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Improving Flash Flood Warnings: A Study from Thailand

Strengthening local capacity in the economic analysis of environmental issues

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Southern Thailand is often affected by tropical storms, depressions and typhoons. The heavy rain brought by these weather events is often accompanied by flash floods, which significantly affect people's lives, homes, and property. Therefore, flash flood warnings need to be improved to prevent flash flood hazards from becoming disasters.

A new EEPSEA study looked at how this can best be done. The study is the work of Kannika Thampanishvong from the Thailand Development Research Institute (TDRI). It examines the factors that affect people's decisions to evacuate when there is a flash flood. It highlights a number of steps the government can take such as providing emergency public shelters that cater to the needs of young families with children, providing guidance to local residents in the preparation of evacuation plans for their communities, and training authorized personnel to help people evacuate. It also highlights two-way radios as a key warning device and recommends that the government should do more to give people access to this technology.

A summary of EEPSEA Research Report No. 2013-RR11: 'Determinants of Flash Flood Evacuation Choices and Assessment of Preferences for Flash Flood Warning Channels: The Case of Thailand' by Kannika Thampanishvong, Natural Resources and Environment Program, Thailand Development Research Institute, 565 Soi Ramkhamhaeng 39, Ramkhamhaeng Road, Wangthonglang, Bangkok, Thailand. Tel: 662 718 5460 ext. 415. Fax: 662 718 5461 2. Email: kannika@tdri.or.th.

The flash flood challenge

The scale of the flash flood challenge can be seen from one recent extreme weather incident. Between the end of March and the beginning of April 2011, prolonged heavy rainfall caused flash floods in 10 provinces in Southern Thailand. These affected over two million people. The total death toll was 64, while over 40,000 people had to be evacuated. In addition, the flash floods caused financial losses totalling over four billion Thai baht (Department of Disaster Prevention and Mitigation, 2011).

The 2011 disaster was only one of many flash floods that have occurred in recent years. Given the significance of this challenge, Dr. Thampanishvong set out to determine why people choose to evacuate and what flood warning channels they prefer. Her aim was to provide information that will help the government reduce casualties and losses from future flash floods.

The research area

The research project focused on the province of Nakhon Si Thammarat in Southern Thailand. Six villages took part in the study: Pianbon, Sarmthep, Wangsarn, Nakaowat, Natorn, and Tamlord. These villages are located along foothills near waterways and have been severely affected by past flash floods. Out of the six villages that served as study sites, only Pianbon had access to flash flood warning sirens. However, according to local people, the sirens have been switched off because there were a few false alarms in the past.

The study's fieldwork took place from July to September 2011. This stage of the research involved a series of interviews with a carefully-selected group of villagers. A local person in each village assisted the research team in recruiting the local residents for the interviews. A male and a female were selected from each household as the study also wanted to examine the difference in their evacuation decision. A total of 332 participants were selected for face-to-face interviews. Male and female members of each household were interviewed separately.

The survey obtained information about the respondents' individual experience with flash floods. To assess individual preference for flash flood warning channels, respondents were asked to rank options and to choose between pairs of options. Information was also collected on personal and demographic characteristics.

Flash flood warnings are crucial

A large proportion of the respondents (88%) were farmers or rubber tapers. A few respondents had freelance jobs or small grocery stores in their village. The study found that the communities affected by flash floods were not new settlements and that the people at risk had been living in the same place over a number of generations.

Out of the 332 individuals who participated in the survey, 144 respondents (43.4%) chose to evacuate; the rest chose not to. Among those who evacuated, 61 were male (42.4%) and 83 were female (57.6%). Among the 188 respondents who did not evacuate, 105 were male (55.9%) and 83 were female (44.1%).

Study results showed that people were more likely to evacuate if they receive a flash flood warning. They were also more likely to evacuate if they had information about safe meeting places; prior information about the existence of an evacuation meeting place increased the probability of evacuation by almost 70%. Female residents were over 10% more likely to evacuate than male residents. At the household level, families were more likely to evacuate the greater the number of young children they had.

Reasons why people chose not to evacuate

The main reason people gave for not evacuating was the perception that they were safer from the flash flood inside their own houses. Another important reason was that some residents had been cut off in the past by damaged roads, which had prevented them from evacuating.

Some respondents did not evacuate because they wanted to protect their belongings and properties. This was particularly true for those households with higher incomes. Indeed, a thousand baht increase in income led to a 0.7% decrease in the likelihood that someone would choose to evacuate. This finding can be explained by the fact that people knew that the dwellings of wealthy individuals became targets for looting and theft once they are deserted in the wake of a flash flood. Hence, wealthy individuals preferred to stay and protect their belongings and property rather than evacuate when a flash flood hit.

Photo credit: Kannika Thampanishvong

Table 1. Factors with the highest impact on the decision not to evacuate

Reason for not evacuating	Frequency
House not damaged by flash flood	70
Believed that houses were in a safe location	50
Cut off by destroyed roads	44
Not at home when flash flood took place	8
Fear of theft	6
Helped neighbors who could not help themselves	3
Pressure from neighbor who did not evacuate	2
Had children, elderly or disabled family members to attend to	2
No means of transportation	1

What are the best warning channels?

The study highlighted five key ways in which villagers received flash flood warnings. These included two-way radios, television and radio, word-of-mouth from family members, and mobile phones. Out of these options, the two-way radio was the most preferred. According to villagers, it has two key advantages: it is not dependent on electricity supply and it can work in remote rural areas.

Television and radio were considered effective sources of information when flash floods were a few days or weeks away. However, as power often fails immediately before or during flash floods, these channels were thought to be ineffective during flash floods events.

There were mixed perceptions about the effectiveness of family members as sources of flash flood information and warnings. Some respondents felt that people in their families were reliable and trustworthy sources of information, hence they were ranked quite highly. However, other respondents felt that their family members would not have better information than they would have themselves, thus their warnings were not felt to be of much use.

The mobile phone was the least preferred warning channel. While mobile phones are a relatively low-cost technology, people felt that they could not rely on the authenticity of the warnings they receive through them and that they are not functional immediately before or during a disaster since phone lines usually become congested.

How to improve evacuation warnings

These findings give rise to some important policy implications. First, because people at risk from flash floods are more likely to evacuate if they know where to take refuge after leaving their houses, the government should provide emergency public shelters. Authorities should also inform local residents about the location of public meeting places in their communities. Local residents also need to study the best travel routes to take them and their families to designated meeting places. They also need to prepare travel contingency plans and work out how they would travel if some roads were cut off by floods.

As women and families with young children are more likely to evacuate, emergency shelters should be designed to cater to their needs. Moreover, authorized personnel should be stationed along main evacuation routes to assist vulnerable groups such as females, young children, the elderly and the disabled when a flash flood strikes.

How to improve flash flood warnings

As mentioned, the study found that residents in the flash flood hazard areas in Nakhon Si Thammarat Province highlighted two-way radios as their preferred method of getting flash flood warnings. However, very few had access to this technology. Of the 332 respondents, only 54 respondents (16%) owned a two-way radio. Battery-powered two-way radios are quite expensive and many respondents said they could not afford it. Therefore, the government has an important role to play in helping people access this technology by either providing investment or subsidies. The government could also help with licensing and training.

As for high-income individuals who were less likely to evacuate because

Table 2. Results from direct ranking of flash flood warning channels

Flash Flood warning channel	Full sample	Tha-Sala	Sichol	Nopbhitam
Mobile phone	5th	3rd	5th	6th
Television	2nd	2nd	3rd	3rd
Radio	3rd	5th	2nd	2nd
Neighbor	4th	4th	4th	4th
Family member	6th	6th	6th	5th
Two-way radio	1st	1st	1st	1st

of the possibility of burglary, government agencies can help them by providing some degree of reassurance about the security of unoccupied dwellings during evacuations.

To overcome problems highlighted with the use of mobile phones as warning devices, the government should develop a unified public warning system and make sure that the responsible government agencies are well coordinated. If this is done, people at risk can be confident in the authenticity and credibility of any warnings they receive. Network providers should also try to improve the reception of mobile phones, especially in flash flood hazard areas.

Because television and radio have limited use immediately before or during a flash flood, the public should be encouraged to use these channels to obtain medium- and long-term meteorological information, weather forecast and warnings about future disaster events.

The role of wardens, local forecasts and settlement location

The study also highlights two other issues that need to be addressed. The first is the role of community flash flood wardens. These teams of local volunteers can assist residents, such as the elderly and young children, who cannot reach or access traditional warning channels. However, the government must do more to train the volunteers and make sure that local people know that they are authorized personnel who can be trusted.

Secondly, the government should train people on how to obtain relevant meteorological information locally. For example, community members could be taught how to check the amount of precipitation by reading the rain gauges provided by the Department of Mineral Resources. This information would help local residents better prepare themselves for any flash floods.

The study also highlighted a more fundamental problem that was putting people at risk of flash floods: the location of settlements. Because there has not been effective enforcement of the Forest Reserve Act and the National Park Act, many communities have encroached into protected forest reserve areas. In many cases, they have constructed their houses on hill slopes. This has put their houses at risk from slope failures, gully erosion and debris flow – all problems that are exacerbated by flash floods. Looking into the future, these settlement practices need to be banned to reduce future losses of life and the destruction of personal property.

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