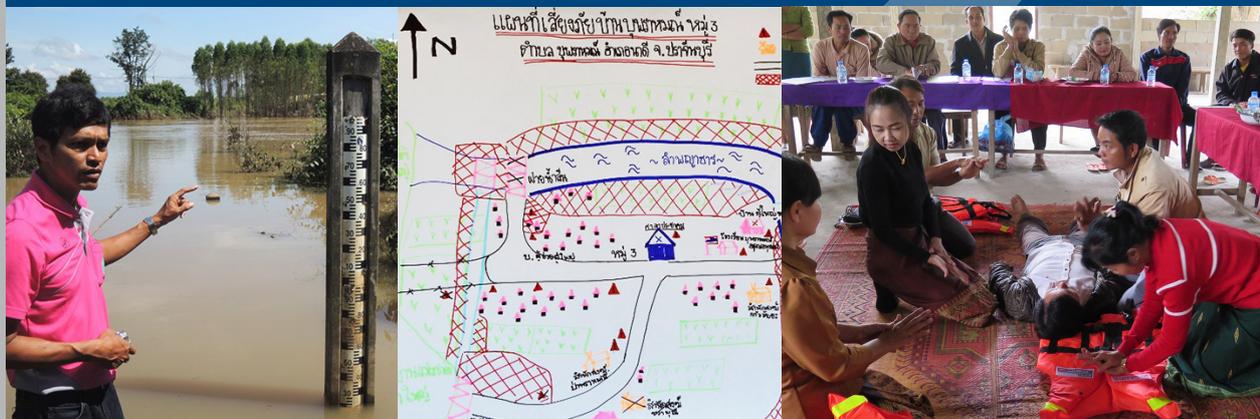


Social Aspects and Stakeholder Involvement in Integrated Flood Management

COMMUNITY-BASED FLOOD MANAGEMENT IN THAILAND



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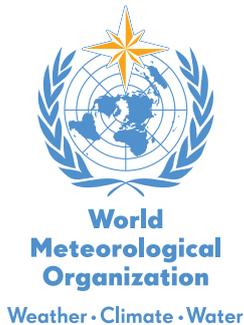
Technical supervision by



The **Associated Programme on Flood Management (APFM)** is a joint initiative of the World Meteorological Organization (WMO) and the Global Water Partnership (GWP).

It promotes the concept of Integrated Flood Management (IFM) as a new approach to flood management. The programme is financially supported by the French Ministry of Foreign Affairs and International Development, the National Water Commission of Mexico (CONAGUA) and the US Agency for International Development (USAID).

www.floodmanagement.info



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<http://www.adpc.net>

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Acknowledgements

This training manual has been prepared by the Asian Disaster Preparedness Center (**ADPC**), with the technical supervision of the Associated Programme on Flood Management (**APFM-WMO/GWP**). The manual presents the impacts and good practices undertaken in the pilot project “Community-based Approaches to Flood Management in Thailand”, implemented by ADPC together with the Department of Disaster Prevention and Mitigation of Thailand (**DDPM**), the Thai Meteorological Department (**TMD**) and other water resource management agencies in Thailand, and local authorities as well as pilot communities in Prachinburi province.

We are particularly grateful to Mr. Aslam Perwaiz, Ms. Thitiphon Sinsupan, Ms. Somvath Keokhamphoui, Mr. Thanongdeth Insixsiengmay (**ADPC**) and staff of the APFM Technical Support Unit for their diligent review of earlier drafts of the manual.

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ABBREVIATIONS & ACRONYMS

ADPC	Asian Disaster Preparedness Center
DDPM	Department of Disaster Prevention and Mitigation
DWR	Department of Water Resources
kph	kilometres per hour
NEWC	National Early Warning Center
PDR	People's Democratic Republic
RID	Royal Irrigation Department
SWOT	strengths, weaknesses, opportunities and threats
TAO	Tambon Administrative Organization
TMD	Thai Meteorological Department
WMO	World Meteorological Organization

PREFACE

Economic and social developments affect livelihoods and land-use planning, and can potentially cause environmental degradation. As a result, natural disasters are becoming increasingly unpredictable and more intense in severity. In 2011, Thailand experienced severe flooding, causing the entire nation to suffer great losses across all sectors. One of the lessons learned from this disaster was the raised awareness (of national and local governments, private sectors and communities) of the importance of disaster risk mitigation through increased preparedness prior to the occurrence of disasters.

Under the Associated Programme on Flood Management (a joint initiative of the World Meteorological Organization (**WMO**) and the Global Water Partnership (**GWP**), the Asian Disaster Preparedness Center (**ADPC**), the Department of Disaster Prevention and Mitigation in Thailand and other water resource management agencies collaborated to build capacity on flood risk reduction, ensuring flood preparedness and enhancing resilience, starting at individual household level and propagating through to the entire community.

ADPC would like to express its appreciation to all stakeholders for helping to build disaster-resilient and sustainable communities. The purpose of this publication is to reduce the vulnerability and enhance the capacity and participation of local communities by raising awareness in risk assessment and flood preparedness planning, management, monitoring and early warning systems, and by integrating individual and household preparedness plans for emergency response. ADPC aims for this community-based flood management manual to become a useful tool for communities, especially in overflow and flash flood risk areas, and for other flood management organizations.

Asian Disaster Preparedness Center

As part of the regional project “**Community-Based Flood Management (CBFM) in Thailand and Lao PDR**”, the pilot project “**Community-based Approaches to Flood Management in Thailand**” has been implemented in Prachinburi province in order to improve self-help capacities of communities living in riverine and flash flood prone areas.

The project was composed of several interventions which have been implemented thanks to the collaboration of the Asian Disaster Preparedness Centre (**ADPC**), Support Base Partner (**SBP**) of APFM which was a technical partner in this pilot project, as well as the Thai Meteorological Department (**TMD**), the Department of Disaster Prevention and Mitigation (**DDPM**) and other national and local authorities which support the activities throughout the project. APFM would like to express as well its gratitude to USAID for its financial contribution and supporting the project.

This pilot project firstly consisted in conducting a rapid assessment to understand the community context in view of flood impacts and flood risk management. It enabled to identify appropriate plans and approaches as well as key partners to provide capacity building to the community to meet project objectives. Risk assessment was then conducted in two target communities, followed by the formation of CBFM committees in February and March 2014 with clear identification of roles and responsibilities, along with the development of community flood management plans and hazard maps. The plans, after being shared with community members and local authorities, were tested during a simulation exercise in August 2014 and revised accordingly. The community trainings on flood early warning and simulation exercises particularly helped in raising awareness of the community on flood management and early warning systems and also enhanced coordination amongst community and local stakeholders systematically. The training was so successful that it was proposed to extend the development of local plans and maps to other nine communities.

Success of the project was the strengthening of community awareness and knowledge of local hazards and their capabilities in flood management. The target communities had increasingly begun to acknowledge and include flood risk reduction activities under their initial development plan and mobilized funds from different sources to implement flood risk reduction activities. Through the different project activities, it also heightened partnerships between national, local authorities and communities, utilizing existing knowledge and capacity of the government as per their mandate in local context to build communities capacities. In a long-term vision, it enhanced capacity of national and local authorities on community-based flood management approaches and their ability to replicate and adapt these in other locations.

This publication, in addition to capture impacts and good practices of partner organizations’ work in building community resilience, is an application of the APFM Tools Series “Community-Based Flood Management” (APFM, 2017) which presents guidelines for effectively organizing community participation and capacity building in flood management. This Manual provides short guidance on how targeted communities have been involved in flood risk management and what participative tools and approaches have been implemented in the field. It also identifies what roles and responsibilities can heighten community empowerment and build their resilience.

1 INTRODUCTION

1.1 Background

Thailand and its neighbouring country, the Lao People's Democratic Republic (**PDR**), witnessed severe flooding brought on by tropical storms in 2011. In Thailand, the flooding was the worst of its kind in over half a century, causing tremendous losses across several regions of the country. The adverse effects of rapid economic development in past decades have caused great destruction to the environment and changed how land is being used. These effects, together with impacts related to climate change, have caused more intense and more frequent flooding in recent years. This emphasizes the importance for local communities to focus on reducing flood risks through a systematic and holistic approach in order to improve preparedness for flooding disasters.

Based in Thailand, the Asian Disaster Preparedness Center (**ADPC**) has provided technical support to agencies and organizations in the Asian and Pacific regions to enhance flood management capacities. ADPC has also provided technical support to countries in these regions within the framework of the Associated Programme on Flood Management, initiated by the World Meteorological Organization (**WMO**) and the Global Water Partnership in 2001. Under this collaboration, ADPC and WMO implemented a regional project, Community-based Approaches to Flood Management in Thailand and Lao PDR, with the main objective of strengthening community capacities for adapting to and coping with flooding, focusing on riverine floods and flash floods. With a duration of 30 months (June 2013 to November 2015), this project also aimed to strengthen community resilience by empowering communities to respond to disasters.

Taking into consideration the existing flood management mechanism of the Thai Government, which focuses on the participation of local governments and communities with support by relevant government agencies at subdistrict, district, provincial and national levels, the expectation is to use the outputs of the pilot project to develop other flood management initiatives to strengthen the effectiveness of this mechanism.

1.2 Objectives

The project had the following main objectives:

- To enhance community capacity for flood management by strengthening practical skills to prevent, prepare for, respond to and recover from riverine and flash floods
- To strengthen community capacity to manage risks, as well as to transform risks into opportunities
- To create more opportunities for communities to be involved in flood management projects and relevant activities at provincial and national levels

1.3 Implementation

The Department of Disaster Prevention and Mitigation (**DDPM**), the Thai Meteorological Department (**TMD**), the Department of Water Resources (**DWR**), the Office of the National Water and Flood Management Policy, the National Disaster Warning Center, the Office of the National Economics and Social Development Board and the Thai Red Cross Society were involved in the project as advisers, and provided valuable suggestions for the selection of target communities. They also provided technical support and specialists for national and provincial level training workshops, and coordinated with communities on project implementation activities.

As a first step towards project implementation, ADPC conducted surveys to understand the backgrounds of the target communities and to design project activities that addressed their needs. For example, Talad Keo Community in Prachinburi Province, Thailand, is an urban community with a strong leader and where the

residents have previously formed small groups to implement community activities. As a result, ADPC could work directly with the community to coordinate project activities and report back to the local government on a regular basis. In Bupfram Community, ADPC worked with the Tambon Administrative Organization (TAO) to plan and implement project activities, as TAO was very capable and understood the community's needs and the objectives of the project. ADPC facilitated reporting of the project's progress to relevant national and provincial agencies.

1.4 Target areas

As an initial activity, consultation meetings were conducted in Thailand and the Lao PDR to present the project details to relevant agencies and ask for their recommendations and guidance on the implementation approach. Active participation of these relevant agencies during the meetings was also requested. In order to avoid any duplication of activities in the target communities, the approach was combined and adapted to be in line with existing activities and community experiences in dealing with floods. The consultation meetings focused on riverine floods (in flood plain areas) and flash floods (in mountainous areas), and identified target communities in the two countries, as shown in **Table 1**.

Table 1 — Risk-prone areas in Thailand and the Lao People's Democratic Republic

Risk-prone area	Thailand	Lao People's Democratic Republic
Flood plain area, located in a medium-sized city	Talad Keo Community, Kabinburi District, Prachinburi Province	Suan Luang Village, Xiang Nguen District, Luang Prabang Province
Mountainous area subject to flash floods	Ban Bupfram, Nadi District, Prachinburi Province	Kaewmanee Village, Nan District, Luang Prabang Province

After the project areas were chosen, ADPC collected community information from relevant organizations in both countries.

2 FLOOD GENERAL INFORMATION

In order to have a clear understanding of the context in which the project has been implemented, this chapter gives an overview of the causes of floods in Thailand, their types and impacts.

2.1 What are floods?

A flood is defined in the International Glossary of Hydrology (WMO/UNESCO, 2012) as a “Rise, usually brief, in the water level of a stream or water body to a peak from which the water level recedes at a slower rate.” In the same glossary, flooding is defined as “Overflowing by water of the normal confines of a watercourse or other body of water.” Floods and flooding usually occur over what is normally dry land, affecting households, plantations, assets, human lives and economies.

2.2 Causes of floods

Floods are natural events that can be caused by many factors, most commonly including hydrological events (see **Box 1**) such as tropical storms, depressions, typhoons, low-pressure areas, intertropical convergence zones and south-west monsoons. These phenomena cause heavy rainfall for an extended period of time, which leads to overflow of rivers, especially during the rainy season (mid-May until mid-October in this region, see **Figure 1**). In addition, the humidity, soil saturation, groundwater level and channel cross-section can also cause a rise in water level. **Figure 2** shows a sample weather map of the area.

Box 1 – Building urban flood resilience in Mumbai, India (*Gupta, 2007*)

On July 26 2005, more than 60% of Mumbai was flooded by torrential rains that were no contest for the city’s antiquated stormwater-drainage system.

The people of Mumbai suffered considerable losses and as they waded through sewerage overflows in the streets, their exposure to water-borne disease was immense. In the aftermath of the disaster, the government of Maharashtra was determined to learn from this event and increase resilience against future flood events.

Since major capital investment to upgrade the outdated drainage system was not a viable option, a fact-finding committee was formulated to recommend key measures to reduce flood risk incrementally. As a result, early warning systems, flood-management plans and emergency control centres were implemented. Enhanced maintenance of storm drains, inlets, waterlogged areas and a ban on plastic bags contributed to reducing the risk of drainage failure at vulnerable network nodes.

The implementation of combined structural and non-structural measures serves as a basis for long-term planning in Mumbai in a multi-hazard approach.

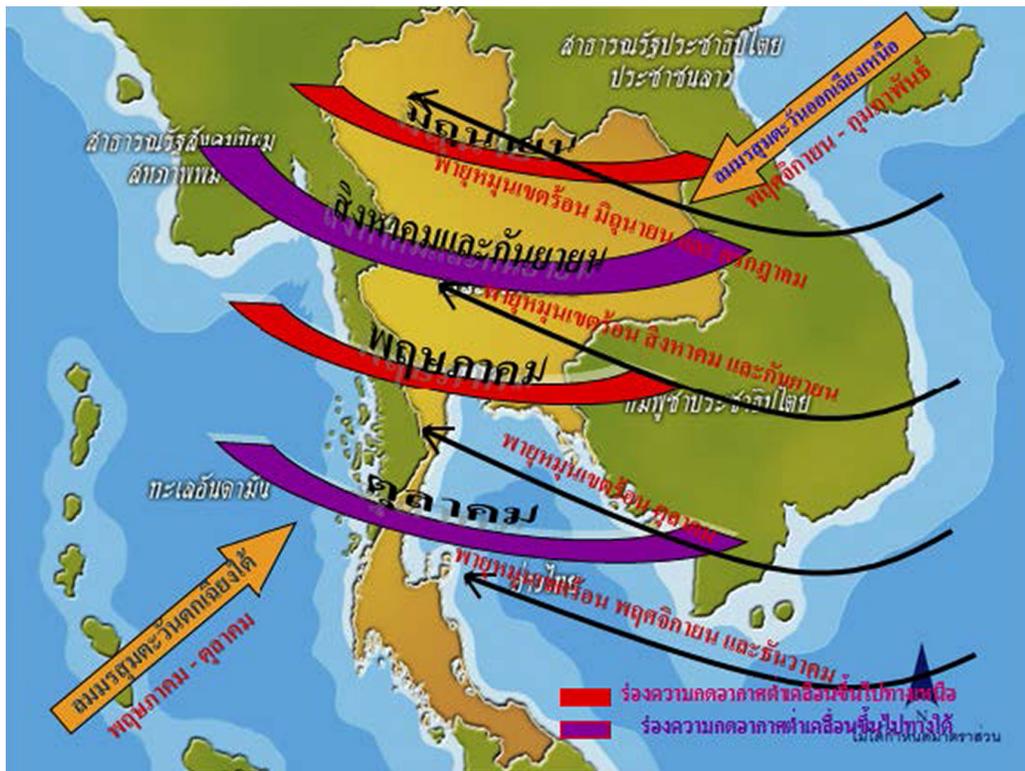


Figure 1 — Areas that are influenced by hydrological events during the rainy season in Thailand (Thai Meteorological Department, 2014)

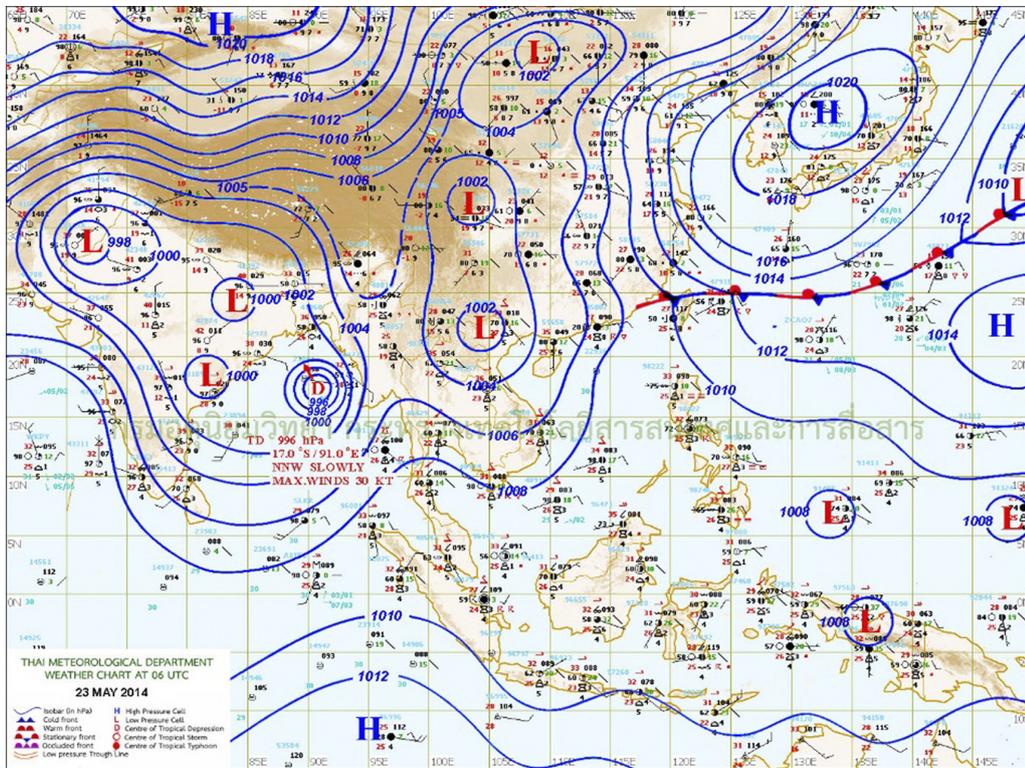


Figure 2 — Weather map over Thailand (Thai Meteorological Department, 2014)

Box 2 describes the weather in Prachinburi Province, Thailand.

Box 2 — Prachinburi Province weather (*Kabinburi Hydrometeorological Station*)

Located in eastern Thailand and in the intertropical convergence zone, Prachinburi Province suffers from the effects of north-east and south-west monsoons with southerly winds. The seasons are as follows:

- i **Summer extends from March to May, with an average temperature of 39–41 °C**
- ii **The rainy season extends from May to October, with an average rainfall of 1 380 mm in 2013 (average precipitation for the region over a 30 year period is 1 800 mm/year)**
- iii **Winter extends from November to February, with an average temperature of 16–22 °C**

Floods can also be caused by human activities. For instance, deforestation, encroachment of forest land and improper land use can cause flash floods and landslides. The rapid growth of urban areas lacking proper planning, the dumping of refuse and untreated sewage into rivers, the building of constructions blocking the natural flow of water, improper maintenance of drainage systems and inefficient water management, as well as a lack of coordination by water-related agencies, are possible factors that contribute to flooding.

2.3 Types of floods

There are two main types of floods in this region:

- A **flash flood** occurs due to excessive rainfall within a short period of time in mountainous areas. It is also known to occur in plain areas near the mouths of rivers, or in any low-lying areas adjacent to rivers where the soil is unable to absorb excess water. A flash flood can occur rapidly within minutes or hours, and it is difficult to provide sufficient early warning for communities to prepare themselves. A flash flood may cause subsequent landslides, and can cause greater damage than other types of flood due to its intensity and speed. If the flood water is not drained quickly, it can also lead to the spread of transmissible diseases such as conjunctivitis, diarrhoea, leptospirosis and athlete's foot (*tinea pedis*).
- A **riverine flood** is caused by the water level in a river exceeding its water retention capacity due to heavy rainfall. This happens when high-intensity rain has fallen in the river catchment area, or in nearby areas, and drains to the river. A riverine flood occurs when a large amount of water is unable to drain downstream towards the mouth of a river and flows over the banks of a river or stream instead. The degree of soil absorption and the steepness of slopes in the area surrounding the river or stream affect the drainage capacity and flood duration. An example of a riverine flood in Talad Keo Community is shown in **Figure 3**.



Figure 3 — Riverine flood in Talad Keo Community (2013)

Flood risk areas in Prachinburi Province are shown in **Box 3**.

Box 3 – Flood risk area in Prachinburi Province (*Kabinburi Hydrometeorological Station, 2014*)

Flash floods and landslides occur in highly sloping areas such as:

- i Buphram Subdistrict, Nadi District
- ii Bufai, Nong Kaew and Prachantakam Subdistrict, Prachantakam District

Riverine floods/high tides/urban flooding occur in areas such as:

- iii Muang Prachinburi District
- iv Srimahosot District
- v Baan Sang District
- vi Prachantakam District
- vii Srimahaphot District
- viii Kabinburi District

2.4 Impacts of floods

Flood events are not disasters per se, but combined with elevated exposure and vulnerability, they could become disasters. The following sectors can be affected by flooding:

- **Life and psychosocial well-being:** immediate causes of death or injury include drowning, electrocution, trauma, being hit by floating debris, being bitten or stung by poisonous animals, being unable to access health care centres and depression over loss of family member(s).
- **Health and hygiene:** increasing chances of contracting transmissible diseases such as conjunctivitis, leptospirosis, skin infections, diarrhoea, cholera, respiratory problems, dengue fever and malaria, or being bitten/stung by poisonous animals.
- **Property:** loss of or damage to properties, buildings, tools and equipment.
- **Infrastructure:** disruption of electricity and water supplies, telephone service and Internet, and damage to roads.
- **Agricultural products and livestock:** damage to agricultural areas, leading to the loss of livestock and crops. However, in some cases, floods are beneficial by carrying nutrients and sediments that are deposited as fertilizers on flood plains, and by killing weeds and field rats. In addition, communities can increase their income by catching and selling fish from flood waters.
- **Daily life:** when roads are damaged by floods, communities face increased difficulties in travelling, which raises the costs of living, business operation and education.

3 FLOOD MONITORING AND EARLY WARNING

This chapter shares information on tools and equipment for flood monitoring and early warning used in Thailand and in particular in the Prachinburi Province. It also presents the institutions responsible for flood monitoring and providing early warning information and highlights the role of communities in creating effective end-to-end early warning systems.

3.1 Flood monitoring and early warning systems

Flood monitoring systems are deployed to monitor and track water levels as an early indication of flooding. In Thailand, information on water levels and weather forecasts are provided by TMD. In addition, other agencies such as the Royal Irrigation Department (RID) and DWR supply similar flood monitoring information for river basins and mountainous areas. Some of these agencies also incorporate early warning systems by utilizing advanced technology and computer systems to analyse data, in order to provide early warning information to flood-prone communities.

Flood early warning systems issue warnings or provide information to flood management agencies and communities so that they can prepare for evacuation when water levels reach a critical point. These systems decrease potential losses and reduce flood impacts on communities.

End-to-end early warning systems include both of the above, integrating data collection, monitoring, forecasting and dissemination of the warning. They tackle the problem of early warning from its inception (monitoring the situation/collecting the necessary data), elaborating it to produce a forecast and consequently disseminating an alert to the relevant stakeholders, and also providing support for decision-making. They consist of four core elements (**Figure 4**):

- **Risk knowledge:** an early warning system is effective only if the local community understands the nature of the risk. Data and disaster profiles must be systematically collected and analysed as part of a risk assessment. In addition, local residents must be able to understand and agree with the responsible agencies to have access to information on risk profiles, vulnerabilities and elements at risk.
- **Hydrological monitoring and flood forecasting:** these are important for situation analysis before the onset of hazards, to provide early warnings to communities. The accuracy of evaluation of the flood situation for early warning depends on the quality of information and of the forecasting system. Therefore, it is important to have up-to-date information on the flood situation and good flood forecasting capabilities (or good communication channels at the local level to receive them from a central authority) so that early warning systems can function efficiently.
- **Dissemination and communication:** any early warning information disseminated to at-risk communities should be easy to understand. The details of announcements must be sufficient for people to know how to prepare themselves. Early warning communication channels must be set up by the relevant agencies and must inform communities prior to any events so that they can be prepared and avoid any confusion. In addition, alternative communication channels should be established to ensure that information will definitely reach local residents.
- **Awareness and response capability:** communities should not only pay attention to early warning messages but they should also know how to take appropriate actions to manage disasters. Enhancing community knowledge through training on early warning systems will improve the capacity to effectively respond to and protect from disasters. For instance, communities should develop community disaster plans to respond to disasters and conduct simulation exercises regularly to improve these plans.

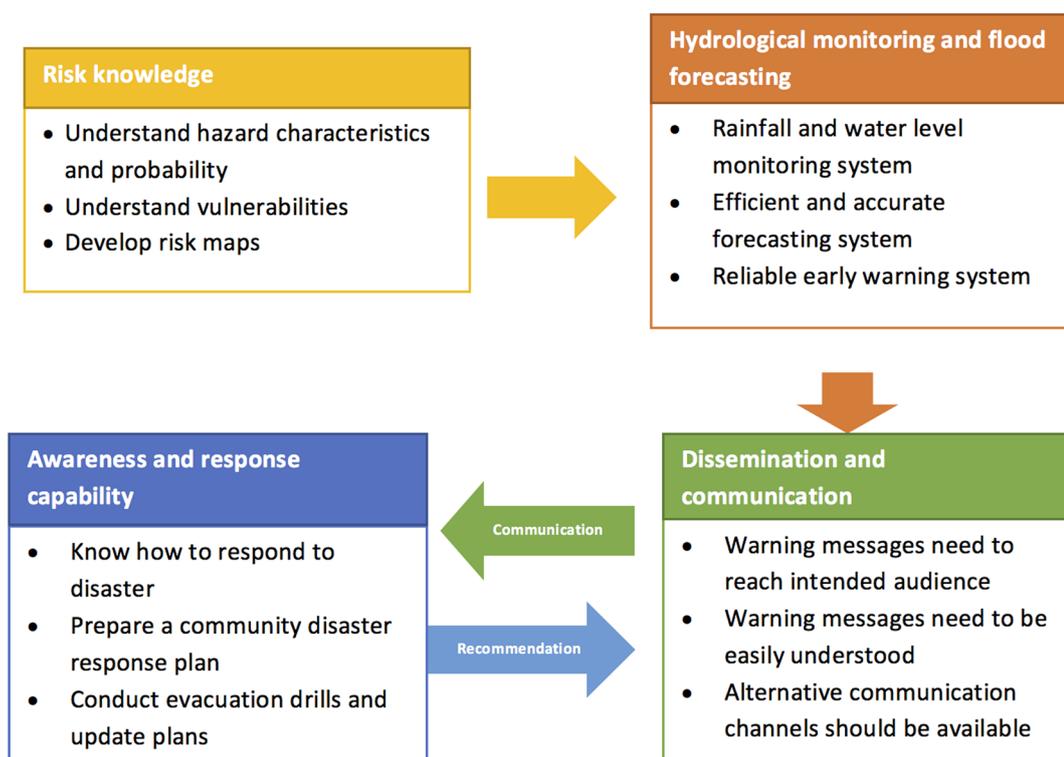


Figure 4 — End-to-end early warning system (Apirummaneekul, 2013)

3.2 Flood monitoring

During the rainy season, people living in at-risk areas need to regularly follow flood forecasts and monitor water levels and early warning messages so that they can be prepared to respond to flooding. Governments should have communication channels set up to disseminate early warning messages to communities for incoming floods, which the communities can then use, together with their own information, to prepare for events.

Box 4 shows an early warning for evacuation from Talad Keo Community by Kabinburi Hydrometeorological Station, Prachinburi Province.

Box 4 — Early warning from Kabinburi Hydrometeorological Station

On 10 May 2015, Kabinburi Hydrometeorological Station, Prachinburi Province, reported a flood situation to Talad Keo Community, saying that “Water level in Kabinburi this morning is 10.24 m high with amount of rainfall at 8.1 mms.” This meant that the amount of rainfall measured from the morning of 9 May 2015 at 7 a.m. to 10 May 2015 at 7 a.m. was classed as light rain.

However, the water level in the river (10.24 m) was much higher than the critical level of the river’s capacity (height of left bank was 8.97 m and right bank was 9.24 m). Therefore, the water level in the river was critical, and communities needed to evacuate to safe places, as well as closely monitor the flood situation.

The following tools and equipment can be used for flood monitoring.

3.2.1 Raingauges

Raingauges (see **Figure 5**) are used to measure the intensity of rainfall within a 24 hour period. The frequency of measurement is every 3 hours, in order to effectively develop weather information and assess the amount of rainfall and potential for flooding.



Figure 5 — Standard rain gauge at Kabinburi Hydrometeorological Station, Prachinburi Province

For a standard TMD rain gauge, the amount of rainfall can be classified into five levels, as shown in **Table 2**.

Table 2 — Levels of rainfall

Amount of rainfall (mm)	Classification
Less than 0.1	Trace rainfall
0.1–10.0	Light rain
10.1–35.0	Moderate rain
35.0–90.0	Heavy rain
More than 90.1	Very heavy rain

The threshold amount of rainfall that will lead to flooding cannot be specified with certainty, as there are many other contributory factors, such as soil absorption, surface-water capacity and level, drainage systems, drainage obstruction caused by constructions and high tides, that contribute to flooding in a particular area.

3.2.2 Water staff gauges

Normally, water staff gauges are set up by communities next to rivers to monitor water levels (see **Figure 6**). This equipment is used together with a rain gauge to monitor whether the water level is at a critical point in relation to the capacity of the river, for issuing an early warning and estimating the time available for evacuation before the arrival of a flood. An early warning will need to provide sufficient time for evacuation.



Figure 6 — Water staff gauge in front of Kabinburi Hydrometeorological Station, Prachinburi Province

Communities need to use data from different types of measurements together with data from other sources, such as information on water levels from the RID water level station, and water management and drainage information from dams and water gates (upstream and downstream), to fully understand their current situation. The following sources of information can be used for flood monitoring.

3.2.3 Weather forecasts from the Thai Meteorological Department

TMD is responsible for providing weather forecasts in Thailand. If there is a possibility of severe weather, TMD will give warning information through different public communication channels and send messages to inform DDPM to pass the warning information on to at-risk areas at provincial, district or subdistrict levels.

People can obtain weather forecasts from TMD through television, radio or the TMD website at www.tmd.go.th. TMD provides 7-day weather forecasts for each province in Thailand (see **Figure 7**). In addition, communities can request provincial meteorological stations in each province to provide information on water levels, to be used as another source of information to analyse the flood situation.



Figure 7 — Weather forecast from the Thai Meteorological Department website

3.2.4 Department of Mineral Resources

The Department of Mineral Resources is responsible for monitoring geo-hazards such as mudslides, landslides, rockslides, fissures and sinkholes. It provides early warning information for geo-hazards, sends information to DDPM to warn people in at-risk areas to prepare for disasters and provides capacity-building training on the early warning network in at-risk areas.

3.2.5 National Early Warning Center

The National Early Warning Center (NEWC) focuses on earthquakes and provides early warning information through different communication channels such as warning towers (see Figure 8) and messages to relevant agencies to warn of pending events. NEWC also communicates directly with DDPM through a dedicated hotline in order to disseminate warning messages to at-risk areas at provincial, district and subdistrict levels.



Figure 8 — Warning tower

3.2.6 Water Watch and Monitoring System for Warning Center, Royal Irrigation Department

RID, as the lead agency in water management in Thailand, provides information on water levels in dams, reservoirs and rivers. RID also disseminates drought and flood early warning information.

People can access the RID website (www.rid.go.th) to check their water situation. This website provides useful information such as: daily and weekly water situations; water levels in watershed areas, dams, reservoirs, dykes and water gates; amount of rainfall; amount of runoff; water gate status; flood situations (via cameras); and a flood situation report web board. In addition, people can follow their flood situation by downloading the Water Watch and Monitoring System for Warning Center mobile phone application, as well as telephoning the RID call centre .

3.2.7 Flash flood and landslide early warning system, Department of Water Resources

DWR has established flash flood and landslide early warning systems for high-risk areas (see Figure 9) that directly transmit early warning information to TAO. To make the warning systems more effective for communities in high-risk areas, DWR has developed relevant training courses that focus on community participation to enhance the capacity to respond to disasters, to manage evacuation routes and to develop early warning networks. People and local governments can access warning messages and share information at http://202.129.59.76/website/ews_all/index.php.



Figure 9 — Flash flood and landslide early warning equipment

Early warnings can be divided into three levels, as shown in **Table 3**.

Table 3 — Example of early warning levels

Level	Light signal	Sound signal	How to respond
Monitor	Green	Every 20 minutes, 10 seconds/time	<ul style="list-style-type: none"> – Monitor situation – Wait for further information from the broadcasting tower
Warn	Yellow	Every 15 minutes, 10 seconds/time	<ul style="list-style-type: none"> – Be ready for any situation – Prepare for evacuation – Wait for further information and the next signal
Evacuate	Red	Every 3 minutes, 10 seconds/time	<ul style="list-style-type: none"> – Evacuate to the safe place as planned

3.2.8 Thailand integrated water resource management

Developed by the Hydro and Agro Informatics Institute, the www.thaiwater.net website provides information on weather such as storm situations, cloud characteristics, weather maps, tides, flood situations and other information given by RID and TMD. This website also provides information on runoff, water levels in medium- and large-sized reservoirs, and flood-, drought- and landslide-prone areas. Historical flood and drought records in Thailand can also be found at this site.

3.2.9 Department of Disaster Prevention and Mitigation

DDPM is responsible for monitoring and coordinating with TMD and NEWC to disseminate weather forecast information and provide early warnings to local communities. DDPM coordinates with the provincial DDPM and the provincial office of disaster prevention and mitigation to establish an emergency operation centre to coordinate the dissemination of early warning information to districts, subdistricts, villages and TAOs in high-risk areas, so that communities can prepare to respond according to their disaster preparedness plan. In addition, DDPM informs the 'Mr. Warning mechanism' (see **Section 3.5**) in each village to follow up the situation, in preparation for evacuation. People can report situations in their community to DDPM via a telephone hotline, at www.disaster.go.th and www.nirapai.com or via the Nirapai radio network.

3.2.10 Local wisdom

In some communities, people use their own local, traditional, wisdom to look for signs to forecast incoming and potential natural hazards:

- The appearance of bamboo shoot spires indicates that the rainy season is coming, whereas when reed flowers start blooming, it means that the rainy season is ending and winter is coming
- A longer winter means much rainfall in the next rainy season and more bountiful harvests for farmers
- In summer, if ants dig a hole and pile the soil around the hole, it means there will be a lot of rainfall in the forthcoming rainy season; if there are many beehives and ant nests in trees, it means drier days during the rainy season
- If bastard teak trees have more flowers than usual, if tamarin and jambolan plum bear more fruits than usual and Bermuda grasses stand upright, it means there will be a lot of rainfall during the rainy season
- If the colour of water in tributaries becomes red or brown, it means there may be landslides in upstream areas, the water level will rapidly increase and a flood will follow

Some communities use their existing tools or invent new monitoring and early warning systems. Everybody in the community must be aware of these tools, which include: knocking on wood, lighting fireworks, striking a drum in a Buddhist temple or in the community, blowing whistles, blowing horns, flying flags, ringing bells and so on. **Box 5** shows the procedure followed by Talad Keo Community.

Box 5 — Talad Keo Community

Talad Keo Community receives water situation reports and weather forecast information from Kabinburi Meteorological Station and broadcasts from the municipality office, together with data on the Hanuman stream water level and colour monitored by the monitoring and warning unit in the community. After receiving information from these sources, the committee provides early warnings on the water situation to committee and community members through a community broadcasting system, to aid preparation for and response to flooding.

3.3 Types of flood early warnings

Flood early warnings can be categorized into two types:

- **Direct warnings:** using television, radio, amateur radio, fax, mobile phone, communication halls, wire broadcasting, trucks equipped with loud speakers, community heads, volunteers, civil defence volunteers, public health volunteers, hand-operated sirens, or by social media such as Line, Twitter and Facebook.

- **Warnings through agencies:** using provincial administration structures such as the provincial, district and local administration structures of the province administrative organization, municipalities and TAO.

3.4 Objectives of flood early warnings

The objectives of flood early warnings are to:

- **Prepare for flooding:** to warn people in at-risk areas to be ready for flooding, in order to prepare for evacuation and move belongings to higher ground.
- **Evacuate:** to warn people of impending hazards such as high water levels or changes in colours of rivers. People can then use appropriate transportation methods for evacuation, such as cars, boats or on foot.

3.5 Levels of flood early warnings

Flood early warnings comprise the following levels:

- **Provincial level:** using early warning networks, government and private or public communication networks such as radio, local radiocommunications, fax and provincial broadcasting systems. The provincial DDPM is the agency responsible for the dissemination of information to relevant agencies to provide early warning messages to people in at-risk areas, so that they may prepare for and then evacuate to safe places.
- **District level:** using government and private or public communication networks such as community radio, local radiocommunications and fax through relevant agencies in the district.
- **Subdistrict/community level:** using community broadcasting, radio, communication halls, hand-operated sirens, speakers, mobile phones, whistles or any kind of sound that the community has agreed upon, to provide warnings to community volunteers and a disaster preparedness and warning network within subdistricts and communities. Mr. Warning is a mechanism established by DDPM at the local level to train volunteers to monitor and provide early warnings for floods, flash floods and landslides.
- **Disaster prevention and mitigation committee level:** it is necessary to have flood prevention and mitigation plans for at-risk areas, as well as to set up disaster prevention and preparation committees to be responsible for specific matters before, during and after the disasters occur as follows:
 - **(a) Prevention and preparation unit:** to raise community awareness on how to respond to disasters before, during and after the disasters occur, prepare tools and equipment for emergency response, conduct evacuation drills and so forth.
 - **(b) Monitoring and warning unit:** to regularly monitor and follow up the flood situation, as well as to warn the community and to provide information on evacuation steps and how to respond to flooding.
 - **(c) Evacuation unit:** to coordinate with the monitoring and warning unit to evacuate the community to safe areas and to move people back to their houses after the situation improves. This unit is also responsible for management of the evacuation centre.
 - **(d) Search and rescue unit:** to search for and rescue disaster victims.
 - **(e) Nursing unit:** to provide first aid to disaster victims and refer them to public health care centres.
 - **(f) Security unit:** to look after houses and properties, as well as to facilitate traffic management during evacuation.
 - **(g) Liaison unit:** to communicate with TAO, health care centres and police to report situations, to request assistance and to coordinate with search and rescue volunteers.
 - **(h) Recovery unit:** to assess damage to and loss of households and facilities and to coordinate with external agencies to request equipment to clean houses after water levels have decreased.

3.6 Community response after receiving flood early warnings

The community should agree upon how to react to early warning information in order to inform everybody about the forthcoming disaster within the shortest possible time. Therefore, people should have sufficient time to evacuate and move their belongings to a safe area (see **Figure 10**).

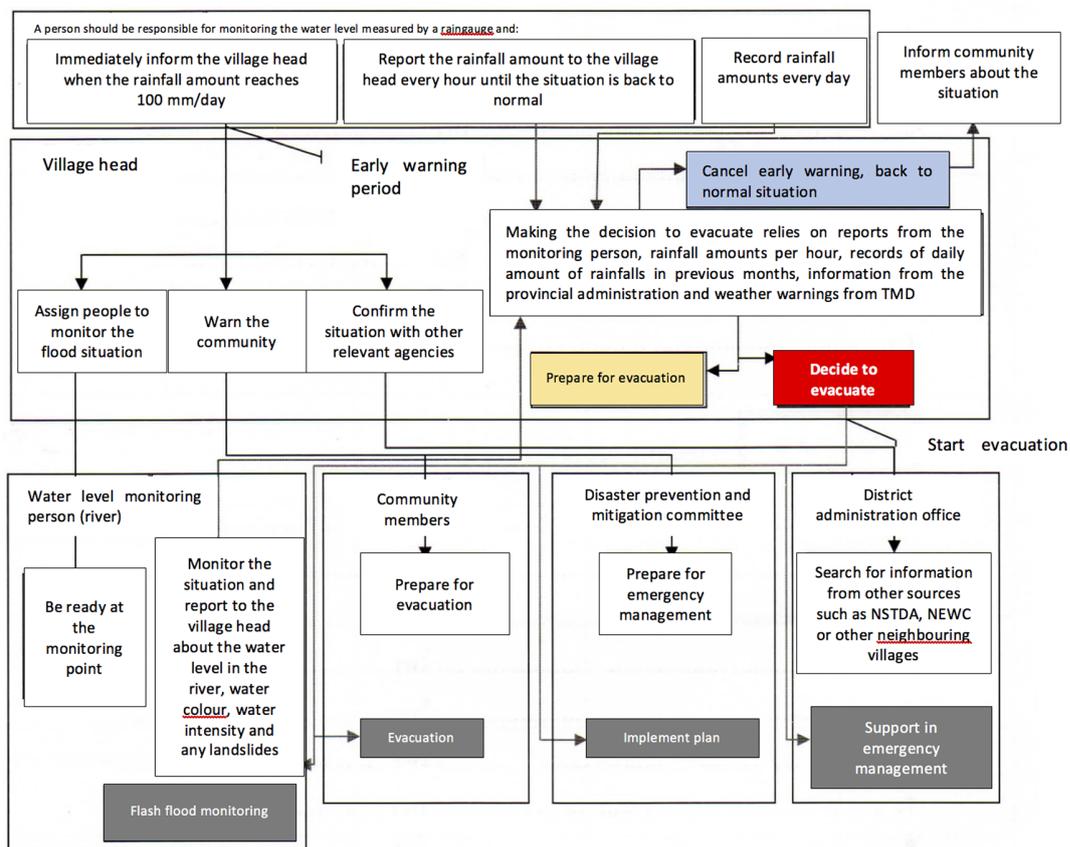


Figure 10 — Community early warning structure

Note: NEWC = National Early Warning Center, NSTDA = National Science and Technology Development Agency, TMD = Thai Meteorological Department

Table 4 — Examples of early warning levels and how to respond in Talad Keo Community, Kabinburi, Prachinburi Province

Level	Situation	How to respond
Normal	Water level at the lowest area of the community is low	Follow weather forecasts from the Thai Meteorological Department, Royal Irrigation Department and other reliable sources
Critical	Water level reaches the road surface at the lowest area of the community	Announcement by the community committee to move household belongings to higher levels
Evacuate	Water level at the lowest area of the community reaches 2.50 m above the road surface	<ul style="list-style-type: none"> — Announcement by the community committee to move to evacuation centres — Coordinate with Kabinburi Municipality — Community leader informs all committees to take up their roles and responsibilities

Box 6 shows how ten groups of villages have identified a Mr. Warning mechanism as part of their community response.

Box 6 – Moo

Ten groups of villages (Moo) in Buphram Subdistrict, Nadi District, Prachinburi Province, located in a flash-flood-prone area, have identified a Mr. Warning mechanism in each village to monitor their water situations and communicate with other villages downstream, as well as to coordinate with Buphram Tambon Administrative Organization and relevant agencies to report their situations and request assistance.

3.7 Recommendations for communities to create effective end-to-end early warning systems

The following are recommendations for communities to create effective end-to-end early warning systems:

- Give priority to the four elements of the early warning systems. Most people ignore the fourth component, which is the awareness and response capability.
- There should be only one agency responsible for early warning, to avoid any confusion.
- The warning message should identify the intensity of the flood such as depth of water and duration of water increase, the estimated arrival time of the flood, how people should respond to the flood and which information source people should follow.
- Technical warning messages should be translated into something that can be easily understood.
- Warning messages should be disseminated through different channels such as telephone, e-mail, word of mouth, television and radio so as to release messages more efficiently.
- The early warning messages should be accurate; inaccurate information will increase people's ignorance.
- Evacuation drills to test and evaluate the effectiveness of early warning systems, as well as to raise awareness of the early warning systems for relevant agencies, should be conducted.
- There should be a standard operating procedure for relevant agencies, to increase the understanding of their roles and responsibilities in specific periods of time and to have a database and contact details for timely coordination.

4 LIVING SAFELY WITH FLOODS

Floods are annually recurring events in Thailand, and cause great losses of lives and properties. They also increase the pace of environmental degradation. Thus, it is important for communities to be aware of and know how to prepare for flooding, in order to reduce loss and damage. This chapter covers how people and communities can help themselves to live safely with floods and shares successful methods implemented in pilot communities.

4.1 Signs of incoming floods

4.1.1 Riverine floods

During rainy seasons, people who live and have their plantations alongside river banks regularly monitor water levels in the rivers. When heavy rainfall occurs in an area (or upstream) in a short period of time, low lying areas can be flooded from the accumulated water. In addition, water release from dams or the closing or opening of water gates to prevent or drain water in one area can rapidly affect the water level in another area.

4.1.2 Flash floods

Flash floods usually occur in mountainous areas, near to streams or rivers, in earth flow areas or in sloping areas that have previously experienced flash floods and landslides.

The following observations focus on particular signs of incoming floods:

- Heavy rainfall of more than 100 mm/day
- Water levels in streams and rivers increasing rapidly
- Water colour turning brown or black from upstream silt and mud
- Rumbling sounds coming from mountains or streams
- Floods and excess water increasing rapidly

4.2 Guidelines on possible actions

4.2.1 Before floods

It is particularly important that people in at-risk areas should prepare themselves and their families for floods before the rainy season. Communities need to know how to react before and during flooding, to ensure that their lives and properties are safe, before any external assistance arrives. Guidelines and recommendations for preparation include:

- Follow the news for weather forecasts on radio, television and the Internet, especially during the rainy season, as there will be updated information on flood warnings. Be sure to check the information from trustworthy sources.
- Practise swimming and learn how to use a life vest. Ensure that there are items around which could be used as floatation devices.
- Develop an evacuation plan for the family and community. Identify and agree upon evacuation routes and safe areas. Conduct evacuation drills frequently so that everybody is familiar with the plan. Evacuate vulnerable groups, such as the elderly, chronically ill, disabled, pregnant women, small children or persons who may require assistance, before flooding occurs.

- Write down the emergency contact details of agencies such as TAO, the municipality office, the district office, the police station, the fire station, the hospital, the health care centre, the provincial electricity authority, the provincial waterworks authority and community committees.
- Collect all important documents (national identification, house registration, bank book, health insurance, passport, car registration and driving licence), keep them in a waterproof container and also make photocopies.
- Prepare tools, equipment and supplies to use in an emergency, for example:
 - (a) Clean water, dry food and ready-to-eat food cans that will last for 3–5 days;
 - (b) Regular medication, other medicines and a first-aid kit;
 - (c) Clothes, blankets and necessary appliances, and keep valuable items in a safe place;
 - (d) Portable radio (if applicable) to follow the news updates;
 - (e) Mobile phone and battery charger;
 - (f) Torch, new batteries, candles and matches;
 - (g) Dry firewood and portable gas for cooking, as well as a rice cooker, plates, bowls, spoons, forks and plastic wrap;
 - (h) Boots, plastic gloves, refuse bags, toilet paper, rope and tape;
 - (i) Multi-purpose knives and scissors;
 - (j) Any extra food, documents and special requirements, such as instant milk, milk bottles, supplementary food, nappies and sanitary towels, for infants, elderly, chronically ill, disabled and pregnant women.
- Move furniture, equipment, electric appliances and vehicles to higher ground.
- Evacuate people and animals to a safe place.
- Prepare a boat in case of long-term flooding.
- Build dykes and use sand bags to increase levees to prevent flooding in certain areas.
- Keep chemicals and poisonous substances such as pesticides in a safe area, so they do not contaminate the water.

4.2.2 During floods

During floods, communities should not panic, be prepared for any circumstances and follow these guidelines and recommendations:

- Switch off circuit breakers in houses and turn off the gas.
- Stay in a reinforced building on ground that is above any previous flood levels.
- Keep warm and be aware of transmissible diseases spread by flood water.
- Drink boiled water and eat hot, thoroughly cooked food.
- Gather refuse and food scraps in a bag to eliminate waste disposal when the water level recedes, to prevent the spread of any transmissible disease.
- Do not swim in flood water.
- Beware of poisonous insects and animals such as centipedes, snakes, scorpions and so forth.
- Do not drive vehicles on flooded roads.

- Closely monitor the situation and check updated information from the government or TMD.
- Be ready for evacuation and follow the government’s suggestions.
- Vulnerable groups have first priority for evacuation before flooding occurs.
- Prioritize personal safety over belongings.

4.2.3 After floods

After water levels recede, communities should commence repairs and follow the guidelines and recommendations listed below:

- Clean houses and roads, and repair anything affected by the disaster where possible.
- Check plugs, electricity lines and appliances to make sure they are safe and functioning correctly.
- Bury dead animals immediately.
- Avoid entering dangerous areas.
- Be aware of transmissible diseases, drink clean water and eat thoroughly cooked food.
- Contact government agencies such as TAO, the municipality office, the district office, the provincial office, volunteers and disaster prevention/mitigation agencies if any assistance is required.

5 COMMUNITY FLOOD MANAGEMENT SURVEY

Prior to the implementation of the project, initial community surveys can be conducted to assess community characteristics, flood risks and their capacity to cope with those. This chapter presents the different methods that have been used in the field to collect such information and results based on these surveys.

5.1 Initial community surveys

5.1.1 Objectives

The objectives of the initial community surveys conducted for flood management under the pilot project were to assess the flood impacts on communities and how they responded to flooding. Riverine floods in Talad Keo Community, Kabinburi District, and flash floods in Moo 3, Buphram Village, Nadi Subdistrict, Prachinburi Province were used as examples. There were two main objectives:

- To initiate community surveys and collect data from the target areas
- To conduct a capacity assessment of how the target communities manage the flood situations

A project team was established, which then collected data and information prior to the project implementation process. This allowed the team to gain a better understanding of the existing flood management methods of the target communities and stakeholders, and also enabled it to develop a suitable plan to support the enhancement of community capacity.

5.1.2 Data-collection methods

In-depth interviews (semi-structured questionnaires) and group discussions within the communities were used for data collection. To retrieve the required information, the questions were adjusted according to the interviewees. Diverse groups were arranged for individual and group interviews, comprising community heads, village heads, community members, teachers and local government organization staff. In addition, the team observed, took photographs and walked through the villages to collect data in the target areas.

The provincial DDPM, Buphram TAO and Kabinburi Municipality Office, which were members of a project advisory group, provided their support, and facilitated and participated in the data-collection process.

5.1.3 Results

Based on the results of the initial surveys, the team developed a community flood response report for the two target areas. This report was intended for the communities and local government agencies, Buphram TAO and Kabinburi Municipality Office, as well as the provincial advisory committee.

The outline of the report was as follows:

- **Date:** the date that the project team conducted data collection and surveys.
- **Focus group:** the interviewees, such as community leaders, community members, teachers, TAO staff and so forth.
- **Community background:** the population (by gender and age), number of disabled, community livelihoods, community geography, location, neighbouring communities, roads and so forth.

- Community characteristics: background, history, population composition, living conditions, livelihoods and development.
- **Community risk and impact:** causes of risk and elements at risk, as well as impacts from disasters including floods.
- **Community disaster preparedness and response methods:** existing capacity to prepare and respond to disaster; for instance, what methods are used to monitor floods, how the people live safely with floods, what training courses have been conducted, what agencies provide emergency management assistance, which constructions reduce disaster risk or whether community wisdom is used to adapt to living with floods.

5.2 Community capacity analysis and assessment

After collecting information, the team analysed community strengths, weaknesses, opportunities and threats (SWOT), and used the SWOT analysis tool on community flood management as detailed in **Table 5**.

Table 5 — Sample of strengths, weaknesses, opportunities and threats (SWOT) analysis in Talad Keo Community, Kabinburi District, Prachinburi Province

Strengths	Weaknesses
<ul style="list-style-type: none"> – Strong community leader (in economic, social and political sector) – Indigenous population in the community has a middle level of economic capacity and is eager to develop and strengthen its community capacity – Potential for small groups in the community to develop their capacity – Community is experienced and aware of flood preparedness and response 	<ul style="list-style-type: none"> – Indigenous population is a minority group in the community – Most family types are nucleus or elementary, so many elderly stay at home alone – Majority of population in the community has a low income and works outside of the community – Houses are old and have unstable infrastructures

Opportunities	Threats
<ul style="list-style-type: none"> – Tambon Administrative Organization (TAO) is aware of social and community structure problems, and supports external development agencies to provide assistance to communities – External agencies are interested in providing assistance when disaster occurs, which enables the community to develop to prepare for future risks – The Thai army and TAO work efficiently together with community leaders 	<ul style="list-style-type: none"> – Insufficient budget available for local development activities – No budget for long-term development and lack of cooperation with TAO on community development plans such as no canal dredging project – Structural developments for flood prevention in neighbouring communities, such as road or dyke construction, may affect the flood situation in this community

5.3 Recommendations for communities

After conducting the community capacity assessment using SWOT analysis, the project team could understand the characteristics of communities and their problems, and could identify stakeholders. Therefore, the team could develop an initial plan and promote activities in each community, to enhance community capacity development with support from local agencies.

Talad Keo Community suggested that the team should work with their community leader and committee, as well as with existing working groups, such as the women's group, the livelihood group and the elderly group, to implement preparedness on flood management. This collaboration could increase the awareness and participation of the passive population within the community.

On the other hand, Bupfram Community suggested that the team should collaborate with its TAO, which has good understanding and awareness of disaster risk reduction in the community. TAO could work with community leaders, schools and volunteers who have experience in mainstreaming disaster management knowledge to adapt and implement project activities.

In addition, the provincial DDPM and the Disaster Prevention and Mitigation Academy in Prachinburi are the agencies responsible for building the capacities of communities on disaster management and for working with TAO to provide technical support and equipment to both communities.

6 FLOOD RISK ASSESSMENT

This chapter provides knowledge on disaster risk assessment tools that can be used to understand hazards, vulnerability and resilience in the community, based on the information collected in the initial community surveys.

6.1 Community disaster risk

Community disaster risk is the likelihood of a hazard striking a community, causing damage and loss to lives and properties, disruption to socioeconomic activities and degradation to the environment.

Natural hazards occur across different areas and at different times, and affect communities in different ways. It is not only the intensity of the hazard itself, but also the vulnerability and capacity of the community that are factors which can be used to estimate the severity of the impacts on a community.

Disaster risk will increase if hazards occur more frequently with higher intensities and communities are highly exposed without the proper capacities to respond.

To reduce the risk, it is necessary to study and manage the causal factors of disasters, including through reducing exposure to hazards, decreasing vulnerability and increasing community capacity.

6.2 Community participatory disaster risk assessment

In order to reduce disaster impacts, communities need to understand the causes of risks by conducting disaster risk assessment.

- **Disaster risk assessment** is the process of identifying the elements at risk and the probabilities of disaster impacts (conditions, processes, factors and causes) by analysing hazards in the community, exposures to hazards, vulnerabilities and community resilience, and predicting the impacts on lives, livelihoods, properties and the environment, in order to make appropriate plans to reduce risk.
- **Community participatory disaster risk assessment** is the process of building understanding of disaster risk in the community by including participation by everyone (men, women, children, teenagers, elderly, disabled and minority groups).

As nobody understands the community better than its members, who are the first responders to any disasters, the community needs to have a common understanding in order to prepare itself by using its own capacity and resources to reduce disaster risk.

Assessment results will help the community to understand the probability of hazard occurrence, its own capacity to respond to those hazards and its vulnerability. This will aid identification, prioritization and analysis of the causes of and solutions to disaster vulnerability issues.

6.3 Community hazard, vulnerability and resilience assessment

Disaster risk assessment is the process of determining the three main components of disaster risk: hazards, vulnerabilities and resilience (see **Table 6**).

- **Hazard assessment** is a participatory process to identify hazards in a community. The outputs should be able to identify the nature of hazards in terms of their probability, location, seasonality, impact area, causes,

intensity and the estimation of probability (or frequency) of future occurrence. This information will enable the understanding of hazards and the challenges faced by a community in dealing with them.

- **Vulnerability assessment** is a participatory process to identify what elements are at risk (people, properties, plantations, community infrastructures or social issues) for each hazard type and the probability of them being damaged or lost. This assessment will identify what damage or loss are likely to take place during disasters and the reasons why they occur.
- **Resilience assessment** is a participatory process to determine what people do in times of crisis to reduce the damaging effects of hazards and to protect themselves from disaster.

Table 6 — Hazard, vulnerability and resilience assessment: key questions

Hazard assessment	Vulnerability assessment	Resilience assessment
<p>What kinds of hazards has the community experienced in the past?</p> <p>What were the characteristics of the hazards?</p> <ul style="list-style-type: none"> – Origin – Intensity – Warning signs and signals – Speed of onset – Frequency – Season – Period of occurrence – Possibility of catastrophe for the community <p>Where were the impact areas?</p> <p>How severe were the hazards?</p>	<p>What can incur damage or loss from the disaster?</p> <ul style="list-style-type: none"> – People – Households – Infrastructure and facilities – Livelihoods – Nature – Other elements at risk <p>Why did these people and elements suffer damage and loss?</p> <p>What are the reasons behind the disaster damage and loss?</p>	<p>How did the community respond to flooding in times of crises to reduce the damaging effects of the hazards?</p> <p>What kinds of resources did the community use to respond to, prevent and mitigate floods?</p> <p>Who owns or is able to assess those resources?</p> <p>Does the community possess the knowledge or skills to respond to flooding?</p> <p>Does the community collaborate with neighbouring communities or networks to request assistance?</p>

6.4 Community assessment tools

In order to assess risks, there are tools to aid understanding of hazards, vulnerability and resilience in the community. Examples are included in the following.

6.4.1 Timeline

A timeline is a simple tool to monitor disaster history, stating what significant events have happened in the community and when they took place, thus providing records from when the community was established until the present day. This tool requires participation by elderly people, as they have witnessed many previous events.

6.4.2 Seasonal calendar

A seasonal calendar (see **Table 7**) contains information on community events, hazards and other incidents in the community in specific months of a year such as seasonal epidemics and community events. This enables

the disaster impacts to community activities in each period to be analysed and identifies disaster prevention and mitigation measures.

Table 7 — Seasonal calendar of Buphram Community, Nadi District, Prachinburi Province

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Cassava harvesting</i>												
<i>Cassava planting</i>												
<i>Bamboo plantation work</i>												
<i>Rice planting</i>												
<i>Rice harvesting</i>												
<i>Songkran festival</i>												
<i>Community festival</i>												
<i>Beginning of the Buddhist Lent Day (first day of rainy season retreat)</i>												
<i>End of the Buddhist Lent Day</i>												
<i>Ceremony at the end of Buddhist Lent</i>												
Hazard in the community												
<i>Flood</i>												
<i>Drought</i>												
<i>Insect infestation</i>												
<i>Dengue fever</i>												

6.4.3 Matrix ranking

Matrix ranking is a tool to prioritize disaster impacts, needs identification or weighting solutions that the community has reached common agreement on (from the most urgent to not urgent). Communities can use various methods for counting votes, such as stones, seeds or hands. An example of a flood matrix ranking is given in **Table 8**.

Table 8 — Sample flood matrix ranking of Talad Keo Community, Kabinburi District, Prachinburi Province

Effects of flood	Votes collected	Priority level
Increased number of robberies	23	1
Transportation difficulties	7	5
Household and property damage	15	2
Increased number of dangerous animals	5	7
Refuse or solid waste problems	10	3
Facility (water, electricity) cut-offs	8	4
Hygiene and sanitation difficulties	2	9
Incidences of athlete's foot	6	6
Self-diagnosis	3	8

6.4.4 List of vulnerable groups and list of emergency contact details

Communities should develop a list of vulnerable groups such as the elderly, disabled, chronically ill, infants, pregnant women and people who require special needs. It is necessary to identify their vulnerabilities to prioritize and provide assistance during floods. In addition, it is useful for communities to develop emergency contact details containing the details of community leaders, committee members and other relevant agencies, from whom assistance may be requested when disasters occur. An example of such a list is given in **Table 9**.

Table 9 — List of vulnerable groups or emergency contact details for community leaders, committee members and other relevant agencies

No.	Name	Address	Tel. no.	Remarks
1				
2				
...				

6.4.5 Hazard and resources map

As each community knows its hazards and resources in its own setting, a hazard and resources map allows community members to identify graphically its areas, boundaries, houses, community landmarks, rivers, plantation areas and so forth. In addition, the community can identify the levels of impact by using different colours and mark its safe areas and evacuation routes. This tool also enables the community to identify facilities and resources that can be used during disasters, such as hospitals, schools, temples and common areas. Community hazard and resources maps can also allow communities to identify the locations of vulnerable groups (elderly, disabled, chronically ill, pregnant women and small children) who require special assistance or who need to be evacuated first when disasters occur.

It is necessary to identify the community name, symbols used, directions and date in the hazard and resources map (see **Figure 11** for an example).

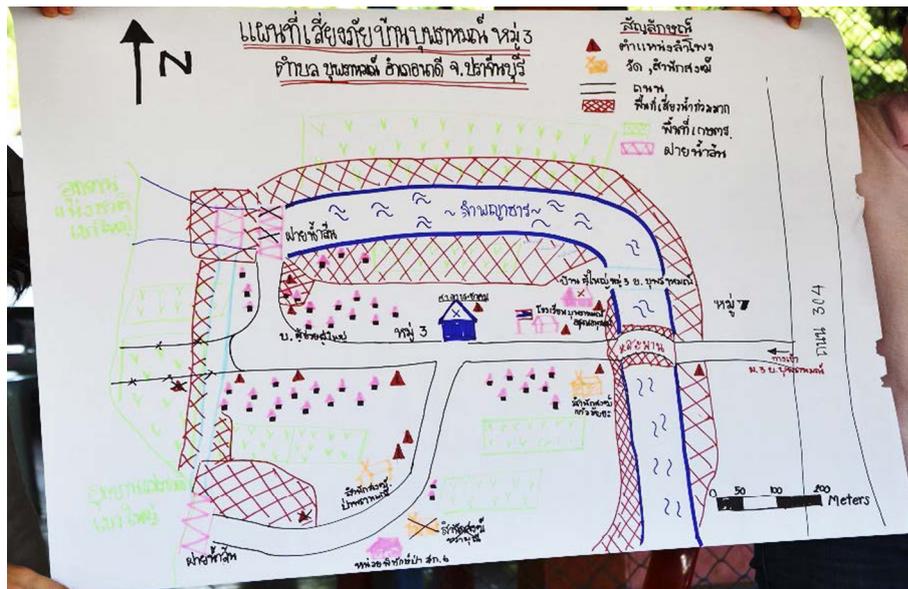


Figure 11 — Sample hazard and resources map of Bupfram Community, Nadi District, Prachinburi Province

6.4.6 Survey

A community survey allows local residents to see the overall picture of the community, especially the vulnerable areas and available resources such as the locations of houses, plantation areas, rivers and hills, and the ground elevation. The survey should be conducted after the community has finished drawing its hazard and resources map, to enable community members to understand the causes and disaster impacts in their area.

6.4.7 Resources

Community members should collect information on resources, such as the locations of tools, machines and equipment, that can be used during emergencies. This activity should be carried out by the local residents themselves. An example of a list of tools, equipment and vehicles is given in **Table 10**.

Table 10 — Sample list of tools, equipment and vehicles of Talad Keo Community, Kabinburi District, Prachinburi Province

No.	Equipment	Amount	Owner	Remarks
1	Boat	2	Community	Community committee member houses
		30	Personal	Ready to use
2	Life vest	50	Personal	Ready to use
3	Fire extinguisher	5	Community	Inspection required
4	Mobile phone	All households	Personal	Network
5	Community park	2	Community	To use for community meetings and activities Maintained by municipality office
6	Fire engine	2	Municipality office	Need to contact municipality office
7	Speaker	6	Municipality office	News/information from municipality office
8	Flood staff gauge	1	Community	Near to river bank

6.4.8 Interviews and group discussions

Apart from discussions with the community as a whole, discussions between different smaller groups will allow understanding of the community from different perspectives. This also provides the opportunity to ensure that no groups (community leaders, elderly, women, men, teachers, children, labourers, minority groups or development agencies working in the community) are omitted. Other tools can be also used for this purpose, such as a community timeline when discussing with the elderly, or a hazard and resources map and data collection when holding discussions with children.

6.4.9 Important contact details

A list of persons to contact is useful for a community during emergencies. Community members will be able to communicate with neighbouring communities or local governments to request assistance in a timely manner. The community should add information and contact details for the head of the community committee, police station, health care centre, TAO and first responders, and ensure that these details are correct and up to date.

7 FLOOD PLANNING

This chapter provides knowledge on the flood risk management plans and evacuation drills that can be developed in communities to reduce risks and help them to be prepared for an emergency.

7.1 Community flood risk management plans and evacuation drills

Community-based disaster risk reduction requires community participation to assess hazard exposure, vulnerability and resilience, in order to analyse the risks and reduce them. As a result, the community develops its own capacity to respond to disasters before external assistance reaches it, and is able to communicate with other stakeholders to reduce disaster risks more efficiently.

Community disaster prevention and mitigation planning is a tool with which a community can envisage its ideal preparedness and resilience stage. After community participation to identify its own risks, gaps and capacity, the results from risk assessment can be used to develop a disaster prevention and mitigation plan to reduce the risks in the community and prioritize the areas that have a higher probability of disaster impact. Thus, the community will be able to mobilize resources for disaster response more efficiently. In addition, this plan will emphasize community participation and common understanding of disaster management by forming a committee organization and identifying roles and responsibilities in concurrence with the three phases: before, during and after the disaster.

The following guidelines to develop the community disaster prevention and mitigation plan are provided by DDPM:

- Define objectives.
- Assess the community background (location, geography, population, livelihoods, income, places, risk profile, seasonal calendar, hazard calendar and so forth).
- Prepare a community map (risk areas, safe areas and evacuation routes).
- Establish a disaster prevention and mitigation committee, with a structure, roles and responsibilities – the community needs to discuss and agree upon its own structure, which depends on its needs.
- Implement steps in concurrence with the phases in disaster risk management (before, during and after the disaster) and identify persons responsible for each phase.
- Provide an index consisting of an early warning structure, a list of people in the community, especially vulnerable groups (small children, elderly, disabled, chronically ill or pregnant women), who should be the first priority to receive assistance when disasters occur, a list of tools, equipment, vehicles and resources that can be used in disaster management and a list of emergency contact numbers.

The community should discuss and agree on how to prioritize solutions to reduce flood risks. This will lead to the creation of community disaster projects that can become an integral component of community development planning in the future.

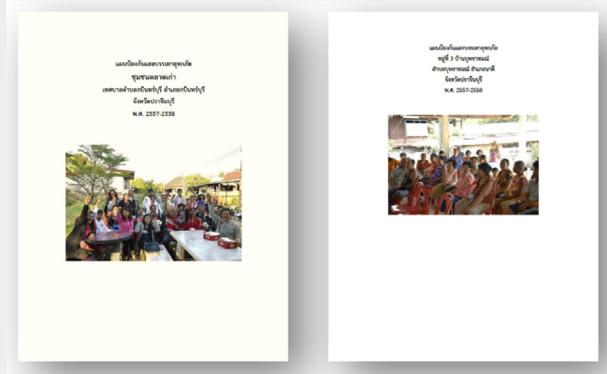
After developing a disaster prevention and mitigation plan, the community should conduct evacuation drills so that members of the community committee can fully comprehend their roles and responsibilities when disasters occur. In addition, this is an opportunity to revise and adjust the plan, as well as to use lessons learned to improve the plan's efficiency.

The following box gives an example of a draft community disaster prevention and mitigation plan.

**Box 7 – Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan**

Village Name..... **Moo**.....
Subdistrict (Tambon).....
District
Province
Year

(The structure can be adapted to suit requirements as appropriate)



1. Introduction

a Provincial disaster prevention and mitigation plan for (year)

2. Objectives

- a To undertake the disaster preparedness process and early warnings in order to respond to disasters efficiently;
- b To prevent loss of lives in and properties of (village name) from disasters;
- c To develop a standard operating procedure for early warnings and evacuation for people who live in disaster risk areas.

3. Community Background

a **Area and location**

Village name Moo Subdistrict

District..... Province.....

under the authority of Tambon / Municipality Administrative Organization.....

Bordered to the north by

Bordered to the south by

Bordered to the east by

Bordered to the west by

b **Population and religion**

Most of the nationalities of the people in the community are, with religion

Total number of people in community is people, with male and female

Total number of households is

Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan (continued)

3. Community Background (continued)

c **Livelihoods**

.....per cent of the people in the community are.....

Others are (specify)

The average income per year of each household is baht.

4. Social and economic background

a Identify important places in the community such as the school, subdistrict medical centre, temple, TAO, municipality office, forest fire control division and so forth (specify).

5. Disaster risks in the community

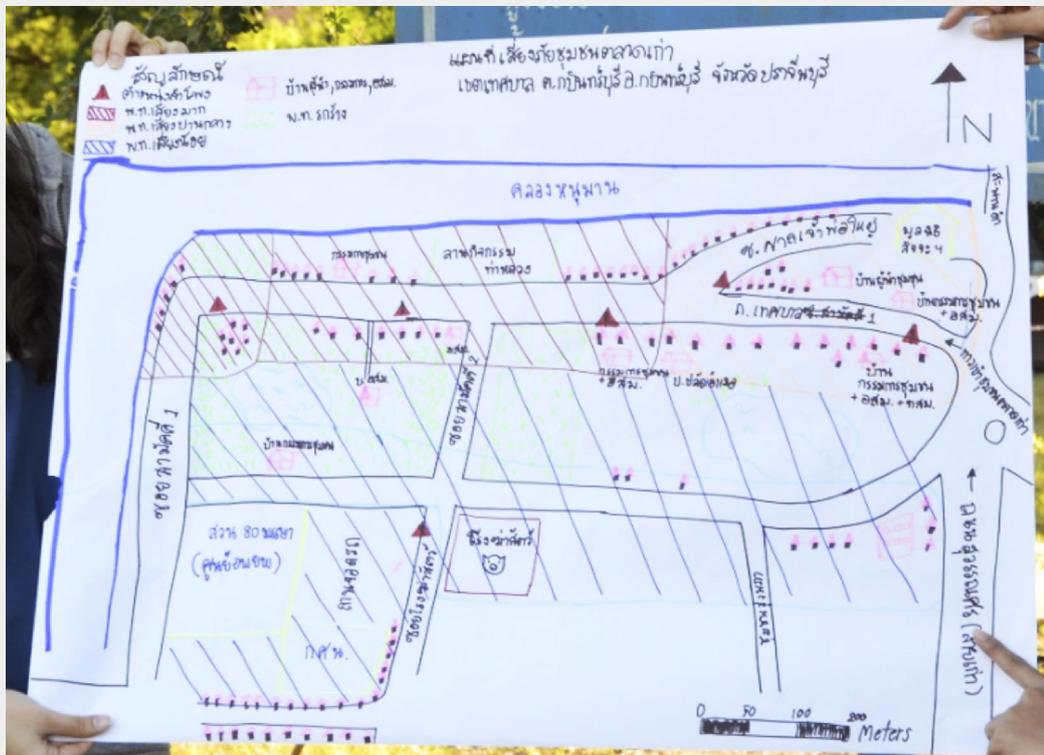
a Seasonal calendar/disaster calendar;

b Disaster historical profile.

6. Community map

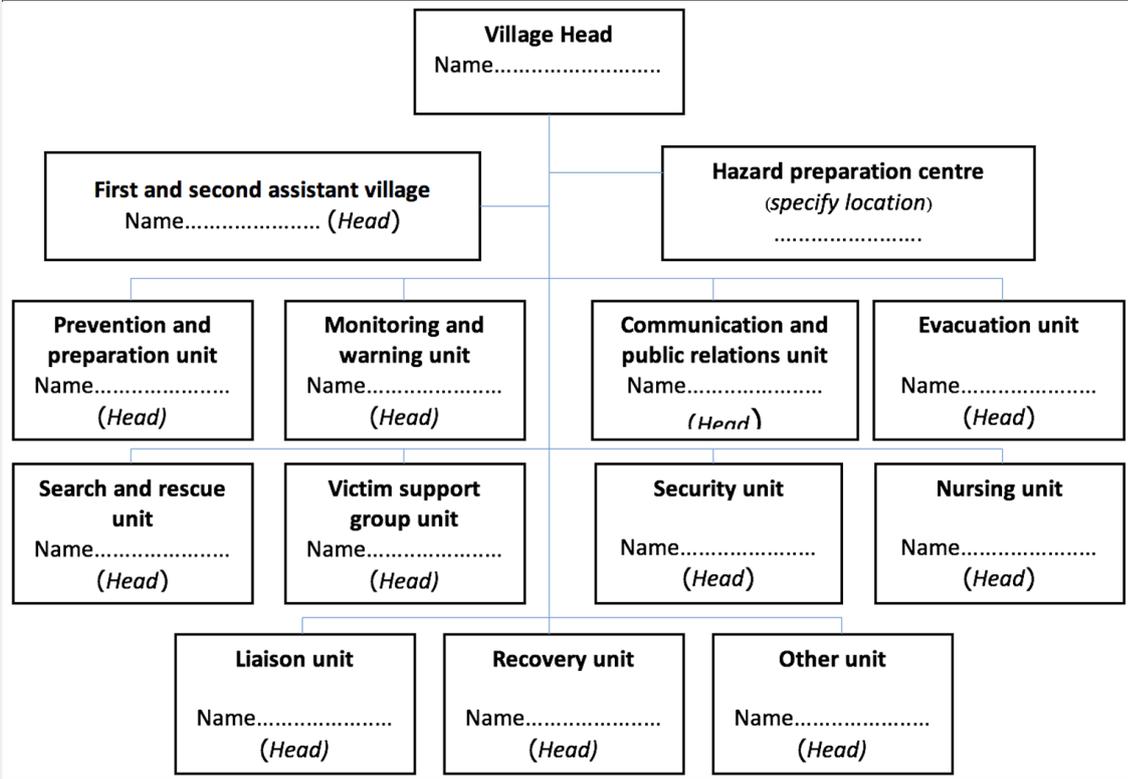
a Identify the households, risk areas, safe areas and evacuation routes.

Disaster risk map of (village)



Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan *(continued)*

7. Disaster prevention and mitigation committee of (village).....



^a Disaster prevention and mitigation committee:

- | | | |
|---------------|-----------|------------------|
| – Mr/Ms | Tel | Chairperson |
| – Mr/Ms | Tel | Vice-Chairperson |
| – Mr/Ms | Tel | Vice-Chairperson |
| – Mr/Ms | Tel | Secretary |
| – Mr/Ms | Tel | Committee Member |
| – Mr/Ms | Tel | Committee Member |
| – Mr/Ms | Tel | Committee Member |

Roles and responsibilities:

- Regularly identify, inspect and assess disaster risks in the community;
- Identify means and methods of disaster prevention and mitigation with direct involvement of community members as well as coordination with the local government;
- Consider and approve the community disaster prevention and mitigation plans proposed by committee members;
- Observe and monitor the disaster situation in the community;
- Coordinate with government agencies and other disaster prevention and mitigation organizations;
- Others (specify).....

(continued)

Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan *(continued)*

7. Disaster prevention and mitigation committee *(continued)*

b Disaster prevention and mitigation committee composition:

i Prevention and preparation unit:

– Mr/Ms	Tel.	Head
– Mr/Ms	Tel.	Member
– Mr/Ms	Tel.	Member

Roles and responsibilities

- Arrange disaster preparedness training for the community to develop attitude and behavioural changes on what to do before, during and after a disaster;
- Mobilize tools and equipment to ensure sufficient resources are available for disaster response, and to regularly conduct disaster emergency response simulation exercises;
- Others (specify).....

ii Monitoring and warning unit:

– Mr/Ms	Tel.	Head
– Mr/Ms	Tel.	Member
– Mr/Ms	Tel.	Member

Roles and responsibilities

- Regularly observe and monitor the disaster situation;
- Issue warnings to the community and implement planned disaster response measures;
- Others (specify).....

iii Communication and public relations unit:

– Mr/Ms	Tel.	Head
– Mr/Ms	Tel.	Member
– Mr/Ms	Tel.	Member

Roles and responsibilities

- Coordinate with the national government and work with a representative of the community group to provide information on the disaster situation;
- Regularly report the community situation to the local government in order to analyse the situation efficiently;
- Coordinate with the local government and other relevant agencies to request support and assistance;
- Others (specify).....

(continued)

Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan *(continued)*

7. Disaster prevention and mitigation committee *(continued)*

iv **Evacuation unit:**

- Mr/Ms Tel. Head
- Mr/Ms Tel. Member
- Mr/Ms Tel. Member

Roles and responsibilities

- Coordinate with the observation and monitoring unit;
- Evacuate people in risk-prone areas to safe places;
- Prepare guidelines and move people back to their homes after the disaster;
- Others (specify).....

v **Search and rescue unit:**

- Mr/Ms Tel. Head
- Mr/Ms Tel. Member
- Mr/Ms Tel. Member

Roles and responsibility

- Search for, rescue and assist disaster victims;
- Provide first aid and refer victims to hospitals;
- Others (specify).....

vi **Victim support unit:**

- Mr/Ms Tel. Head
- Mr/Ms Tel. Member
- Mr/Ms Tel. Member

Roles and responsibilities

- Provide help and support to disaster victims, especially food, medicines, drinking water and clothing supplies during the disaster;
- Request help and support, especially emergency survival kits for victims;
- Others (specify).....

vii **Nursing unit:**

- Mr/Ms Tel. Head
- Mr/Ms Tel. Member
- Mr/Ms Tel. Member

Roles and responsibilities

- Provide medical support to disaster victims;
- Provide psychosocial support to victims;
- Others (specify).....

(continued)

Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan *(continued)*

7. Disaster prevention and mitigation committee *(continued)*

viii **Security unit:**

- Mr/Ms Tel. Head
- Mr/Ms Tel. Member
- Mr/Ms Tel. Member

Roles and responsibilities

- Look after evacuated households and properties;
- Facilitate traffic flow during evacuation;
- Others (specify).....

ix **Liaison unit:**

- Mr/Ms Tel. Head
- Mr/Ms Tel. Member
- Mr/Ms Tel. Member

Roles and responsibilities

- Coordinate with TAO/municipality office/district office, community health care centre, police station and so forth to report the current situation and to request any required relief assistance;
- Coordinate with neighbouring TAO/municipality first responders for assistance.

8. Roles and responsibilities

Duration	Roles and Responsibilities	Action by
i Before the disaster	<ul style="list-style-type: none"> – Prepare tools, equipment and warning devices – Investigate risk areas, evacuation routes and safe areas for evacuation – Provide information on the disaster to the community – Follow the weather forecast news, and monitor and assess the situation – Provide early warnings to the community 	<ul style="list-style-type: none"> – Prevention and preparation unit – Prevention and preparation unit – Prevention and preparation unit – Monitoring and warning unit – Monitoring and warning unit
ii During the disaster	Prepare for evacuation by: <ul style="list-style-type: none"> – Gathering community member information and listing people, tools and vulnerable groups – Assigning people to manage the evacuation – Informing the community to be ready for evacuation – Preparing a safe place 	<ul style="list-style-type: none"> – Evacuation unit

(continued)

Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan *(continued)*

8. Roles and responsibilities *(continued)*

Duration	Roles and Responsibilities	Action by
ii During the disaster <i>(continued)</i>	Evacuate to a safe place/evacuation centre by: <ul style="list-style-type: none"> – Managing the evacuation – Checking the number of evacuees – Taking part in community and evacuation centre patrols – Providing medical support Search for and rescue victims	<ul style="list-style-type: none"> – Evacuation unit – Evacuation unit – Security unit – Nursing unit – Search and rescue unit
iii After the disaster	Inspect damage and provide support to victims by: <ul style="list-style-type: none"> – Inspecting damage and loss to people (injuries, deaths and losses), properties (total and partial damage), tools and equipment (cars, boats, plantations and fish ponds) and infrastructure (roads, bridges and dykes) – Providing lists of damage and loss to municipality to request assistance according to the Ministry of Finance's regulations for providing emergency financial support to disaster victims Recover infrastructures Initially fix facilities and infrastructures Coordinate with external agencies to request assistance	<ul style="list-style-type: none"> – Victim support unit – Recovery unit – Recovery unit – Liaison unit

Annex I: List of tools and equipment for disaster response

No.	Details	Unit	Location	Remarks
1				
2				
3				
...				

Annex II: List of vehicles to be used for evacuation

No.	Details	Unit	Capacity	Owner
1				
2				
3				
...				

Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan *(continued)*

Annex III: List of people to be helped, moved and evacuated first (small children, elderly, disabled, chronically ill patients and pregnant women)			
No.	Name	Address	Remarks
1			
2			
3			
...			

Note: This list needs to be regularly updated

Annex IV: List of contact persons in community and contact details				
No.	Name	Position	Roles and responsibilities	Tel.
1				
2				
3				
...				

Annex V: List of government agencies located in Village and Subdistrict.....		
No.	Name	Tel.
1		
2		
3		
...		

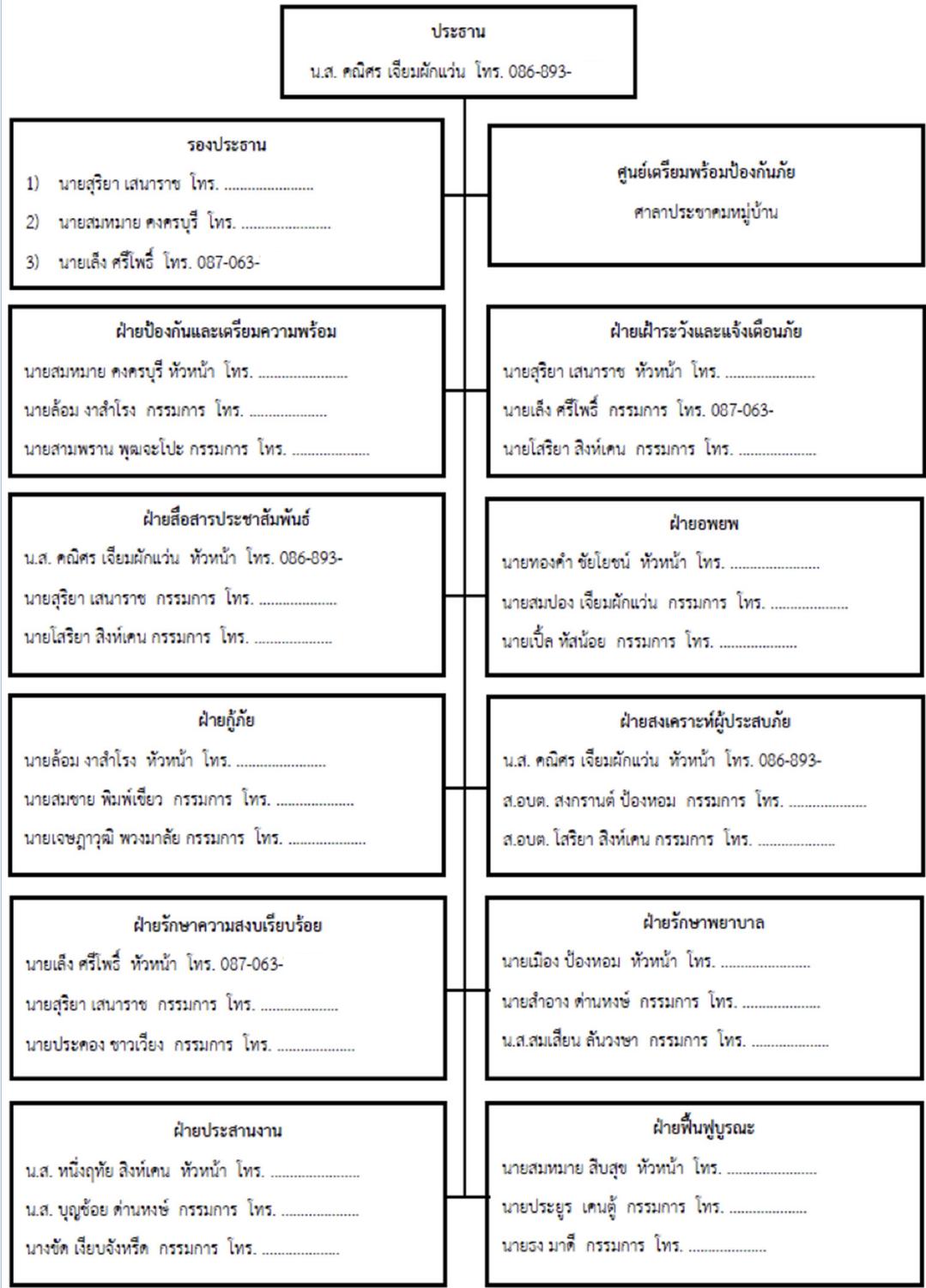
Annex VI: List of government agencies in District.....		
No.	Name	Tel.
1		
2		
3		
...		

Annex VII: List of focal persons for evacuation route	
Area to be evacuated (specify)	Focal person (name)
1	1
	2
2	1
	2
3	1
	2

The focal persons are in charge of guiding people in case an evacuation is required. They will indicate the way and maintain the route operational (for example, sometimes it's already flooded so they need to arrange boats)

Draft Community Disaster Prevention and Mitigation Plan
Community/Village Disaster Prevention and Mitigation Plan (continued)

Annex VIII: Village early warning dissemination diagram



7.2 Community plan evaluation

Before the rainy season, the community should evaluate its disaster preparedness plan, after conducting simulation exercises to review the roles and responsibilities of the committee members. In addition, evaluation of the plan will allow the community to revise its flood response methods to make them more efficient.

After a disaster occurs, committee members and the affected community should work together to evaluate whether they actually followed their disaster preparedness plan, whether there were any gaps in the plan and whether the disaster prevention and mitigation plan could reduce damage and loss in the community. These evaluation questions will enable the community to better plan and improve its disaster response capacity for future disasters.

8 FLOOD MANAGEMENT AND DEVELOPMENT PLAN

This chapter covers the relationship between floods and development and provides guidance on mainstreaming Disaster Risk Reduction into local and community development plans.

8.1 Impacts of floods on development

Floods are one of the most important issues that can affect community development (see **Figure 12** for their positive and negative impacts).

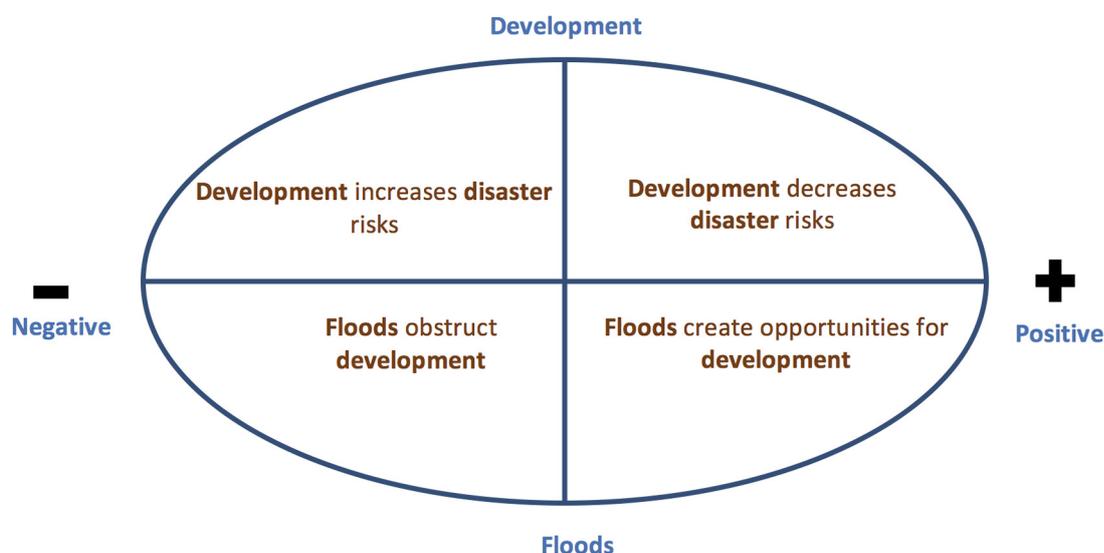


Figure 12 — Relationships between disasters and development

8.1.1 Floods obstruct development

Floods can cause loss of lives, livelihoods and properties, leading to damaged socioeconomic sectors, particularly in the disruption of a country's development plans.

When a flood-related disaster occurs, governments need to spend considerable amounts of money on emergency management, disaster relief and compensation. In addition, the private sector, communities and local government need to spend time and money on recovery from the flood-induced disaster. These types of expenses affect a country's development budget because budgets and resources will be diverted from development to recovery planning. Private sectors and communities will need to spend money on reconstruction, which will affect the overall economic system and obstruct any planned activities. As a result, existing development plans might need to be postponed or abandoned due to budgetary limitations.

8.1.2 Floods create opportunities for development

Even though floods can have significant negative impacts on society, they can also create positive opportunities for social, economic and environment development. Lessons learned from previous flood-related disasters can be used to analyse the elements at risk and to identify policies, rules and regulations to reduce disaster risks in the future. Therefore, recovery is not only the reconstruction of damaged infrastructures, but it can also provide

an opportunity for improved rebuilding using new technology and innovations to develop tools for the reduction of disaster risk and achievement of sustainable development.

Disasters will increase the understanding and demand to reduce their impacts through strengthening community resilience. All stakeholders should be aware of and work together to reduce future disaster impacts using indigenous knowledge or by adopting new innovations to effectively alter disaster trends. This will lead to more efficient livelihood adaptation that will reduce flood-related impacts and losses.

8.2 Impacts of development on risks

8.2.1 Development increases disaster risks

Some development plans can increase community vulnerabilities, which increases their disaster risks. For instance, new roads can block the natural flow of water and create potential for flooding. Expansions of urban areas, building constructions or improper maintenance of existing constructions could alter the terrain and multiply the impacts of disasters.

Degradation of the environment destroys nature's balance. For instance, the livelihood diversity of coastal communities can be destroyed due to the removal of mangrove forests to build shrimp farms, or deforestation of hilly areas to grow mono plants increases the risks of flash floods, landslides and soil erosion to communities nearby.

8.2.2 Development decreases disaster risks

It has already been said that development increases disaster risks. On the other hand, risk-sensitive development, such as using innovative disaster mitigation designs, disaster risk management capacity-building of communities and community vulnerability reduction, can decrease disaster risks.

As mentioned in the Preface to this publication, natural disasters are tending to occur more frequently and with higher intensities. This can increase the number of impacts on nature, society and the economy. However, if communities can turn risks into opportunities, lessons learned from disasters can create new development opportunities. Mainstreaming disaster risk reduction into development planning will reduce potential disasters due to unplanned development, decrease future disaster risks and lead to future sustainable development.

8.3 Mainstreaming disaster risk reduction into local and community development plans

The relationship between disaster and development is key to mainstreaming disaster risk reduction. People, communities and relevant stakeholders need to consider carefully all aspects of development and disaster risk reduction before implementing any plans or projects. The following points should be taken into consideration:

- Will communities be affected by disasters?
- Will development plans increase community disaster risks?
- Will development plans reduce the impacts of disasters on communities?

Answering these questions correctly will ensure that planned activities will result in the reduction of risks and the movement towards future sustainable development.

Therefore, it is necessary for communities or local governments to apply the three questions above to consider the impacts of any activities in their local development strategies for infrastructure, economy, social, tourism,

natural resources management and environment sectors, which are guided by national master economic and social development plans.

Development plans can be designed to reduce the direct impacts of floods such as by using dyke construction and maintenance projects to control the flow of water for agriculture, and by implementing drainage projects to improve drainage systems to prevent water stagnation (which can lead to the spread of transmissible diseases in communities).

On the other hand, development projects can reduce the impacts of floods indirectly. Implementing road construction and maintenance projects to strengthen structures that do not obstruct the natural flow of water, implementing water supply improvement projects to ensure drinking water will not be polluted by sewage during flooding, implementing community education centre construction projects that can be used as evacuation centres in the event of disasters, or implementing forest restoration projects to enhance the balance of nature are just some of the indirect impacts of development activities.

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