

## Improved dissemination of flood forecasts through community-based early warning systems

*Building the local capacity in flood-vulnerable communities in Cambodia*

### ABSTRACT

**T**his case study highlights the features of community-based early warning flood systems in four districts in Cambodia. By looking at previous and existing early warning systems at national, provincial and district levels, this case study explains the various aspects and activities which contribute to the sustainability of early warning systems in Prey Veng and Kandal provinces in Cambodia. Connecting this system to the district and provincial Flood Preparedness Programs, community-based early warning initiatives can become imbedded in a more efficient sustainable flood management system which has its foundation in local development plans.



**E**very year in the Lower Mekong River Basin, the river flows overtop its banks and creates untold damage to surrounding villages. Working directly with these local communities is an effective way to lessen flood impact. One Cambodian flood early warning project is doing just that. With its focus on flood-prone communities, the Community-Based Early Warning System project aims to build the capacity of local disaster management committees in order that they may respond more effectively to potential flood disasters for a sustainable future. This initiative serves as a starting point for villagers and communities to make decisions and take appropriate protective actions to reduce the negative impact of flooding.

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### INTRODUCTION

Climate change, deforestation, and poorly planned development activities contribute to the damage caused by the annual flooding of the Lower Mekong Basin. Lives are lost; crops destroyed; and livelihoods are often irreparably affected. Flood early warning systems are

vital to this region as they help to alleviate the destruction by alerting flood-prone communities of an impending disastrous flood.

How do flood early warning systems work? In Cambodia, the flood early warning system begins with the

Department of Hydrology and River Works (DHRW) in the country's capital, Phnom Penh. The DHRW generates flood forecasts which are sent to various concerned ministries, departments and districts as well as the media. National radio stations further disseminate this critical information to the general public.

In order for an early warning disaster system like this to be effective, the community must then use its available resources in order to respond effectively to the warnings. The Mekong River Commission (MRC) has partnered with the Asian Disaster Preparedness Center (ADPC) in implementing a community-based early warning system (CBEWS) which strengthens the capacity of local disaster management committees and ensures the necessary effectiveness in preparing for floods. The activity is part of the implementation of the Component 4 "Flood Emergency Management Strengthening (FEMS)" of the MRC's Flood Management and Mitigation Programme (FMMP).

In Cambodia communities have traditionally been dependent on the government for relief when floods have occurred. H. E. Ponn Narith, Deputy Secretary General of the National Committee for Disaster Management (NCDM) said that in the past the government responded with emergency and relief efforts while villagers "waited for rice and food distribution".

If communities, which are at the forefront of flood disasters, become empowered to protect their own lives and properties, they will be less dependent on outside aid. Sustainability is created when local communities take part in flood preparedness using locally available and realistic resources. The responsibility of the community's future is firmly placed into the hands of those directly affected and creates a sense of ownership.

### EXISTING FLOOD EARLY WARNING SYSTEMS IN CAMBODIA - ESTABLISHING A FOUNDATION

Rural communities in Cambodia require vital flood information from national agencies in order for them to prepare appropriately. At the same time government structures need information from the communities to better understand the resources required once the flooding occurs. There are several flood early warning projects which have been implemented in Cambodia since 2003, each with its own strengths and lessons to be learned.

Effective flood early warning systems are generally simple in structure. The goals are to identify an impending flood; formulate and disseminate warning messages; and create a community response. Each of the following

projects contains varying degrees of these components.

### Flood Early Warning

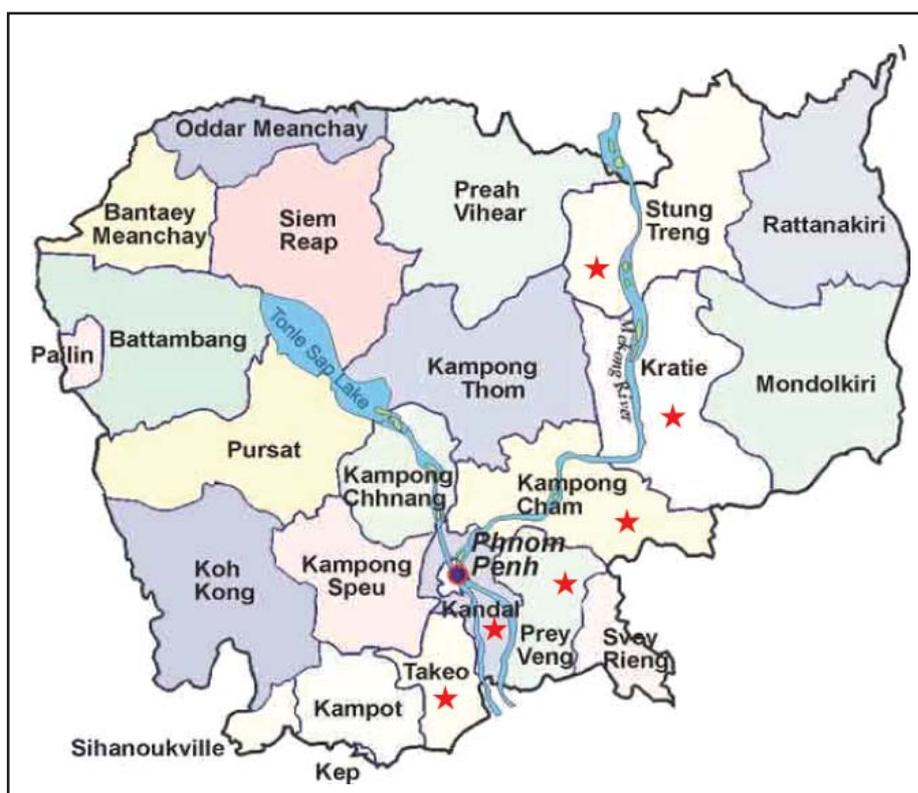
The MRC Project entitled "Provision of Flood Early Warning to Flood Vulnerable Communities in the Lower Mekong Basin" funded by the Office of United States Foreign Disaster Assistance (OFDA), implemented the first community early warning system project in Cambodia from 2003 to 2007, in collaboration with the American Red Cross (ARC) and the Cambodian Red Cross (CRC).

The project was able to target vulnerable communities in around 40 villages along the Mekong and its tributaries in five flood-prone provinces in Cambodia (Stung Treng, Kompong Cham, Kratie, Kandal, Prey Veng).

One of the first of such systems in Cambodia, the Flood Early Warning System (EWS) project set an example for useful and understandable flood forecasts based on information from local villages in the flood plain. Flood-prone communities effectively respond to the flood information prepared by the DHRW with MRC support. The community early warning systems, set up in each target village, consists of water level staff gauge (also called a flood marker), flood information billboard (where daily village flood forecast information are displayed and updated every day), ICOM/radio (walkie talkies) equipment and loudspeakers, etc.

Large simple and easy-to-read hand-drawn village maps were created to appeal to the understanding of villagers, indicating roads and the location of safe areas.

Billboards include various stages of alarm using a



colour code of red (severe flood warning), yellow (flood warning) and green (all clear) as well as water level information. These stages of alarm communicate the level of seriousness of the flooding and appropriate action to take.

Red Cross Volunteers (RCVs) maintain the billboards and work with local communities in disseminating the vital flood information to communities.

### Lessons learned

Several lessons were learned from this successful pioneer project. Villagers have very low education levels bringing challenges to the appropriate processing of flood information in the communities. Alternative methods of communicating to very low educated village people were needed.

Information dissemination was further challenged by the lack of infrastructure in rural communities. People living near the billboards were able to access the essential flood forecasts. However, disseminating flood information to more remote communities was hampered due to a lack of roads and boats. RCVs often had to visit every house in an isolated village as it was discovered that villagers could not or did not necessarily consult the marked billboards daily. Loudspeakers were used to counter this but again they only worked as far as the sound could travel. Moreover, the ICOM/ radios often lost their signal in bad rain or wind.

While the EWS worked on building the capacity of the NCDM in establishing an effective communication and flood forecast system, in the latter stages of the project it attempted to work with the NCDM on strengthening its system at the commune level. The use of RCVs to operate the flood markers and billboards at the local level, while useful for its purpose, does not contribute to sustainability as they belong to a partner agency and are not a part of the NCDM structure.

### Flood Early Warning System Project by Action Contre le Faim

Funded by the Disaster Preparedness of the European Community for Humanitarian Aid Department (DIPECHO), the MRC has collaborated with Action Contre le Faim (ACF) in similar flood marking activities as the ARC/CRC EWS project. This project was smaller, targeting nine vulnerable villages in the Cambodian province of Kompong Cham. Concentrating not only on a flood early warning system, it also operated directly with the disaster management



teams in flood preparedness. While, to a certain degree, the ACF project replicated the previous EWS, it differs in that it works closely with provincial and district authorities, as well as RCVs and commune leaders in establishing Flood Preparedness Programs (FPPs). Local involvement in this project has helped to establish a foundation in more long-term community ownership and sustainability of the flood early warning system.

Using the same kind of early warning system as the ARC/CRC project, this project includes alerting villagers through billboards, flood markers and loudspeakers for emergency broadcastings. It diverges from its predecessor, however, in its direct collaboration with the Department of Information in Kompong Cham province. Flood forecasts were broadcast for the first time by radio as most poor farmers own one. This proved an effective method for information dissemination.

Some villagers created their own home flood markers so they would not have to travel all the way to another village where the marker is installed. This has been useful as other villagers in the area also do not have to travel very far to get flood information. This knock-on effect of flood marking has been maintained in several remote areas.

### Lessons learned

The ACF project also encountered difficulties overcoming the low education level of local communities. An example of this was in incorrect recording of flood marks which not only interferes with accurate flood forecasts and warnings but also has implications on villagers' trust in the flood early warning system.

## Early Warning System Project by Oxfam Great Britain (GB)

This flood early warning system project, funded by Oxfam GB from 2003 to 2005, replicated the original MRC EWS project in 13 villages in three districts across Takeo province. Consistent with the two previously mentioned projects, it advertised flood information by establishing flood markers and billboards. It managed to effectively communicate flood information to local communities which have been able to prepare appropriately for floods.

### LESSON LEARNED

Accessing more remote villages which were not located near the established flood markers was challenging.

#### **CBEWS: FLOOD EARLY WARNING INFORMATION AT THE COMMUNITY LEVEL**

Existing flood early warning system projects have established positive inroads in flood disaster reduction in Cambodia. Continuing with flood preparedness using these types of systems at the community level can only be beneficial. Building on the capacity of local level disaster management teams will help to maintain the level of ownership and trust so important to the sustainability of disaster preparedness. As well, it will help with the effective communication of trustworthy flood early warning information.

The FEMS project, funded by Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), strives to strengthen the understanding of early warning information at the local level by drawing on the lessons learned from the existing flood early warning systems. Since 2004, under the aegis of the Flood Emergency Management Strengthening (FEMS) project (Component 4 of the MRC Flood Manage-

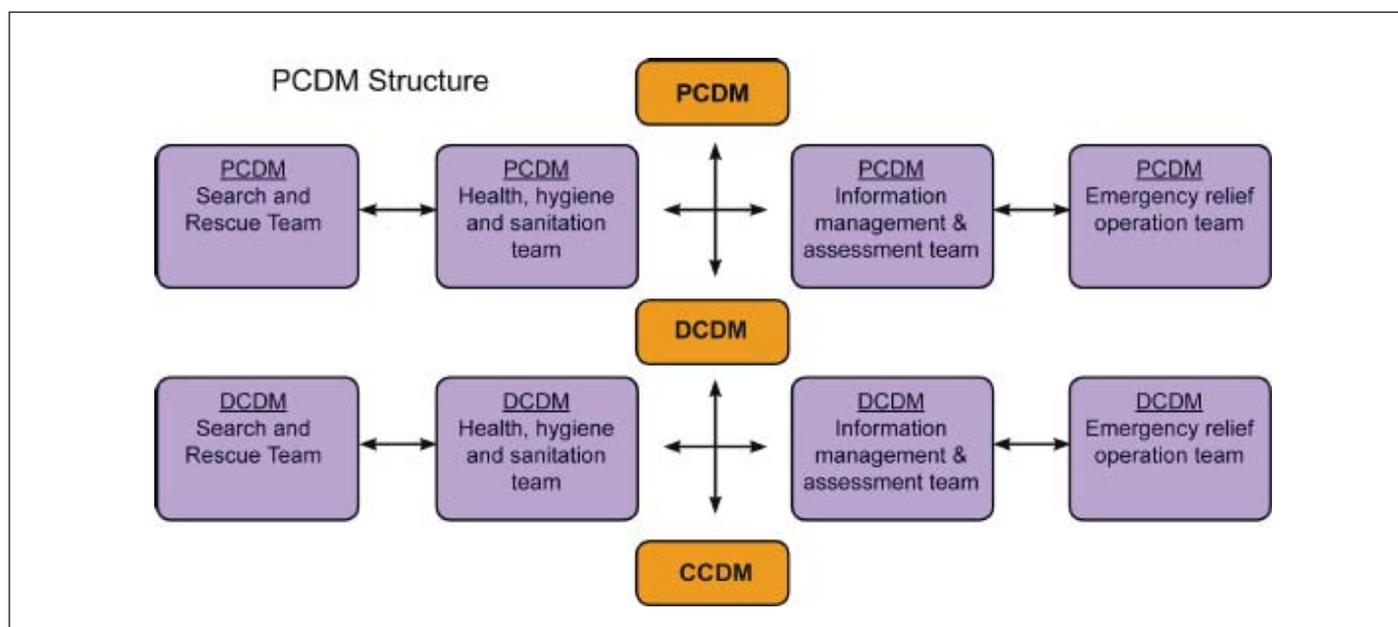
ment and Mitigation Program), the Community Based Early Warning System (CBEWS) has been one of sub-priority project within the existing Flood Preparedness Programs (FPP) which are managed by the Provincial and District Committees for Disaster Management (PCDM/DCDM).

The CBEWS is a capacity and skills building program on disaster management. It aims to raise public awareness in communities and is committed to the sustainability of a flood early warning system at the community level. Its focus area is Peam Chor district in Prey Veng province, reaching nine villages. The CBEWS contributes greatly to the strengthening of national capacity in flood preparedness. The NCDM at the national level can put the FPP into action more effectively when it supports the local communities in flood preparedness, targeting those who need the support the most, the rural poor.

The goals of the CBEWS are two-fold. By implementing the use of flood markers as a tool for flood management in vulnerable communities as in previous flood early warning system projects, the project aims to reduce the disastrous impact of annual flooding by increasing the capacity for self-reliance in managing floods before, during and after they happen.

The activities within the CBEWS were coordinated around two stages of flooding: before and during floods. Before the floods, a meeting was held with commune and village chiefs, community volunteers and villagers. Together they surveyed selected sites, and nine villages along the Tonle Toch were collaboratively identified within Prey Veng province in Cambodia. Flood markers and billboards were installed, and communication equipment was provided for base stations at the provincial, district and commune and village levels.

The primary structure and role of the PCDM is to carry out the national policy for disaster management (*see PCMD structure*). It prepares guidelines and supports the activities of the District Committee for Disaster Management (DCDM).



It reports to the National Committee for Disaster Management (NCDM) on all activities undertaken by government agencies and NGOs at the provincial level. At the provincial and district level, the respective vice chairman works with the team leaders of four disaster management teams: search and rescue; health, hygiene and sanitation; information management and assessment; and emergency relief and rehabilitation. The PCDM additionally reports on disaster damage and losses and prepares proposals for financial and material support and any other further interventions during disasters.

## The CBEWS

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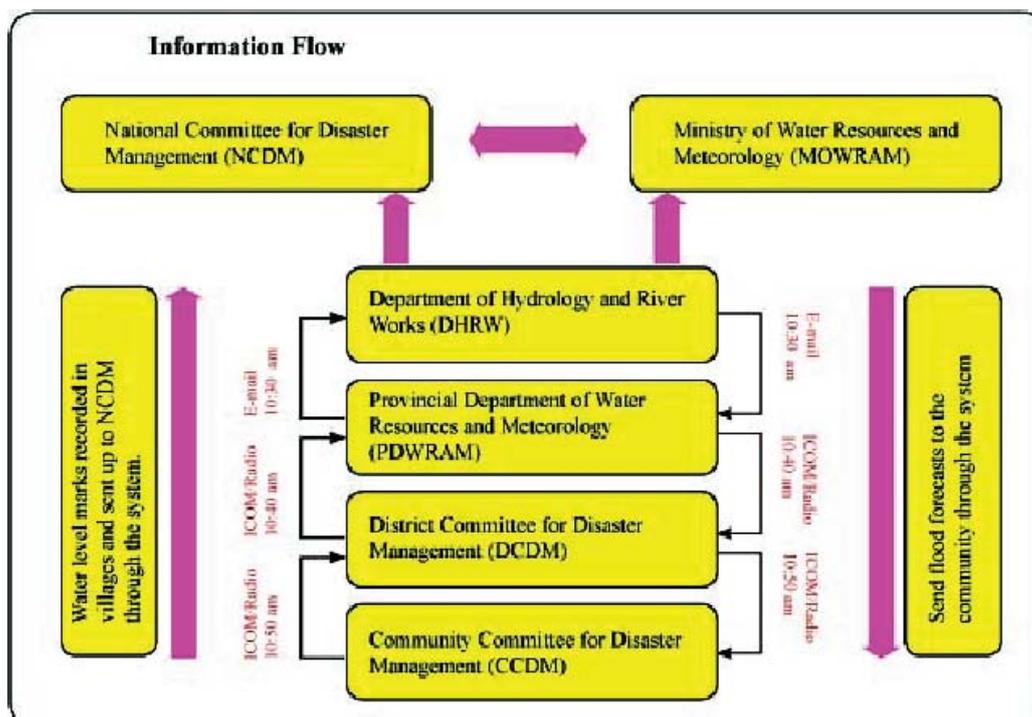
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The Commune Committee for Disaster Management (CCDM) and village authorities received training from the DHRW on flood mark operations and maintenance. This training focused on orienting them in operating, maintaining and utilizing data collection, as well as accurate record keeping of the new flood marks and billboards.

In order for the DHRW, with support from the MRC Secretariat, to make accurate flood forecasts, it relies on daily information from designated marked stations along the Mekong river. During flood seasons, villagers measure flood levels in their respective villages every day and report their findings by ICOM/radio (walkie talkie) to the district authorities. The levels are then communicated through the established communication system all the way up to the DHRW. (*See Information Flow box.*)

The DHRW informs the villages, through the PCDM and DCDM, of future flood forecasts. Flood information is recorded by village chiefs on billboards displayed at various points throughout the district. The billboards provide a three-day forecast: today, tomorrow and the next day, with arrows pointing up (water level rising) or down (water level falling). Each arrow is color-coded according to the rate at which the water is rising. A red arrow shows there will be a rapid increase in water, indicating serious flood warning. Yellow advises villagers of a flood warning and to be cautious. A green arrow shows that water levels are not changing and that for the moment the area is safe. Pictures also accompany





Flood markers located in homes of some village residents were an effective tool for reaching more people with information about floods. Not all of them have access to flood information boards or flood marks installed outside their village.

“Because villagers can easily follow up flood water levels, they can evacuate to the safe areas on time.”

Mr. Tea Chhun, Praek Teng village chief

either too general, too infrequent or lacking in sound.

The flood mark information is regularly documented and the billboards updated accordingly. This has supported local trust in the system in general as the information is reliable and managed by recognized people of status in the village. As well, the information is disseminated using a variety of techniques from village ceremonies and public meetings to knocking on people's doors. Despite some villagers being unable to read the flood information due to poor education, up to “85% of villagers understand the information”, reported Mr. Meng Monorom, vice village chief of Khsach village.

The training of the CCDM and villagers helps to improve the vertical cooperation of flood management from the village all the way up to the NCDM and back. In the same manner, the project enhances horizontal communication. Communes can communicate through the DCDM and share information that is mutually understandable.

The project has also provided an opportunity to strengthen the capacity of the CCDM and partner line agencies,

the colored arrows informing communities of the appropriate preparatory actions to be taken at that time.

Community members are also trained in reacting to the flood early warning information through public awareness campaigns, the incorporation of flood preparedness into the school curriculum and other community events.

## The advantages of the CBEWS

There have been several advantages of the CBEWS. Most importantly, it has allowed vulnerable communities immediate access to flood early warnings. For example, rural villagers in Prey Veng province were not previously aware of exactly when or where flooding would take place. Flood forecasts had been previously located in larger communities located along the main artery of the Mekong river. Smaller, more rural communities could not benefit from them as the television and radio forecasts were

such as the CRC and local non-governmental organizations (NGOs), on how to operate and maintain flood marks. By utilizing this flood information people's livelihoods can improve; communities can make simple village flood/land use maps in their agricultural practices and benefit from the flooding of the Mekong rather than being devastated by it.

The CBEWS project is unique in that it incorporates village chiefs and community authorities in the operation and maintenance of flood marking and recording. By including those with vested interests in the well being and development of the community the chance for sustainability increases.

## Future Sustainability

The FEMS project aims to ensure the continued use and participation of existing community structures for

flood relief. The CBEWS project involves the CCDM, RCVs and village authorities in collaborating on disaster management.

The CBEWS is also being included in larger Disaster Risk Reduction (DRR) operations, as in the Commune Development Plan (CDP) and the Commune Investment Plan (CIP). By incorporating flood early warning and management systems into the CDP, community ownership is ensured and flood management becomes integrated into local development objectives.

**LESSONS LEARNED/FUTURE CHALLENGES**

There have been several lessons learned from the FEMS CBEWS project:

- Transportation to the flood marks has been difficult due to a lack of equipment. Twice a day, operators require

boats to read and record flood marks. Generally, each household has one small boat which is usually used for their livelihood, such as fishing, transporting children to school or taking goods to market. They cannot afford to give up their boats for flood marking duties.

- There have been difficulties with the communication equipment provided. Often, radio handsets could not be used due to poor quality batteries and/or infrequent electricity to recharge them. In general, equipment is not always reliable during bad weather and maintenance can be costly.
  - Flood information has been mistakenly recorded in log books.
  - Some villagers have reported a lack of safe areas and much-needed supplies when the flooding occurs.
- Challenges in the continued implementation of the project are:
- A village chief has been appointed

by the CCDM to be the flood mark operator which ensures the future operation and maintenance of the flood early warning system. It was the intention of the project to use community volunteers to manage the flood early warning system to ensure community ownership and sustainability.

- Solutions for long-term sustainability are in progress. Plans are underway to integrate disaster risk reduction (DRR) programs such as the CBEWS into commune development plans. This would finally place full responsibility of disaster management programs into the hands of the Cambodian people.
- To support faster information transmission, the MRC Flood Management and Mitigation Program is exploring the possibility of a low-cost system for sending flood forecasts to the communities via instant-messaging (SMS) on mobile phones as a way to help alleviate issues with communication equipment.



Information boards adequately served in providing vital information to villagers in flood-prone areas.

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**Safer Communities** is a series of case studies that illustrate good practices of disaster preparedness and mitigation undertaken by either the government or non-government agencies with the goal of reducing the vulnerabilities and risks on the communities living in hazard-prone areas.

The series aims to provide decision makers, development planners, disaster management practitioners, community leaders and trainers with an array of proven ideas, tools, policy options and strategies derived from analyses of real-life experiences, good practices and lessons learned in Asia and the Pacific region, with a specific focus on reducing community risks and vulnerabilities and building more disaster-resilient and better prepared societies.

The first few case studies under the series have been developed under the Component 4 "Flood Emergency Strengthening" (FEMS) of the Flood Management and Mitigation Programme (FMMP) of the Mekong River Commission Secretariat (MRCS). Therefore, the focus of these studies will be on flood risk management and their geographical coverage is limited to four MRC member countries of Cambodia, Lao PDR, Thailand and Vietnam. However, good practices from other countries and other natural disasters are to be added over the years.

The Mekong River Commission Secretariat implements a Flood Management and Mitigation Programme (FMMP) designed to prevent, minimize, or mitigate people's suffering and economic losses due to floods, while preserving environmental benefits. FMMP has five components:

1. Establishment of Regional Flood Management and Mitigation Centre
2. Structural Measures and Flood Proofing
3. Enhancing Cooperation in Trans-boundary Flood Issues
4. Flood Emergency Management Strengthening
5. Land Management

The Component 4 "Flood Emergency Management Strengthening (FEMS)," of the FMMP has been implemented by the MRCS with technical assistance from the Asian Disaster Preparedness Center (ADPC) and funding support from the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), started from September 2004 to April 2008. The project target areas are in Cambodia and Vietnam, namely two provinces and four districts each in Cambodia and Vietnam. The project partners are the National Mekong Committees, National Disaster Management Offices and their local authorities at provincial, district and commune levels, concerned line agencies, mass organisations, Red Cross Societies, international organisations, local and international NGOs, etc.

Since 2004, FEMS has achieved the following:

1. Flood Preparedness Programs (FPP) in the target districts and provinces developed and implemented.
2. Local and national capacity in support to the FPP development and implementation process built through training at local levels on community based flood management, damage and need assessment, search and rescue, emergency kindergarten management, swimming lessons for children, etc. and involving/participating in the project implementation.
3. Public awareness on household safety measures at local levels raised, including school teachers' orientation and School Flood Safety Program for schools, identification of special needs of women-headed households, cultural performances, folk songs, distribution of flood booklet, posters, etc.
4. Local and regional knowledge sharing conducted through national and regional workshops as well as distribution of good practice documents.

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