cai Province is one of the Northern Mountain provinces in Viet Nam that is highly prone to flash floods and landslides. **Kon Tum Province** in the Central Highlands is also affected by flash floods and landslides though, as Table 2 below shows, the problem is less severe than in the Northern Mountains.

Table 2: Damages from disasters in Lao Cai and Kon Tum[5] from 2005-2007 and for Typhoons Kammuri and Ketsana

Lao Cai	2005	2006	2007	Kammuri (2008)
Deaths	52	13	10	51
Injured	12	20	0	58
Houses destroyed	125	16	Not available	320
Houses damaged	1,128	194	46	353
Area of crop loss (ha)	862	625	116	3,643
Economic loss (Million VND)	110,000	60,000	12,000	879,424
Economic Loss Euro	4,234,329	2,358,676	471,735	35,176,960

[4] From http://www.oas.org/dsd/publications/unit/oea66e/ch01.htm#a

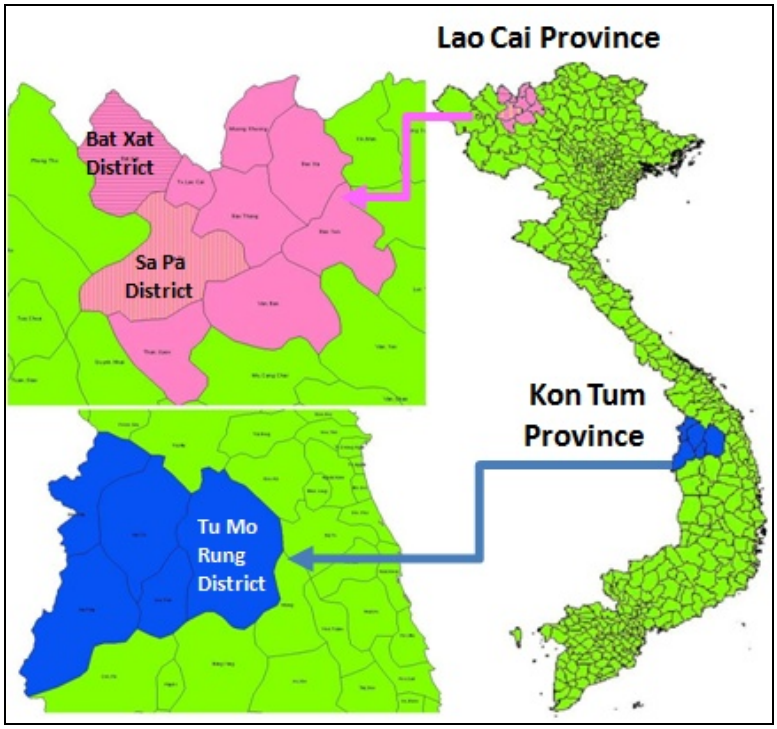
[5] From CCFSC, http://www.ccfsc.org.vn/ccfsc/?module=800&sid=NDMP&mnid=67

Kon Tum	2005	2006	2007	Ketsana (2009)
Deaths	0	5	3	50
Houses destroyed	0	64	220	699
Houses damaged	Not available	Not available	Not available	2,253
Area of crop loss (ha)	2778	1846	1032	3,403
Economic loss (Million VND)	21,754	30,519	29,739	3,387,592
Economic loss (EUR)	888,177	1,119,741	1,169,078	135,503,680

Though it is difficult to determine concrete trends from the above data, it is evident that events such as Typhoon Kammuri (Storm No. 4, 2008) and Typhoon Ketsana (Storm No.9, 2009) can cause high numbers of deaths and substantial economic losses.

The BCRD Project chose Lao Cai and Kon Tum Provinces to work in as they are both representative of upland provinces with an ethnically diverse population where few disaster mitigation programs had been implemented in the past and where government capacity is still growing. Lao Cai and Kon Tum Provinces also presented the project with the opportunity to pioneer and pilot how to undertake impactful DRR work within an area where few INGOs have worked before.

Figure 2: Map of Target Provinces and Districts in Viet Nam



3.2.2. Poverty profile

Not only are Lao Cai Province and Kon Tum Province exposed to high risks[6] in terms of flash flood and landslides, but the populations are also extremely vulnerable[7] to the impact of disasters. Their vulnerability

[6] **Risk** is the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions (UNISDR Terminology http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm)

stems from the fact that there are high levels of poverty in these areas, 32.3% in Northern midlands and mountain areas and 28.6% in the Central Highlands. This is high especially when compared to the rest of Viet Nam. With such high levels of poverty, the provincial populations cannot afford to lose production or assets to disasters, as this only aggravates the poverty incidence and retards efforts to alleviate poverty.

Table 3: General poverty rate by region in Viet Nam from 1998-2006 (*)[8]

	1998	2002	2004	2006
WHOLE COUNTRY				*%*
General poverty rate	**37.4**	**28.9**	**19.5**	**16.0**
By region				
Red River Delta	30.7	21.5	11.8	8.9
Northern midlands and mountain areas	*64.5*	*47.9*	*38.3*	*32.3*
North Central area and Central coastal area	42.5	35.7	25.9	22.3
Central Highlands	*52.4*	*51.8*	*33.1*	*28.6*
South East	7.6	8.2	3.6	3.8
Mekong River Delta	36.9	23.4	15.9	10.3

(*)General poverty rates have been estimated by monthly average expenditure per capita according to the poverty lines by GSO and WB with different standards as follows: 1998: 149 thous. dongs; 2002: 160 thous. dongs; 2004: 173 thous. dongs; 2006: 213 thous. dongs.

Natural hazards such as landslides and flash floods only become disasters when they cause negative impacts on people and/or their economic assets and other sources of well-being[9]. When natural disasters occur, the poor are often the most vulnerable. In these upland mountain areas, high poverty levels are a result of underdeveloped infrastructure, low and scattered population density, less urbanization, and a high dependence on agriculture, a dependency that is higher than any other flat, coastal, or urban region.

Table 4: Provincial and District Poverty Rates of Project Target Areas in 2006

	Lao Cai Province	*Sa Pa District*	*Bat Xat District*	**Kon Tum Province**	*Tu Mo Rong District*
Poverty rates (MOLISA)	25.77%	29.65%	29.89%	38.63%	76.99%

Within Lao Cai and Kon Tum Provinces in particular, the lack of early-warning systems, low proximity of rescue teams and of health services, and the location of households within high risk areas means that localized hazards such as landslides and flash floods frequently result in loss of assets, injury, or death. Local officials and communities face numerous difficulties in coping with disasters due to deficits in communication,

[7] **Vulnerability** is the conditions (determined by physical, social, economic, and environmental factors or processes) which increase the susceptibility of a community to the impact of hazards (UNISDR Terminology http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm)

[8] General Statistics Office of Vietnam: http://www.gso.gov.vn/default.aspx?tabid=503&ItemID=9172 as of 4 November 2009.

[9] Torrente, E., Zhang, J., Le-Huu, T. (2008). *CBDRM and Poverty Reduction*. ADPC. http://www.adpc.net/v2007/Programs/CBDRM/INFORMATION%20RESOURCE%20CENTER/CBDRM%20Publications/2008/final_cbdrmANDpoverty_23nov.pdf

transportation, the fragility of the physical environment during disasters, the lack of safe shelters, and the high exposure of livestock, crops, and water systems to damage.

Research thus far on the nature, extent, causes, and impacts of upland disasters is limited, making it difficult to know how to reduce the risk of disasters within remote and mountainous areas. For example, according to the Hazard, Vulnerability and Capacity Assessment (HVCA) conducted by UNDP/CECI in 2006 in Lao Cai and Kon Tum Provinces, communities are accustomed to coping with disasters without external support. This means in turn that information on disaster related damages and coping mechanisms does not always reach the commune, district, or provincial levels.

3.2.3. Ethnic composition of Viet Nam's Upland Areas

H'Mông Ethnic Group

History: The H'Mông are an ethnic group found in the mountainous areas of Viet Nam, Laos, Thailand, and Burma. They are also one of the sub-groups of the Miao ethnicity in southern China.

Language: H'Mông dialect.

Agricultural Practices: The H'Mông traditionally practiced shifting or slash-and-burn agriculture. They grow maize, rice and barley. They also plant flax, poppies, and fruit trees, and raise buffalos, cows, pigs, poultry and horses. Pack-horses in particular are useful to the H'Mông for transportation within the high mountain areas.

Dao Ethnic Group

Location: The Dao generally live on the mountain slopes in the northern provinces of Viet Nam.

Language: There are several distinct groups within the Dao nationality, and they speak several different languages from different language families.

Agricultural Practices: The main crops grown by the Dao are rice, maize, and vegetables (marrows and sweet potatoes). They raise buffalo, cows, pigs and chickens on mountain slopes and horses and goats at high altitude.

Xê Đăng Ethnic Group

Location: The Xe Dang live mainly in Kon Tum province, and in scattered groups in mountain areas of Da Nang Province.

Language: Part of the Mon-Khmer Group.

Agricultural Practices: The used to farm mainly using slash-and- methods. The Mo-nam practice cultivation in submerged fields but to work the soil, they do not use ploughs and harrows, but use buffaloes and men to trample it. Apart from rice, the Xe Dang plant millet, maize, cassava, marrow, tobacco, melons, bananas, sugar cane. Cattle and poultry

Ethnic minority people are amongst the poorest in Viet Nam. They make up 14% of the country's population but account for 29% of those below Viet Nam's poverty line[10]. Most of the 54 ethnic groups in Viet Nam — except the Chinese who are largely urban-based — are located in remote upland areas. Persistent high levels of poverty amongst ethnic minority groups are mainly due to the fact that they have:

- Poor access to land
- The land they can access is often of poor quality
- Limited access to water
- Limited access to information and markets
- Limited public infrastructure and support services
- Lack of basic supplies, such as mosquito nets and warm clothes
- Difficulties in covering health treatment costs
- Limited education, including limited Vietnamese language and literacy skills.

Many of these problems stem from the tendency for ethnic minorities to live in remote areas which has inadequate infrastructure.

In the target districts of both Lao Cai and Kon Tum provinces, over 90% of the population are from diverse ethnic minority groups. In Sapa and Bat Xat Districts (Lao Cai Province) the population is mainly made up of H' Mông, Dao, and Giáy. In Tu Mo Rung

[10] http://www.ausaid.gov.au/publications/pdf/vietnam_poverty_analysis.pdf

raising, hunting, picking and gathering, fishing, basketry, weaving and forging are also common occupations.

District (Kon Tum Province), the Xê Đăng ethnic minority predominates.

Table 5: Ethnic Groups within Lao Cai Province and Target Districts

Ethnic groups	Lao Cai Province	Sa Pa District	Bat Xat District
H' Mông	122,030	24,452	18,439
Dao	73,148	11,402	17,385
Tay	80,533	1,336	-
Kinh	182,401	6,057	12,553
Giáy	24,324	713	3,460
Nùng	22,331	-	-
Hà Nhì		-	11,961
Thái	51,403	-	-
Others		579	1,242

Table 6: Ethnic Groups within Kon Tum Province and Target District

Ethnic groups	Kon Tum Province	Tu Mo Rong District
Kinh	178,406	643
Xê Đăng	94,336	20,515
Ba Na	47,818	-
Giẻ Triêng	29,371	-
Gia Rai	20,019	-
Brâu	351	70
Rơ mâm	380	-
Other	17,329	-

3.3. CURRENT GOVERNMENT POLICY AND STRATEGY

The Government of Viet Nam's *National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020* recognizes the need for specific strategies to address disasters in Mountainous regions and in the Central Highlands. It aims to proactively prevent natural disasters by undertaking the following activities[11]:

- Define and map areas highly prone to flash floods, landslides, geological hazards; make residential planning, evacuate the population in dangerous areas, make land use planning, restructure crops, manage mineral exploitation to prevent harmful impacts on the environment and landslide risks, properly plant and exploit forests.
- Establish warning and communication systems down to commune and village levels; build structures to prevent landslides and flash floods; expand flood discharge openings of sluices and bridges on traffic roads to ensure flood drainage; build reservoir system for both flood and drought control.
- Strengthen the cooperation with bordering countries in disaster forecasting, warning, search and rescue.

3.4. BCRD PROJECT DESCRIPTION

Due to the remoteness, geography, and rapid-onset of disasters in these upland areas as well as the culture, language, and education levels of the ethnic minority population, disaster risk reduction measures need to be developed to respond to the specificities of these areas and peoples.

[11] Socialist Republic of Viet Nam (2007: 10).

Since 2007, the project *Building Community Resilience to Natural Disasters in Upland Areas* (BCRD) has set out to develop such specific responses by applying community-based disaster risk management (CBDRM) principles in order to reduce the vulnerability of mountainous and ethnic minority communities to natural disasters. The project aimed to pilot and to develop a better understanding of the impact of disasters in mountain areas whilst also recognizing the capacities and coping strategies of the ethnic minority populations.

In order to achieve this, the project enlisted a reiterative approach, piloting, testing, monitoring, improving, and expanding those initiatives that delivered outcomes. This approach was required due to the lack of existing background knowledge on how to best build ethnic minority community resilience to disasters in upland areas.

Based on information gathered through participatory Hazard, Vulnerability, and Capacity Assessments (HVCA), the project designed a CBDRM training program to raise awareness of the local communities and authorities in these regions to DRR issues. The project also focused on developing systems for risk assessment and planning through the use of hazard mapping. It also set out to pilot a system that would enable early warning and response at commune level.

The project was designed and implemented in two phases. Phase 1 officially ran from February 2007 to September 2008. Phase 2 commenced in July 2008 and is due to finish in December 2009.

Throughout both phases, the project worked in six communes in total. They were Ban Ho and Trung Chai Communes in Sapa District, Lao Cai Province; Phin Ngan and Sang Ma Sao Communes in Bat Xat District, Lao Cai Province; and Tu Mo Rong and Mang Ry Communes in Tu Mo Rung District, Kon Tum Province.

3.5. IMPLEMENTING AGENCIES

Centre for International Studies and Cooperation (CECI)

CECI is a Canadian international NGO that contributes to improving the lives of one million people each year through a range of development interventions in Asia, Africa and Latin America implemented with local government and non-government partners. Registered as a development organization in Vietnam for the past 15 years, CECI's program has three main components: livelihood improvement in mountain areas, supporting communities to prepare for and recover from disasters, and integrating disaster risk reduction into local development planning. Within its disaster mitigation programs, CECI has been working with local partners and communities to strengthen their capacity to work together to assess their vulnerability to natural disasters and other factors of poverty and to plan solutions based on their own priorities and existing capacities.

Agency for Technical Cooperation and Development (ACTED)

ACTED is an international NGO registered in France and operating in 22 countries in Asia, the Middle East, Africa and Central America. ACTED intervenes in a range of emergency, rehabilitation and development situations to assist the vulnerable and promote lasting improvement to the lives of the marginalized and impoverished. ACTED has extensive experience supporting communities vulnerable to natural disasters to meet their basic needs and recover shelter, infrastructure and livelihoods following crises.

Strategic Partnership for BCRD Partnership

For the purposes of the BCRD project, ACTED and CECI formed a strategic partnership to combine resources and expertise to improve local capacities for disaster preparedness and mitigation. Whilst ACTED provided monitoring and evaluation expertise and access to funding opportunities, field-level project implementation was conducted by CECI through its Vietnam-based field teams.

4. AWARENESS-RAISING ON DISASTERS WITH ETHNIC MINORITIES

4.1. WHAT IS AWARENESS-RAISING?

Awareness-raising is a way of alerting target groups that a certain issue or problem exists. When conducting awareness-raising with ethnic minorities, the following four considerations need to be taken into account:

1. **Who** does the awareness-raising training
2. **What** type of awareness-raising activities are done
3. **How** the issue is presented and explained in materials
4. **When** the awareness-raising activities take place

Awareness-raising is the first step towards achieving behavior change around an issue. In terms of working with ethnic minorities within upland areas on issues of disaster risk reduction, awareness-raising is designed to help communities change their behaviors so that they can mitigate, prepare, response, and recover from disasters within their areas.

4.2. WHY DID THE PROJECT NEED TO RAISE AWARENESS WITHIN UPLAND AREAS?

At the beginning of the project, HVCA results showed that target groups in Lao Cai Province had already received some training on disaster risk management from previous INGO projects. This meant that there was some awareness amongst officials and communities on how to reduce their vulnerability to disasters and on how to respond to disasters. However, there was still room for improvement.

In contrast, Kon Tum Province had little or no prior disaster management knowledge. This stemmed from a lower presence of international agencies and less attention from central authorities up until recent which curtailed the transfer of DRR knowledge. As a result, awareness needed to be raised as a priority on disaster related issues.

It was also revealed that communities had limited experience when it came to participating in consultative processes. Many had difficulty articulating their needs and priorities. Women in particular were very reluctant to participate in community gatherings.

4.3. HOW DID THE PROJECT GO ABOUT RAISING AWARENESS WITH UPLAND ETHNIC COMMUNITIES?

4.3.1. Training of Trainers

4.3.1.1. Capacity Assessment

At the beginning of the project, Hazard, Vulnerability and Capacity Assessments (HVCA) were conducted by the project team at province, district, and commune levels to ascertain the government's capacity to address risks associated with upland disasters and their capacity to provide outreach services to remote areas and ethnic minority groups. The process was also used to identify local trainers with the potential to raise awareness of DRR issues within communities at commune and village levels.

4.3.1.2. Identification of Trainers

A total of 40 local trainers were eventually identified from provincial, district, and commune levels from Lao Cai and Kon Tum Provinces. These trainers were selected from the Project Management Boards, from the Government's Committees for Flood and Storm Control (CFSC) (provincial and district levels), the Department of Agriculture and Rural Development (DARD), the Commune People's Committee, and from mass organizations such as the Viet Nam Red Cross, the Women Union, the Farmer Association, and Youth Union.

Those selected were already involved in, or have a role to play in disaster risk reduction. Representatives from non-governmental mass organizations were also included as their established networks allowed access to their members for awareness-raising activities. For example, trained Women Union representatives provided an ideal entry point to reach women at village level to raise their awareness on disasters.

Commune level representatives were the principal ones charged with doing awareness-raising activities at village level within their respective communes. This was because commune level trainers would be able to speak the local ethnic language as well as understand local cultural habits.

Provincial and district participants attended primarily to understand the project and its content, as well as to support the commune level trainers in the future. For example, provincial authorities from Lao Cai were only involved in cultural event activities and the search and rescue emergency team as opposed to doing awareness-raising directly.

4.3.1.3. Training of Trainers (ToT) Course

Figure 3: ToT Training

Provincial, district, and commune level participants initially attended a two day Training of Trainers (ToT) course given by project staff. The course covered the theory behind Community Based Disaster Risk Management. Afterwards, those who would be conducting the training at grassroots level stayed on to do more practical training on how to conduct HVCAs, Safer Community Planning (SCP), and participatory techniques. This allowed more high level strategic government participants to leave the training and return to their stations.

Specific training materials and tools were developed for the ToT training and community awareness-raising activities based on existing CBDRM materials from the Viet Nam Red Cross. Many of these materials were devised for coastal areas and the associated disasters that happen there, so these needed to be modified to take into account flash floods, landslides, and other upland issues.

These materials were only available in Vietnamese, and the project staff who conducted the training only spoke Vietnamese, so the course by necessity was carried out in this language. However, simplified terms were often used due to some participants being not totally conversant in Vietnamese. The participants were also shown pictures and other visual methods to help them understand concepts. The course also employed considerable learning-by-doing techniques to give the trainers opportunities to practice how they would raise awareness later on at commune level as well as allowing them to rehearse how they would transfer the DRR knowledge into local languages. The project training team watched and provided feedback to the local trainers to help them improve their skills and methods.

4.3.1.4. Trainers conduct Awareness-Raising

Next the local trainers were supported by the project team to conduct HVCAs, CBDRM trainings, Safer Community Planning, and emergency response sessions in the six target communes. These served not only as planning activities but also helped raise awareness at commune and village levels. The HVCA process was designed to include ethnic minority groups and women through the use of participatory tools and methods.

The majority of participants at village level were from ethnic minority communities who did not understand the Vietnamese language. The local trainers (who were originally trained in Vietnamese) were able to translate the awareness-raising topics into the local languages. Also because the local trainers were from the area, they were able to give specific, relevant examples that were easier for local participants to understand.

During these HVCA assessments, the local trainers were helped by the project team. This also provided an opportunity to do an on-site review of how the local trainers trained others so to identify any additional needs they had. In particular, the capacity assessment done as part of the HVCA helped develop the training plan for trainers and decide what awareness-raising activities needed to be done with communities.

4.3.1.5. Review of Training Teams and Course Content

After fifteen months, the project team reviewed the availability and capacity of the original local trainers. Some of these trainers were in key positions in the government and so were not able to attend the trainings or follow-up with the communities as originally hoped for due to their regular workload. A third of them were replaced by other trainers who had the skills, interest, and time to do the job.

The training modules used at the start of the project were also revised in consultation with the local trainers. This was so to make the training modules simpler and more understandable given the evident capacity constraints amongst some of those trained. More pictures were included, definitions were made less complicated, and learning-by-doing training methods were promoted over classroom-based lecture style trainings.

Following the revision of the modules, a series of refresher training programs for all the local trainers were conducted in Lao Cai and Kon Tum. During these sessions, participants were also equipped with skills on how to conduct effective awareness-raising campaigns at grassroots level i.e. how to present well and presentation methods to use; how to listen and give feedback; how to prepare materials.

Based on the refresher courses, the local trainers repeated awareness-raising activities at the commune and village levels. These activities included a review of the safer community plans prepared at the beginning of the project. Trainers were also accompanied by project staff to conduct HVCAs in new localities within the same districts.

4.3.2. Awareness-Raising Activities

A wide variety of activities were used by local trainers in order to raise awareness amongst commune and villages about disaster risk reduction, for example:

- Trainers would go to five households at a time to do awareness-raising sessions.
- The topic of DRR would be integrated for a few minutes during meetings at village unit level. For example, in Lao Cai Province, awareness-raising was integrated into the normal Women Union village unit's monthly meetings.
- Disaster simulations were conducted over two days in each of the target communes, with a specific focus on search and rescue.

- Evening cultural events were held at commune, district, and provincial levels. These involved song, drama, and multiple choice quizzes and competitions.
- Teams within communes competed against each other in DRR quizzes and prizes were given.
- Extra-curricular school activities were held where sixth to ninth Grade students (12-15 years old) were mobilized to compete in CBDRM quizzes and to do drama on CBDRM topics.

Overall, the activities done tried to avoid lecturing communities on DRR. Instead, they used learning-by-doing techniques, such as the simulation drill and practical first aid training. They also tried to make the awareness-raising activities enjoyable and fun. The activities tried to get village members to actively participate. For example, communities would discuss pictures based on their own experiences and then come to conclusions about what they meant or what they asked them to do.

These awareness-raising activities were mainly conducted during the six month period when landslides and flash floods can potentially occur i.e. from May until October.

4.3.3. Awareness-Raising Tools

Figure 4: Laminated Flipcharts for Awareness Raising

Figure 5: Picture of a Whirlwind used to explain this type of hazard

The project designed and disseminated Information, Education and Communication (IEC) materials on disaster preparedness and risk reduction. These materials used simple visual formats that were culturally relevant to ethnic minority communities and for the hazards that exist within upland areas. The IEC materials had numerous photos and pictures of scenes that the village communities would easily recognize. These materials were used by trainers to verbally explain to the communities about disasters and how to manage them. This worked especially well in communities where illiteracy was high.

The IEC materials tried to minimize the amount of text used. In Lao Cai, any text used was in Vietnamese as the local ethnic languages do not exist in written format. In Kon Tum, the local ethnic language has a written format, so the IEC materials were translated from Vietnamese into Xe Dang.

Provincial partners, the CFSCs, and local trainers were actively involved in developing these training and awareness-raising materials and campaigns, with the project team guiding them on how to prepare context-appropriate, simple IEC material. This helped build their training skills, their skills in developing materials, as well as increasing their ownership of the process and materials.

The main communication tools developed were:

- Transportable, laminated durable **flipcharts** that provided CBDRM lessons in pictures and simple Vietnamese text for use by local trainers in village level awareness-raising sessions. These could be rolled up and brought on a motorbike. Each village in the commune was provided with their own flipchart and one was also on display at the Commune Party's Committee office.

- A **VCD** that could be used in CBDRM training with province, district, and commune officials to reinforce DRR knowledge.
- Provincial and district **TV/radio** and the **loudspeaker** system were employed to broadcast project activities to villagers.
- Paper **leaflets** were produced on first aid, emergency response and disaster mitigation, and the project content.
- Metal **signboards / posters** were erected in prominent areas within the commune (often beside commune offices) where many people would pass. The boards had pictures reflecting the culture and custom of ethnic minorities and contained some key DRR messages.
- **Warning signboards**[12] were also placed in areas where landslides and flash floods could occur.
- **Calendars** with simple photos and messages were disseminated on post-disaster sanitation, hygiene, environment, nutrition, and disease prevention practices for the flood season. A training of district, commune, and village Women's Union members was also given to accompany and reinforce the calendar's messages.
- **Information panels** on flash floods and disaster preparedness were installed in each commune office.

4.3.4. Disaster Education in Schools

Figure 6: Schoolchildren in Tu Ma Rong Commune, Kon Tum Province answering DRR questions during a quiz

Viet Nam's Ministry of Education has stated their intention to integrate disaster preparedness and mitigation topics into the national school curriculum. The project aimed to support the government at provincial and district levels to meet this commitment by developing DRR materials and events that were appropriate to upland areas. However, as changing national school curriculum takes considerable time and requires permission from national government, the project authorities decided instead to focus on doing extra-curricular activities within schools.

The project collaborated with Save the Children Alliance (especially in Yen Bai) and other JANI partners to understand how to introduce and strengthen DRR education in schools. DRR materials were collected from organizations such as the World Health Organization, SCA, and World Vision who have already worked with schools on disaster preparedness.

Teachers were initially trained to first raise their own awareness on DRR. They were then shown how to develop DRR exercises and learning materials for children. Teachers were supported to conduct awareness-raising lessons with the children. They in turn held evening events involving drama, music performances, and quizzes for the children to test their DRR knowledge. The local trainers also made site visits to the schools to support the teachers and to provide feedback on what was working and what needed improvement.

[12] See section on Early Warning System, section 5.3.2.2 for more details.

4.4. WHAT LESSONS DID THE PROJECT LEARN ABOUT RAISING AWARENESS WITH UPLAND ETHNIC COMMUNITIES?

4.4.1. Awareness-raising helped save lives during major disaster

During Typhoon Ketsana (Storm No.9, 2009), people in Kon Tum Province used a variety of topics that were taught during the awareness-raising sessions. In particular, they recognized dangerous places to be during the storm, and they used first aid skills and evacuation procedures that were taught during the drill simulation. Before the storm happened, some people living in dangerous areas had already moved to safer places. The wide variety of awareness-raising topics given during the project supported and complemented each other and helped ensure that no one died during the storm.

4.4.2. Importance of using the local ethnic language

One of the main obstacles when working with ethnic minorities is the fact that most are not fluent in Vietnamese. The project learnt to overcome this issue through a series of strategies:

Figure 7: DRR Signboard translated into Xe Dang in Kon Tum Province

Figure 8: DRR Signboard in Vietnamese in Lao Cai Province but with pictures of cultural dress

- Local commune trainers were selected who understood both Vietnamese and the local ethnic language. It meant that they could be trained using Vietnamese (using the trainers and resources available), but could do awareness-raising in the villages later in the local dialect.
- Where a local ethnic language existed in written form i.e. Xe Dang, IEC materials were translated into the local language.
- Where a local ethnic language did not exist in written form i.e. Dao, IEC materials were translated into Vietnamese using simple words and terms. The project then relied on local trainers to explain the messages verbally to those who could not read them.
- All IEC materials tried to use a minimal amount of text and used instead pictures and photos that could be discussed by communities and explained by local trainers.
- Overall, the project tried to use awareness-raising techniques that did not use text or required people to read i.e. they used more drama, songs, competitions, simulation drills.

4.4.3. Use of wide variety of awareness-raising activities and materials helped reached different target groups

Different people learn in different ways, so the project tried a broad range of methods in order to effectively communicate key DRR messages. Thanks to trainers coming from mass organizations, women were targeted via Women Union meetings and the youth were targeted via Youth Union meetings. Children were also made aware of DRR topics via extra-curricular school activities. The involvement of government officials (from provincial to commune level) in trainings and simulations helped raise their awareness of DRR issues. Cultural events helped convey messages to a broad range of beneficiaries. Signboard messages also helped explain key messages to those living within the commune.

4.4.4. Learning-by-doing is preferred awareness-raising method

Both the ToT training (for provincial, district and commune representatives) and the awareness-raising activities (at commune and village levels) used learning-by-doing techniques. The project saw capacity levels increase remarkably when people were able to apply skills in practice rather than just receiving the training on its own.

In Kon Tum province, after having suffered the consequences of Typhoon Ketsana (Storm No.9, 2009), the key awareness-raising technique that was of most value was the simulation drill. During this, the communes practiced things like how to evacuate, what to bring during evacuation, where to go for safe shelter, how to do search and rescue. This appreciation has not extended yet fully to Lao Cai, where it was noted that it was difficult to assemble everyone in order to participate in the simulation.

4.4.5. Training and awareness-raising messages need to be repeated over a long time period

At the time of this lessons learnt document, the project has been running for over two years. Already, the need to repeat these messages over a longer time period has been noted. This is especially due to the limited baseline capacities and exposure of both the trainers and ethnic minority groups to DRR issues, as well as the newness of these concepts and practices.

Refresher training for local trainers proved vital to ensure that key messages and training techniques were not forgotten. Also many did not understand the messages the first time around. This meant that the same topics had to be repeated several times. Awareness-raising modules and trainings had to be divided into themes with smaller topics so that they could be more easily conveyed. The project also noted what messages were understood and which ones were not so that either materials and or activities could be revised.

4.4.6. School children taught very simple concrete DRR messages

To teach the children what to do during storms, the teachers gave them very simple, concrete messages like, “If there is heavy rain, stay at home”; “Do not cross streams during rain”; “When thunder is happening, do not stand near big trees”; “Clean up the school after the storm so you can go back to study”.

The teachers also avoided doing too many topics together in case this confused the children.

4.4.7. Having fun awareness-raising activities increased interest in DRR

Events such as the cultural evening festivals that involved quizzes, drama, song, and dance attracted many community members and allowed the project to provide many DRR messages in simplified form. By using fun, entertaining activities, people were more interested and energized to listen to the messages being given.

4.4.8. Need durable, understandable IEC materials

The project set out to develop materials appropriate to upland areas that could be replicated by other programs targeting mountain regions. Overall, the IEC materials tried to use simple, basic messages when working with ethnic minorities in upland areas. To make sure the messages could be understood, IEC materials underwent careful pre-tests and revisions, and local trainers were involved in their preparation.

Messages were also primarily in the form of pictures that could be discussed and explained by local trainers. The project realized the importance of having pictures of scenes that were familiar to those within the ethnic minorities' area. For example, one photo used was from a pre-existing material taken in another part of Viet Nam. This picture was not understood by the beneficiaries. This illustrated the importance of using photos from the actual area where the awareness-raising work was taking place.

Training and IEC materials also needed to be durable enough to withstand long-term usage by local trainers.

4.4.9. Ethnic minorities need encouragement to participate in trainings

Most of the local trainers were not familiar with participatory techniques or with ways of involving participants in trainings. In general, most of them used lecturing styles with limited examples from reality. This was despite many of them having a lot of practical DRR experience that they could potentially share.

Many of the ethnic minority groups that the project worked with had also not used participatory training techniques before. Local trainers were therefore taught how to listen to the local participants' knowledge and told not to provide information straightaway. The trainers then helped them actively raise ideas and questions, and to analyze what was correct and explain what was not. This helped increase local people's awareness based on their existing knowledge. The trainers' role was therefore to summarize and to supplement the discussions.

4.4.10.Integration of DRR messages into regular gatherings

In the long term, the project discovered that integration of DRR topics into already existing community level gatherings increased the chances of DRR messages being sustainably delivered. For example, the project found it difficult to arrange two to three hour communication events. But in Lao Cai, the Women Union takes ten minutes during their monthly meetings to discuss a DRR topic. The project also attempted to integrate awareness-raising events and campaigns into cultural events and social festivities practiced by ethnic minority communities. This not only increased chances of sustainability but also proved a cost-effective way to disseminate information on how to prepare for disasters and reduce risk across scattered populations in remote communities.

Commune authorities are currently considering disaster preparedness and response as one of key communication targets for social organizations and the People's Committee in coming years.

4.4.11. Importance of training a cross-section of government officials

Those who were initially trained represented a wide cross-section of Government, from different levels (province, district and commune) and ministries / sectors (People's Committee, CFSC, DARD). As a result they were in a position to advocate for and take necessary steps to integrate DRR into government socio-economic development framework.

One recommendation was that Department of Culture representatives could also have been trained seeing the importance of broadcasting and communication for Early Warning Systems and awareness-raising purposes.

However, provincial and district trainers (who at the same time held other responsibilities within the government and/or were heads of agencies) did not always have the time to participate in awareness-raising activities. To alleviate this problem, the training was divided into two parts: one theoretical training that high level officials attended; and a more practical ToT training that those who were going to do awareness-raising attended in addition to the first conceptual training. This meant that high level government officials only attended the parts of the training that were relevant to them.

The project also tried to only involve the relevant part of the government in the activities related to their sector. For example, the health department was invited to participate in the post-disaster water and sanitation calendar work with the Women Union.

4.4.12. Benefits of training provincial, district, and commune staff together

Province, district, and commune trainers always did some training together during the project. The aim was to create a CBDRM trainer network that could be used as a resource for ongoing disaster risk management programs. Involving representatives from province, district, commune, and village levels also helped get ownership and buy-in. It also provided provincial and district officials with information so that they could potentially roll out the DRR activities to other communes and districts within the province.

Province and district trainers often had higher capacity levels than the other participants. This capacity gap meant that the participants sometimes needed to be divided into groups composed of people of similar level to ensure that everyone understood.

The commune trainers did more of the actual awareness-raising activities later at grassroots level. They were assisted by the higher-capacity provincial and district trainers as well as the project team when conducting training courses.

4.4.13. Selection of mass organization representatives as ToTs helps reach their members

Representatives from mass organizations were also trained to do awareness-raising. This was because mass organizations such as the Women Union and Youth Union have wide networks all the way down to village level. They were particularly recommended by local authorities as the best channel to convey DRR messages.

4.4.14. DRR now present in community plans

Training courses have brought about significant changes in terms of awareness of the impact of natural disasters on human's lives. Many officials in managerial capacity and communities have started to pay more attention to disaster preparedness, mainstreaming the issue into community developmental activities. The focus has therefore shifted from passive disaster response to active disaster preparedness and response.

4.4.15. Improvements in forestation noted

The project has contributed to improvements in forestry practices. In Lao Cai, officials have observed that people are now clearing forests less for fields. Communities understand the advantage of trees in preventing landslides, likening the situation to having a full head of hair over a bald head. Local farmers are also placing concrete on sloping terrain within their fields so to regulate water flow during rains, and are building homes away from rivers.

Though the government forest system was already been in place, the project has assisted in its implementation through its DRR awareness-raising activities. Requests to the government to plant trees have increased, a result that also complements Oxfam GB's work on community forestry within Ban Ho commune.

4.4.16. Disaster health and sanitation messages used in daily life

Figure 9: Health and Sanitation Calendars distributed by Women Union Representatives

The campaign in Lao Cai with the Women Union on post-disaster health, nutrition and sanitation produced greater behaviour change than expected. Because the messages given were also relevant in normal daily life, women were found to actively practice these activities outside of disasters i.e. they cleared drains, washed hands, kept animals separate from where they lived, and had toilets far from the home. DRR messages can also therefore be relevant as a normal livelihood practice.

4.4.17. Need to have staff willing to work with ethnic minorities

Particularly for the awareness-raising component of the project, it was found crucial to have project officers and trainers who were friendly to the community and had the heart to work with ethnic minorities. It was noted that staff who had the right attitudes and competences but lacked the DRR capacity could always be taught the required knowledge or skills. However it was not easy to teach an experienced, skilled person to be friendly or patient in a cross-cultural environment.

4.5. HOW ARE OTHER ORGANIZATIONS DOING DRR AWARENESS-RAISING?

The **Netherlands Red Cross (NRC)** has over ten years experience conducting DRR awareness-raising campaigns, primarily within the coastal areas of Viet Nam.

Just like in the BCRD project, the NRC also uses HVCA not just for grassroots data gathering, analysis, and planning but also as an awareness raising tool. NRC organises five day HVCA events that involve some 300 people in the commune at a time. They also have had similar experiences as the BCRD project in that some sections of the community are not used to participating and speaking out, and that local officials need to learn how to use participatory methods. The NRC found that most facilitators preferred reading from a paper rather than actively generating discussion.

The NRC carries out disaster preparedness trainings for 25 people per commune at a time. The intention of these trainings is that information trickles down to commune and village levels and mass organizations. Similar to the BCRD project, they train commune leaders as ToTs as they speak both Kinh and the ethnic minority language. They are then able to do awareness-raising in the local ethnic language.

ToTs also make extensive use of visual aids and of drawings in its projects that are discussed and explained by the communities (though these techniques are not yet used in NRC's DRR projects). For example, the NRC has developed a hygiene manual that consist of a series of culturally representative pictures without words accompanied by a facilitator's handbook. Over a series of 5-6 meetings, a group is gathered during the evening time to discuss the pictures. The manual was developed using three pilots to ensure the pictures and messages were suitable and understandable.

The NRC also tries to make sure that any text brochures disseminated are accompanied by trainings that explain the brochure contents. For example, one beneficiary was seen to put the brochure upside down on the wall. As a result, they found that just handing out brochures does not necessarily raise awareness.

Learning-by-doing is also seen as a useful way of transferring information. For example, HVCAs and emergency drill simulations are seen as particularly effective. The NRC also tries to make awareness-raising interesting by holding evening cultural events involving song, dance, performances, and quizzes. They also do school awareness raising, training teachers of grade 4 and 5 (9 and 10 year olds) to give a series of eight extra-curricular lessons to children. A quiz contest on DRR is then held to test the children's knowledge in a fun way.

The NRC has also trained qualified educated people to do awareness-raising, but they can end up giving very theoretical training and can have no community feel. For example, community representatives who are trained are often government representatives who do not necessarily have any grassroots affiliation. Also, some trainers have been doing the same training for ten years and are reluctant to change the syllabus and to update their messages or training methods.

Save the Children Alliance (SCA) works together with the Viet Nam Red Cross and the Provincial CFSC in order to train teachers and teach children about DRR. They do extra-curricular activities through the children's clubs at schools, using games on different DRR themes as well as encouraging the children to enter competitions on climate change. The children draw risk maps themselves in order to work out safe places to go during disasters.

SCA have also found that changing the national curriculum is too difficult at the moment, as the curriculum is already full with subjects. However, SCA are concerned about the sustainability of doing this DRR training, as teachers are not paid for these extra activities. Advocating to the Ministry of Education to mainstream DRR lessons within the national curriculum is the only viable, sustainable way forward.

In terms of materials, SCA have their own training manual on DRR specifically designed for raising awareness amongst children. They also use materials from Development Workshop France (DWF), Asia Disaster Preparedness Centre (ADPC), and the Red Cross.

5. EARLY WARNING SYSTEMS IN UPLAND AREAS

5.1. WHAT IS AN EARLY WARNING SYSTEM?

According to UNISDR, Early Warning Systems (EWS) consist of four elements[13]:

1. A **Warning Service** that can generate accurate, timely forecasts of extreme weather events.
2. A **Communication Service** that disseminates an understandable warning to those at risk.
3. A **Response Capacity** whereby those threatened by the disaster know how to and are prepared to act.
4. Foundational to these first three elements is **Prior Knowledge**[14] of the risks faced by the community.

5.2. WHY DID THE PROJECT PROMOTE THE USE OF AN EARLY WARNING SYSTEM?

Early warning systems can prevent the loss of life and reduce the economic and material impact of disasters[15]. The internationally recognized *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters* makes clear references to the importance of Early warning systems. The Government of Viet Nam's **national strategy** also commits to providing warning and communication systems down to village levels.

According to the 2006 HVCA results from Lao Cai and Kon Tum Provinces, the following gaps were identified in terms of early warning systems:

- Early warning and emergency communication systems between the Commune People's Committee and the commune villages needed to be improved to alert villagers to disasters, to the need to evacuate, as well as improve villages' ability to report problems to the commune and request assistance.
- Disaster preparedness plans needed to have clearer measures on what to do before, during, and after disasters, including clear emergency procedures to be followed by villagers and officials at different levels.
- Emergency rescue and first aid training had never been done in either province prior to the project start.

5.3. HOW DID THE PROJECT IMPLEMENT THE EARLY WARNING SYSTEM?

5.3.1. Government Plans to Pilot EWS

The Ministry of Natural Resources and Environment (MONRE) at the national level had already developed a new warning and communication service for use in upland areas, specifically designed for flash floods and

[13] Villagran de León, J.C., Bogardi, J., Dannenmann, S. and Basher, R. (2006). *Early Warning Systems in the context of Disaster Risk Management.* www.unisdr.org/ppew/info-resources/docs/ELR_dt_23-25.pdf

[14] This facet is covered under the awareness-raising component described in Section 4.0.

[15] UNISDR (2006). *Developing Early Warning Systems: A Checklist*. EWC III Third International Conference on Early Warning: *From concept to action.* 27 – 29 March 2006, Bonn, Germany, http://www.preventionweb.net/files/608_10340.pdf

landslides. The government had planned to test this system in different locations, so the project opted to support this testing in collaboration with Provincial and District CFSCs. The project also sought to learn and replicate experiences from other local communities/authorities where similar systems had already been implemented, such as in Ha Giang and Yen Bai Provinces.

5.3.2. WARNING SERVICE

5.3.2.1. Automatic Rain Gauge and SIM Card System

Landslides and flash floods often occur when there is sudden and heavy rainfall. A consultant from the National Institute of Meteorology, Hydrology and Environment proposed the following system that used rainfall information to predict potential disaster incidence:

1. An automatic rain gauge / rain measurement systems to collect rainfall information.
2. A SIM card communication system designed to alert commune leaders.
3. A wireless broadcast system for commune leaders to alert other villages.

Three pilot systems were installed in total in Tu Mo Rong Commune of Kon Tum Province, and in Ban Ho and Phin Ngan Communes of Lao Cai Province. This was done with the technical support of MONRE and in consultation with the National Institute of Meteorology, Hydrology and Environment. The provincial Hydro-meteorological Service assumed responsibilities for monitoring and improving the system's operation.

Figure 10: Rain-Gauge / Rainfall Measurement Device

Figure 11: Datalogger

The automatic rain gauge / measurement system consisted of the following:

1. A rainfall measurement device (VH-022R).
2. A solar batter energy supply system.
3. An auto-write rainfall system.
4. Installed rainfall limits that could auto-alert by siren.

In rain gauge system was placed at the commune head office. An official was then assigned to maintain the machine, monitor rainfall levels, and to listen for warning alarms. In Phin Ngan commune, the rain gauge is placed at the commune Communication and Post Office and the postal staff of were made responsible for managing the equipment.

The gauge worked by measuring the daily rainfall within the commune area. The rainfall threshold was calculated for each location based on rainfall distribution, basin moisture, topography land type, and land cover. The calculations suggested that over a rainfall intensity of 100 mm per day, landslides and flash floods could happen. Daily accumulated rainfall was then measured and data was stored in a Datalogger.

The rain gauge had a SIM card installed that could send a text message to designated mobile phones. In the case of

Figure 12: Early Warning System

Ban Ho Commune, when rainfall exceeded the threshold level of 100 mm per day, text messages were received by the Vice-chairman of the Commune, the Land Administration Officer (responsible for hazard mapping), and the Cultural Officer. The device was compatible with all mobile phone service suppliers in Viet Nam. When text messages were sent notifying that rainfall levels were high, a meeting of the commune staff was convened to decide what actions to take. One of the main actions taken was to issue a warning to all the commune's villages.

In addition to the text messages, a siren also automatically sounded through a loudspeaker attached to the rain gauge. This warned the village in the immediate vicinity that a flash flood or landslide could potentially occur.

The Vice-chair of the People's Committee in Phin Ngan Commune could also send a message to the Central Hydro-metrological Service and request to see the forecast for the next three days. He used the text message he received to confirm the local rain gauge prediction.

During the initial stages of the project, the Hydro-Metrological Service was charged with maintaining the rain gauge. Later this responsibility shifted to the Commune People's Committee and district CFSC.

5.3.2.2. Early Warning Boards

Figure 13: Early Warning Board in Tu Ma Rong Commune, Kon Tum Province

Figure 14: Early Warning Board in Ban Ho Commune, Lao Cai Province

The project opted to also have early warning boards placed in areas that were prone to landslides and flash floods. These signs were text based (written in Vietnamese in Lao Cai Province and in Xa Dang in Kon Tum Province). In Kon Tum Province, they used yellow triangular signs similar to the shape and color of traffic warning signs used throughout Viet Nam.

The Department of Agriculture and Rural Development (DARD), project staff and commune staff investigated potential sites where signs could be erected. All warning boards were installed in the project sites with the technical support of the Provincial Centre for Hydro-Meteorology.

Boards were installed in prominent locations where hazard risks were high and where local people would pass, such as residential areas, traffic roads, production areas, etc. They served as a clear visual reminder of the risk present in the area, especially during the rainy season. Though the digital hazard maps had this same information, communities would not necessarily have understood the maps or would have associated the area mapped with the prevalent hazards. Around the signage areas, farming and house construction were also advised against by government commune officials.

5.3.3. COMMUNICATION SERVICE - Wireless Broadcast System

The Commune People Committee assigned an officer to monitor the rain gauge during the rainy season and to transmit a warning to the community when heavy rain was forecast. In this warning, communities were reminded of DRR messages received during the awareness-raising activities such as not to go the fields or to the forest or to cross rivers during heavy rainfall.

One of the principle challenges faced within upland areas is communicating this information. This is due to the fact that villages are remote and scattered, and that mountains often block transmission signals. The gauge's loudspeaker could not cover all of the commune's remote villages. The project installed wireless radio stations for those areas that the loudspeaker could not reach. A two-way communication system was installed in Kon Tum Province. A one-way communication system was installed in Lao Cai due to budget constraints (one-way being cheaper than two-way systems). The advantage of wireless systems is that it does not require the wiring or electricity systems that the government's own loudspeaker system requires.

In Ban Ho Commune, the wireless system did not cover two villages on the other side of the mountain as the budget did not allow for a booster station. Where network coverage was possible, information was instead relayed by mobile phone. Commune staff could also be physically sent on motorbikes to warn villages that did not receive the messages via the loudspeaker or wireless systems. In some cases, even motorcycles could not reach these areas, so the commune staff had to walk to households to alert them and evacuate them if necessary.

In Tu Mo Rong Commune, the authorities also used the wireless communication system to transmit audio programs in addition to the main coverage provided by district and provincial town radios.

The project also provided training to commune officials on how to operate and maintain the rain gauge and wireless broadcasting systems so that they could follow up technical issues. A small handbook and training manual was developed to support this training. A simple monitoring sheet was also made to collect information on the effectiveness of the EWS during the flood season using participatory feedback mechanisms from the community.

5.3.4. RESPONSE CAPACITY - Emergency Response and Rescue Training

Figure 15: First Aid Training

A three day ToT course was conducted with province, district, and commune officials on Emergency Response and Rescue (ERR) training. These local trainers then held training classes on emergency response for commune leaders and village response teams. This was done in collaboration with the Viet Nam Red Cross. The aim of this commune/village level training was to establish ten person community emergency response teams in each commune and in each village. These two stages also helped to have an integrated emergency response plan from village to province level.

The ERR course included information on evacuation, first aid, and search and rescue as well as an introduction to the early warning system in pilot communes. Most of the training linked theoretical lessons together with practical exercises, for example simulations were done of saving people drowning or of people caught in landslides.

Training materials were developed that used illustrations, large font, and that were printed on A0 paper. The integration of various games interested participants and helped them understand and engage with the course content better.

The emergency response equipment was held by the community emergency response units. The equipment included first-aid kits, first-aid stretchers, tents, loudspeaker/bullhorn (20w), raincoats, safety helmets, rain boots, 150m rope coils, torches, shovels, and mattocks. Power generators and electric saws were managed by the communes, whilst the remaining equipment was divided equally among the villages.

Along with the training, the project provided some equipment for emergency response, as well as training on how to operate and maintain it. The district CFSCs were charged to coordinate and mobilize the equipment when a disaster occurred in the communes.

The ERR training was done together with the distribution of the EWS. This reinforced the fact that the wireless communication system could be used not only to provide early warning but also for emergency response.

The project organized a one day disaster response simulation in all the target communes. These simulations mobilized around 1,000 people from villages, village and commune rescue teams, Commune People's Committees staff, and mass organizations as well as members of the Provincial and District CFSCs.

5.4. WHAT DID THE PROJECT LEARN FROM THE EARLY WARNING SYSTEM?

5.4.1. EWS technology too complicated and expensive given the context

The rain gauge and SIM card system were very modern and scientific, and their ability to send automatic warning messages was judged impressive. However the project learned that, where the rain gauges were installed, the commune staff did not always have the capacity to operate, manage, and maintain it. For example, despite repeated training, they did not know how to maintain the solar battery that powered the rain gauge. They also sometimes forgot to keep the SIM card topped up despite being reminded and the low cost of doing so (50,000 VND = 2.50 USD). Commune staff were not always able to get spares from the supplier to repair broken parts of the gauge.

In addition, the electricity supply in Ban Ho Commune was not part of the national grid but came instead directly from unregulated HEP. This meant that the electricity supply was unstable, causing one part of the wireless system to blow up.

Given the capacity gaps and evident problems with the equipment, the project opted not to roll-out the EWS into all the target communes until the three existing systems proved reliable and easy to maintain.

The project eventually corrected the faults and made the rain gauge and wireless system work. For example, during Typhoon Ketsana (Storm No.9, 2009), the warning siren sounded as intended. However the high cost of the system and the high risk of it not working made the project conclude that investing in simpler, low-cost technology may be more cost-effective for upland areas.

5.4.2. Rain gauge unreliable

Forecast systems need to be dependable so that people can have confidence in their ability. However the rain gauge proved unreliable during the pilot. For example, during heavy rain in Phin Ngan commune, the service did not sound until 150 mm of daily rainwater had collected as opposed to the warning limit of 100 mm. During Typhoon Kammuri (Storm No. 4, 2008) in Lao Cai Province, the automatic warning bell did not operate

even during heavy rainfall. The primary reason for these malfunctions was that the systems had not been maintained properly and those responsible did not know how to repair the faults.

5.4.3. Other forecast systems preferred

During Typhoon Ketsana (Storm No.9, 2009), the rain gauge and SIM card system worked in Tum Rong Commune, and the siren sounded as required. However, the commune preferred to rely on national TV and radio broadcasts, and on information filtering from the central CFSC through to provincial, district, and commune levels about the impending typhoon. These channels gave them 12 hours advance notice. This means that, even when the commune-based rain forecast system works, the commune do not necessarily see the need for it due to the other predictable advance warning systems in place.

5.4.4. Time and location of landslides and flash floods difficult to forecast

One of the major difficulties in developing a EWS suitable for forecasting flash floods and landslides is knowing the factors that can accurately predict where and when these hazards will happen. For example, landslides start when a few particles of soil or rock within a slope start to move, but these early stages can be hard to spot. Following this initial movement, slopes can become unstable in a matter of hours or minutes[16].

The most common way to monitor a slope for signs of an imminent landslide is to watch for changes in its shape by measuring a site directly or by sinking sensors into boreholes or fixing sensors above ground. However, this requires landslide prone areas to be known. The project is still in the process of mapping these areas via hazard maps.

In addition, considerable investment is required to place sensors on the identified slopes. However, given the need for simple technology as stated above, sensors may not be the answer either. Relying on rainfall forecasts from national level may therefore be the simplest approximate forecast given the context and relative capacities.

5.4.5. Wireless communication system useful for other purposes in upland areas in addition to disaster warnings

During Typhoon Kammuri, the rescue facilities provided were effectively used. In particular, typhoon victims whose homes were washed away or had collapsed were able to take temporary shelter under the emergency tents.

The installed wireless system was found effective for transmitting early warning signals and coordinating rescue efforts. It complemented the use of the pre-existing government loudspeaker system. However, the local authority also found the wireless system perfect for other purposes such as delivering announcements on action plans, on the seasonal crop calendar, and on other local services. This provided them with an incentive to keep it maintained for when disasters eventually occurred.

Information transmitted needed to be in the local language so that it could be understood by local villagers. The messages given reminded people what to do during disasters based on what they learned from simulation drills and awareness-raising activities.

5.4.6. Emergency training and equipment helped save lives

[16] Simonite, T. (2006). *Listening Device Provides Landslide Early Warning.* http://www.newscientist.com/article/dn9384-listening-device-provides-landslide-early-warning.html from 19 New November 2009.

Although the rain gauge warning service experienced problems during Typhoon Kammuri (Storm No. 4, 2008) in Lao Cai, local officials and community representatives reported that the emergency training and equipment were instrumental in reducing the post-disaster impacts on people's health. In Ban Ho Commune, when Typhoon Kammuri happened, the search and rescue team were called out and two households were subsequently evacuated to a safer area. In Phin Ngan Commune, one evacuation was carried out and one person was saved from a house that collapsed.

During Typhoon Ketsana (Storm No.9, 2009) in Kon Tum Province, no one died thanks to the training, mobilization, and emergency equipment provided.

5.4.7. Evacuation messages not always obeyed

Despite the awareness-raising activities conducted, and the EWS and communication systems in place, some people still did not want to evacuate their homes when told by the commune authorities to do so. Some did not obey because, based on their experience, the rainfall was not serious enough to cause a disaster. In these cases, the army and police sometimes had to intervene. This shows that awareness-raising activities and a warning service can only do so much, and that some people can take considerable time before they change their behaviors.

5.4.8. Early warning boards are a useful way of reminding communities of where disasters can happen

The early warning boards were seen as a good way of reminding people of areas where flash floods and landslides could occur, especially in densely populated areas. The board messages were written in Vietnamese in Lao Cai and in Xe Dang in Kon Tum and did not use pictures. It was therefore important to also do awareness-raising about the boards so that those who could not read the signs could be told of their significance.

The project also realized the importance of placing the early warning boards in places that corresponded with areas marked on the digital hazard maps as high risk areas. The boards could prove more comprehensible than displaying the actual digital hazard maps in the communities.

5.4.9. Emphasis on communication and response capacity may be currently sufficient in upland areas

As already stated in section 5.1, early warning systems (EWS) comprise 1) A **warning service** that can generate accurate, timely forecasts; 2) A **communication service** that disseminates an understandable warning to those at risk; and 3) A **response capacity** whereby those threatened by the disaster know and are prepared to act.

This project tried to implement a warning system at commune level. However, results showed that warnings issued from national level were currently sufficient given the complexity of forecasting flash floods and landslides locally.

The wireless service seemed to improve the commune's communication system by complementing the loudspeaker systems already in place within the commune. However, additional wireless stations are needed to ensure coverage up and over mountain areas. Such additional stations come at a high price.

The response capacity work was deemed highly relevant by communes that recently suffered from typhoons. As a result of the awareness-raising, mobilization, training, equipment provision, evacuation procedures, and simulations, no one died in the recent Typhoon Ketsana (Storm No.9, 2009).

5.4.10. EWS as part of national DRR strategy increased chances of sustainability

The project worked on the national priority of placing early warning and communication systems for upland areas. This is being carried forward by the DMC and MONRE under their mandates and as part of their roles in the NSDPM Action Plan. Ultimately though, the sustainability of the early warning systems depends on their relevance to commune leaders and villagers.

It is important to remember that the EWS implemented during this project was done as a pilot to assist the government in testing their national strategy. The use of EWS for landslides and flash floods is still being debated by MARD and MONRE. Therefore the difficulties that arose during the project should be seen as valuable learning to influence national policy and strategy.

5.5. HOW ARE OTHER ORGANIZATIONS IMPLEMENTING EARLY WARNING SYSTEMS?

In Hao Binh Province, a comprehensive flash flood and landslide EWS is in place, managed and funded from the national level under the **Ministry of Natural Resources and Environment**. This uses a rain gauge, earth movement sensors, and metrological information to issue warnings. Such a model requires high levels of funding and capacity and therefore could not be managed currently by many provincial authorities.

Hanoi National University[17] has constructed a flash flood EWS consisting of a central processing station (CPS) located in Hanoi and automatic remote measurement stations (ARMS) located on rivers leading to villages in mountain and forest areas. The ARMS does not just measure rainfall as in the BCRD project, but also measures the velocity of flow and the height of water in selected rivers. If a flash flood passes through an ARMS, data is sent to the CPS via satellite and villages are issued with a flash flood warning. The data is also used to construct a predictive graph to improve subsequent warnings. However, the cost of this system, especially the software, is high.

CARE International in Viet Nam is currently focusing on improving the communication part of the EWS in coastal areas at province, district, and commune levels. They are upgrading loudspeaker systems to make them more resilient to storms, providing generators where there is no electricity, and are working with local radios. They have also provided walkie-talkies for two way communication. This means that CARE is relying on the government's own forecast and typhoon prediction system that relays information via the central CFSC as well via national radio and TV. This is opposed to CARE developing a separate forecast and warning service.

[17] Tuan, T.A., Ang, P. and Thong, H.M. *An Efficient Warning System of Flash Flood for Vietnam.*

6. HAZARD MAPPING IN UPLAND AREAS

6.1. WHAT ARE HAZARD MAPS?

In order to prevent disasters, the answers from the following five questions are required:

1. **What** is the disaster?
2. **Where** does it occur and how extensive is the damage?
3. **How** large / intense is the phenomenon?
4. **When** is the disaster most likely to occur?
5. **Who** can potentially suffer from such a disaster?

Hazard maps provide critical information on the first two questions i.e. 1) What type of disasters can occur in an area and 2) Where they can occur.

Hazard maps alone cannot stop a disaster from happening[18]. However, by using hazard maps, the impact of disasters on local communities can decrease through helping raise awareness and facilitating decision-making about the use of appropriate disaster prevention and mitigation activities.

6.2. WHY DID THE PROJECT CARRY OUT HAZARD MAPPING?

The BCRD project decided to produce hazard maps for two main purposes:

1. **To help planning at district/provincial level:** Hazard maps can be used by government agencies to inform their planning activities. Hazard maps can help establish an early warning system and an evacuation system as well as facilitate decision-making as regards land use. They may also be used for disaster preventive works.
2. **To provide information at grassroots/community level:** Hazard maps can help communities recognize and understand potential dangers within the area in which they live. Basic information can be relayed via hazard maps. If hazard maps are used for this purpose, it is crucial that such information is represented in an understandable, simplified manner.

The Government of Viet Nam's 2007 *National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020* made a commitment to define and map areas highly prone to flash floods, landslides and other geological hazards within Viet Nam's mountains areas. The BCRD project is helping fulfill that commitment by assisting in the hazard mapping of these six target communes.

6.3. HOW DID THE PROJECT PRODUCE HAZARD MAPS?

6.3.1. Community Drawn Maps

One of the participatory techniques used during the Hazard, Capacity and Vulnerability Assessments (HVCA) was hazard mapping. The community participants hand drew maps in order to show high risk areas within their commune that were known to be prone to disasters. In particular, participants drew where flash flood and landslides have already happened historically within the commune. The process of hand drawing these

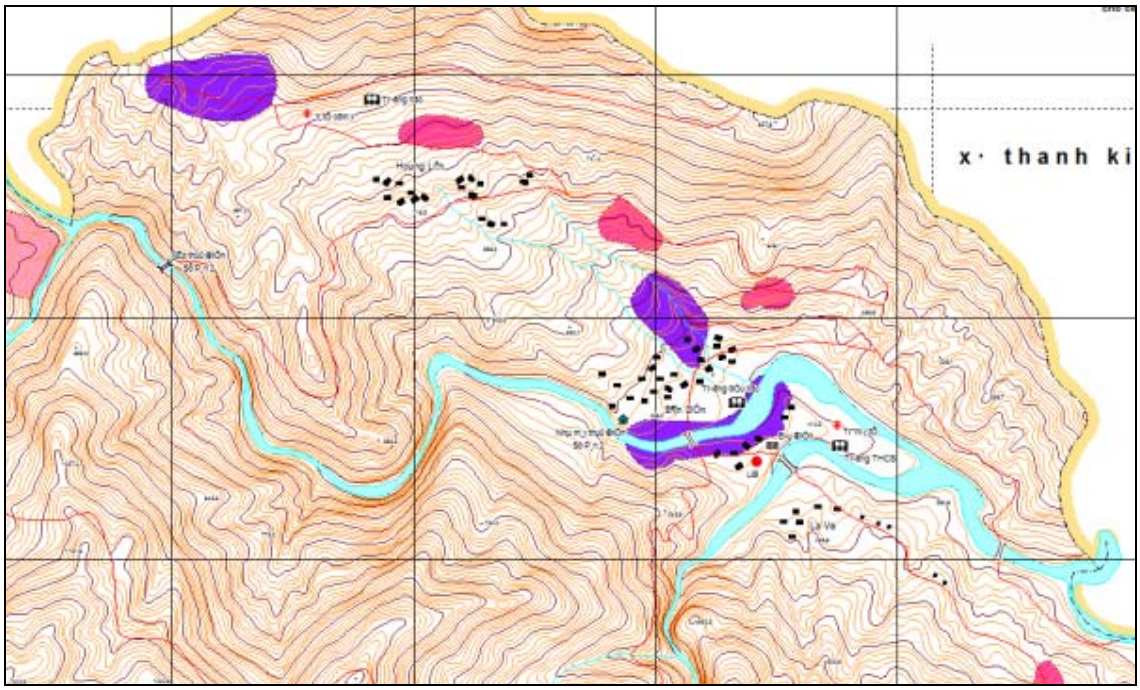
[18]Organization of American States (OAS). Primer on Natural Hazard Management in Integrated Regional Development Planning. http://www.oas.org/dsd/publications/unit/oea66e/ch10.htm#chapter 10

maps helped them discuss and plan how they wanted to reduce such risks within their communes as part of their Safer Commune Plans.

Figure 16: Hand drawn hazard map of Mang Ri Commune

6.3.2. Digital GIS Hazard Maps

Figure 17: Digitally Produced Hazard Map of Ban Ho Commune, Sa Pa District



Simultaneously, the Disaster Management Centre (DMC) of the Committee for Flood and Storm Control (CFSC) based in the Ministry of Agriculture and Rural Development (MARD) worked with Lao Cai and Kon Tum Provinces to conduct surveys and prepare digitally accurate hazard maps using Geographic Information Systems (GIS) for the six project communes. The HCVA assessment information was used together with GIS information to make the hazard maps user-friendly and simple enough to be understood by local authorities and local communities. The steps for producing these digital GIS hazard maps were as follows:

1. The DMC collected and analyzed data and previous research on hydrology, meteorology, topography, geology, forest layers, and socio-economic factors from the commune areas. This information served as an initial basis for the digital maps.

2. Initial digital GIS maps with the ratio of 1/10.000 were produced by a consultant from topography maps (UTM 1/50.000) and forestry maps (UTM 1/20.000) using MapInfo Professional software.

3. A field team comprising DMC, project and commune staff then went to the communes with a portable GPS device to consult with commune leaders and elder villagers to update the maps. The GPS was used to map the physical locations of residential areas, road systems, technical infrastructure works, and farming/production regions onto the map.

4. This accurate GPS information was placed together with information from the community HVCA process and additional information collected from local officials and villagers regarding the locations where flash floods and landslides had previously occurred.

5. The hazard map consultants completed a set of maps of areas that could possibly be affected by flash flood and landslide natural hazards in the future. Risks were graded in terms of high and low for floods, and high, medium, and low for landslides. Medium and low risks were based on information regarding predictive signs i.e. the soil material and cracks in the earth, whilst high risk areas were based on historical experience i.e. where landslides and flash floods have already happened.

6. Paper map data collected by the commune was then transferred to the computer. MapInfo software was used to produce an A0 size digital map print-out.

7. The hazard maps were made available to Commune People's Committee, with copies being made for all six communes and villages.

6.3.3. Training on Hazard Mapping and MapInfo Software

Once the maps were produced, the hazard map consultants from the DMC organized two trainings for each province. The participants were officials from Province (Provincial Committee for Flood Storm Control, Centre for Hydro-Meteorology, and Project Management Board), District (from District Committee for Flood Storm Control and Office of Natural Resource and Environment), and Commune (Chairman and staff in charge of local administration and statistics) levels.

The training contents was on how to read the map, how to map hazards, how to identify risk areas as high / medium / low, how to edit and modify the digital GIS print-out map, and how to use the digital mapping software (MapInfo) to update the hazard map on an ongoing basis. A0 maps, user guidelines, survey materials, and cartographic products were also given to the participants.

6.3.4. Updating Digital Maps

Hazard map updates are ongoing. For example, when any new landslide or flash flood happens, commune staff visit the site to record the area that has been affected. The commune staff manually draw by hand on the

digital hazard maps to update them (in addition to new risks, they also include the location of any new houses, roads, or other infrastructure). These hazard map updates are then sent to provincial level for provincial staff to make the necessary changes to the digital hazard map on the computer.

The digital hazard maps themselves are printed out once a year in the provincial capitals. Maps are then given back to commune level offices and are displayed there. The commune land officer also holds a copy of the map. Maps are also given to the heads of villages. However the digital maps are not often used with village communities due to them being too complex to explain and understand.

6.4. WHAT DID THE PROJECT LEARN FROM HAZARD MAPPING IN UPLAND AREAS?

6.4.1. Hazard maps can be used for residential zone planning and disaster mitigation

The hazard maps are particularly useful for planning purposes by Committees for Flood and Storm Control (CFSC) at district and provincial levels. One of the principal uses of the maps is to determine which households are at risk from flash floods and/or landslides, whether they need to be relocated, and to where. Resettlement out of disaster prone areas to safer places is currently part of Government policy. The government provides a maximum of 10 million VND per household for relocation. The military also help the move and the community gives in-kind contributions. For example, in Ban Ho Commune, three households were moved after Typhoon Kammuri (Storm No. 4, 2008) and the resultant landslide. Some community members were cooperative and relocated, but some did not want to move as they had an established house or had lived in the area a long time.

The maps can also be used for prioritizing and designing disaster management structural works. They can identify where residential areas and infrastructure i.e. roads, schools, hospitals etc. should be built within the area and for overall residential zone planning.

One of the lessons learnt about using the hazard maps for planning is that it is important to have accurate maps on which to base these decisions. The mapping of risks is currently done by estimation as opposed to accurate GPS coordinates onto the map. Mapping by estimation is sufficient if the hazard map is only going to be used as an awareness-raising tool. However, for it to be used as an undisputed planning tool, risks need to be mapped accurately. This is because people can presume digital maps are accurate even if data inputted based on estimations.

The hazard maps also help officials at province, district and commune level determine priorities for awareness-raising and education on disaster preparedness. The map can also be used to establish evacuation plans.

6.4.2. Hazards could be mapped on to current topographical maps used by local authorities

The local authorities in Kon Tum Province noted that they already use topographical provincial maps that hold similar types of information to those on the hazard maps. If this is the case, the local authorities may eventually prefer to use their own planning maps with hazard details included on them, instead of separately prepared hazard maps as developed by the project.

6.4.3. Communities did not always understand the digital GIS hazard maps

One of the original reasons that digital hazard maps were produced was so that they could be used to raise awareness on risks to grassroots communities. However, it was found that the detail contained in the digital

hazard maps (in terms of for example contour lines and spot heights) largely overwhelmed communities and distracted them from the main essential risk information about landslides and flash floods. Instead, the community seemed to understand better the hand-drawn paper maps that used objects (pins, removable stickers) to represent hazards.

The project learned that even commune staff, despite their training, had difficulty understanding all the features and legend on the digital hazard map.

In the short term, warning signboards seem more useful in terms of mapping hazardous areas and for raising awareness amongst communities. It was learned that it is important that these signs also correspond with and match the areas marked on the hazard maps.

6.4.4. Hazard maps can be used for archiving purposes

Once a disaster happens, commune staff trained on hazard mapping visit the area affected to update the hazard maps. Over time, this means that the map is a way whereby historical data can be collected regarding where disasters have happened and what type of disasters occurred there.

6.4.5. Digital GIS hazard maps allow on-going updates

Paper maps are easily updated by hand when in the field. However, these maps can get destroyed from overuse. Equally, there can be debates and changes about which areas are at risk and so modifications may be needed to be made to the paper maps. Digital GIS hazard maps have the advantage of being easy to update on the computer, allowing multiple changes to be made. Different versions can also be saved and compared over time.

6.4.6. On-Site collection of GPS data is time consuming and needs factoring into plans

Given that it can take one or two days to update an area after a landslide or flash flood has occurred, it is a time consuming process for commune staff to travel and accumulate data for hazard maps.

Also, given the size of the commune areas, the fifteen month phase project time periods, and the inaccessibility of some areas, only a limited number of on-site collections of GPS data were possible. This means that detailed information has yet to be collected from each locality. These time constraints mean that hazards are only mapped around areas where communities already live. If households are relocated to an area that is not already mapped, authorities need to be aware that unknown risks may exist in these areas too.

6.4.7. Exercise of mapping hazards useful for project planning

The process of hazard mapping, together with the HCVA and baseline assessments, can also be a productive way of working with communities in order to refine the overall project work plan in each site and to reach consensus on implementation. This means that the process can actually be just as valuable as the actual hazard map product.

6.4.8. High cost of producing and updating maps

The cost of producing and updating the hazard map is relatively expensive. This could make replication by CFSC in other districts difficult. Support may be therefore required from the national government in order to replicate the hazard mapping process.

6.4.9. Digital mapping software difficult for commune staff to use

Initially the commune staff were charged with updating the digital maps using the computer software. Trainings were provided to key commune and village officials on how to use and update these printed hazard maps.

Despite these trainings, commune staff were still not confident in using the software due to capacity issues. The project recognized this and provided additional refresher training. However more training is required if commune staff are to be made responsible for operating the mapping software.

Commune staff also found it difficult to update the digital hazard maps on their own office computers as their computers often have viruses. In addition, they were unable to print the maps and had to send the information to the provincial capital.

It was for these reasons above that the project decided that commune staff would update hazard maps manually and that they would then send them to the provincial level for computer updates and annual printing.

6.4.10. Both paper maps and digital maps have their value

Overall, the project learned that both hand drawn hazard maps and digital GIS maps have their value.

Digital maps allow technical data to be incorporated that can help predict landslides and flash floods. They can also be changed and reprinted over and over again so allowing updates to be done. Digital maps are also ideal for planning residential and farming areas, disaster mitigation works, and evacuation plans. In addition, they are important for archiving disaster information over a series of years to help predict areas that may be affected.

The process of **hand drawing hazards maps** can help encourage community participation within the project and facilitate the incorporation of local community-based knowledge of hazards. They are simpler to produce and understand as a grassroots communication tool. However, warning signs on the ground (see section 5.3.2.2) may be more useful for awareness-raising purposes than displaying hazard maps locally.

6.4.11. Need to be clear about hazard map purpose to know the level of detail required

In order to help commune staff and communities understand the map, the hazard maps were simplified during the project by taking out details such as forests, soil layers, capacities, vulnerabilities etc. However, by taking out these details, those using it for planning purposes found that it then had insufficient information on it. And even with this information removed, it still proved too complicated for it to be used as a grassroots awareness-raising tool. The project therefore learned that it is important to be clear about who will use the hazard map and about what level of detail they require as a result.

6.4.12. Need time to evaluate whether hazard maps are a useful technology for upland areas

The final digital hazard maps were produced near the end of first phase of the project, over one year ago. There was insufficient time to test and evaluate the effectiveness and appropriateness of having digital hazard maps in upland areas. Such evaluations are ultimately dependent on disasters occurring, so determining the effectiveness of hazard maps on reducing causalities can take years. The project plans to continue working

with the DMC to assess how the maps are being used before potentially expanding the use of hazard maps into other provinces.

6.4.13. Undertaking hazard mapping activities within government structures increased sustainability

Hazard mapping is currently a national priority for upland areas. Hence, the hazard maps done by the project will be carried forward by the DMC and MONRE under their mandates and as part of their roles within the NSDPM Action Plan. The project learnt that undertaking work that is already within this national strategy increased the enthusiasm, ownership, and momentum for the work.

Hazard mapping activities were done together with the national level Disaster Management Centre (DMC) in MARD (secretariat of CCFSC). Through linking with the DMC, the project also aimed to standardize the training of provincial and district officials on how to understand and use of hazard maps. It is envisioned that these hazard mapping processes can be applied later to other upland areas within Viet Nam through similar government structures.

6.5. HOW ARE OTHER ORGANIZATIONS IMPLEMENTING HAZARD MAPS?

CARE International is currently developing risk and capacity maps within the coastal communes where they work. These maps provide information on population densities, river flood possibilities, roads suitable for evacuation, major facilities (such as schools and hospitals), and land use (forests, farms) for DRR awareness-raising purposes. However, CARE's work is currently focusing more on typhoon tracking maps for district, commune, and village levels. These enable local authorities to chart on a daily basis the location of typhoons so that they can decide whether or not to issue a storm and evacuation warning.

The **Faculty of Geography at the National University of Hanoi**[19] used remote sensing and GIS technology to help predict flash floods and related phenomenon in Hoa Binh Province. They made use of SPOT images, aerial photos, and topographical maps in order to derive information such as land use, vegetation cover, hydro-geological information, tectonic faults etc. This they combined with field tests, and through a process of weighting and GIS processing, produced landslide prediction maps. Significant investment and expertise was required to make such detailed maps.

The **Netherlands Red Cross** only uses risk mapping during large interventions such as relief operations. They use hand drawn hazard maps during the HVCA process as it can help stimulate discussion and awareness-raising within the commune. They consider the drawing process and resultant discussions more important than the actual map produced. The use of computerised digital risk maps could potentially limit this discussion given that communities can have difficulty understanding the maps.

[19] Dr. Thach, N. N. *Integrated Utilization of GIS and Remote Sensing Technology for Flash Flood and other Geo-Hazards Management in Hoa Binh Province*.

BUILDING COMMUNITY RESILIENCE TO DISASTERS IN UPLAND AREAS OF VIET NAM (BCRD) PROJECT

CECI
CENTRE FOR INTERNATIONAL STUDIES AND COOPERATION

CENTRE FOR INTERNATIONAL STUDIES AND COOPERATION
BLOCK P, LA THANH HOTEL
ADD: **218 DOI CAN STREET, BA DINH, HA NOI, VIETNAM**
TEL: **(04) 37628422**
FAX: **(04) 37628423**
WEBSITE: ***www.ceci.ca***