World Academy of Science, Engineering and Technology
International Journal of Educational and Pedagogical Sciences
Vol:9, No:5, 2015

Failure to React Positively to Flood Early Warning Systems: Lessons Learned by Flood Victims from Flash Flood Disasters: The Malaysia Experience

Mohamad Sukeri Khalid, Che Su Mustaffa, Mohd Najib Marzuki, Mohd Fo'ad Sakdan, Sapora Sipon, Mohd Taib Ariffin, Shazwani Shafiai

***Abstract*—**This paper describes the issues relating to the role of the flash flood early warning system provided by the Malaysian Government to the communities in Malaysia, specifically during the flash flood disaster in the Cameron Highlands, Malaysia. Normally, flash flood disasters can occur as a result of heavy rainfall in an area, and that water may possibly cause flooding via streams or narrow channels. The focus of this study is the flash flood disaster which occurred on 23 October 2013 in the Cameron Highlands, and as a result the Sungai Bertam overflowed after the release of water from the Sultan Abu Bakar Dam. This release of water from the dam caused flash flooding which led to damage to properties and also the death of residents and livestock in the area. Therefore, the effort of this study is to identify the perceptions of the flash flood victims on the role of the flash flood early warning system. For the purposes of this study, data were gathered through face-to-face interviews from those flood victims who were willing to participate in this study. This approach helped the researcher to glean in-depth information about their feelings and perceptions of the role of the flash flood early warning system offered by the government. The data were analysed descriptively and the findings show that the respondents of 22 flood victims believe strongly that the flash flood early warning system was confusing and dysfunctional, and communities had failed to response positively to it. Therefore, most of the communities were not well prepared for the releasing of water from the dam which caused property damage, and 3 people were killed in the Cameron Highland flash flood disaster.

***Keywords*—**Communities affected, disaster management, early warning system, flash flood disaster.

I. Introduction

THE existence of disasters can be perceived as natural or man-made emergency events from which the consequences might lead to economic as well as social collapse [15]. Indeed, the communities may be seriously affected and this will disturb their lives, especially whenever their property has been damaged as a result of the disasters. This situation becomes worse if the disaster has caused the death(s) of their relatives. In this context, government intervention is very important in order to minimize the negative effects caused by the disaster. Nevertheless, the communities should also be responsible individually in disaster management, especially in their efforts to reduce risks and losses. At this stage, one can see that flooding can be considered as one of the natural disasters that may occur for several reasons, such as climate change, wind movement, heavy rainfall and so on [2]. In respect of heavy rainfall, there is no doubt that continuous rainfall in an area will contribute to an overflow of water which will finally cause flooding [11].

Based on the Malaysia experience, flooding has affected many areas and caused huge damage; one particularly serious example of this occurred in 1926 and became known as the "Huge Flooding' [1], [4], [6], [10]. In terms of the numbers of flood victims affected, this has increased to 4.82 million. In order to reduce the huge levels of damage to property and the number of deaths caused by flooding, the government has taken drastic action. Flood mitigation programmes have been planned and implemented. In this context, the government has spent almost RM17 billion on flood mitigation planning over a period of 15 years [6]. The government has increased the allocation for 1.7 billion USD (RM5 billion) in the 10th Malaysia Plan following the huge loss of government assets during flooding in 2006 and 2007. This allocation also includes the flood management plan [1]. In terms of cause of death during flooding, flooding as a natural disaster has contributed to the cause of death of 40 to 50 per cent from all disasters [7] & [8].

Following the discussion above, the government of Malaysia is now very concerned about the flood disasters that have caused huge losses to the country. Therefore, in 1972, the government established the National Disaster Management and Relief Committee (NDMRC) at District, State and Federal levels. The main objective of the establishment of the committee was to reduce property loss and avoid death. With the purpose of managing disasters in Malaysia, the National Security Council (NSC) Directive No. 20 has become a main reference. Besides that, the Fixed Operating Regulations (PTO) was also established by the government to emphasize the aims of the Policy and Mechanism on Disaster and Relief Management on Land. Furthermore, Directive No.20 also outlines the responsibilities of various agencies, and has determined how they should work together as a team in disaster management [1].

Mohamad Sukeri Khalid is with the Universiti Utara Malaysia, Kedah 06010 Malaysia (corresponding author to provide phone: +6019-4509666; e-mail: sukeri@uum.edu.my).

Che Su Mustaffa, Mohd Najib Marzuki, Mohd Fo'ad Sakdan, and Shazwani Shafiai are with the Universiti Utara Malaysia, Kedah 06010 Malaysia. (e-mail: chesu402@uum.edu.my, najib320@uum.edu.my, foad437@uum.edu.my, miss_shazz@yahoo.com).

Sapora Sipon is with the Universiti Sains Islam Malaysia, Negeri SEMBILAN 71800 Malaysia. (e-mail: saporasipon@yahoo.com.my)

Mohd Taib Ariffin is with the Universiti Pendidikan Sultan Idris, Perak 35900 Malaysia. (e-mail: mohdtaib_a@yahoo.com).

If one looks at the flood early warning system, one can see that the ongoing development of science and technology has become very important and helpful. This is because the current flood early warning system is based on the warning system and it has become an important communication channel for warning communities about potential flooding within their territory [11]. In this context, the warning system can be provided based on a siren system, remote sensing, television and so on [14]. For this study, the flood early warning system at Sultan Abu Bakar Dam, based on the siren system, was provided to warn the local community whenever the management of the dam wanted to release water. This means that the siren system will be switched on to notify the local community that the water from the dam will be released imminently. Therefore, the local community must take necessary actions to avoid any unforeseen circumstances from the action taken by the management of the particular dam.

Nevertheless, this study found that the local community was confused when differentiating between the normal siren signal for releasing water from the dam and the emergency siren signal of the flood early warning system that requires the local community to get ready for flooding following the release of water from the dam which will probably cause flash flooding. Failure to react positively to the flood early warning system led to the people in that area ignoring the warning system, and no actions were taken by the community to get ready to face flooding. Therefore, once the water was released, flash flooding occurred and caused property damage; also, four people were killed. In this context, it is fair to say that during emergency situations the element of communication becomes very important [13]. Of course, the government must play a vital role in conveying information to public, and such information must be understood by the people. In this context, local people will definitely react positively to an emergency flash flood early warning system if they understand the signal of the siren system when it is switched on. If this could be practiced, the people around the particular areas could be prepared in order to reduce losses, and specifically to avoid death [3].

II. Methodology

For the purposes of this study, a qualitative approach has been employed. This approach helped the researcher to gather more detailed information from the respondents. The respondents of this study were chosen from flood victims at Sungai Lembah Bertam who were willing to participate in this study. The study uses face-to-face interviews based on several themes such as social support, the early warning system, political beliefs, stress and policy perspectives. The questions of the interviews were structured in such a way as to glean information from the true experience of the flood victims. There were 22 respondents involved in this study. However, for the purposes of this article, the study focuses solely on the theme of the flood early warning system. This is because the flood early warning system based on the siren signal was established as a main communication channel to warn local people within the particular areas. Nevertheless, the effectiveness of the system is debatable since the siren system is always switched on, and because of this, the people were not able to differentiate between the normal siren signal for releasing water and the emergency siren signal for people to get ready for flash flooding which will occur following the release of water from the dam. In this event, failure to react positively to the flood early warning system during an emergency as a result of the dysfunction of the warning system will lead to a situation in which local people will not be ready for any unforeseen circumstances. For this reason, the study was conducted in order to identify the lessons learned by the flash flood victims toward responding to the flood early warning system before flooding. The data were collected using an audio tape recorder and the audio tapes were then transcribed. The descriptive analysis then followed in order to achieve the objective of the study.

III. Findings and Discussion

Most of the respondents strongly agreed that the early warning system was not operating properly. Indeed, they believed that it was not in line with the Fixed Operating Regulations (PTO) established by the government. The respondents argue that they were not informed sufficiently early about the possibility of facing flash flooding since the operation of the siren system was not effective, as the flood victims failed to differentiate the emergency early warning from the normal siren signal for releasing water from the dam.

In this context, the early warning system definition can be considered from various perspectives, i.e. to glean information about an emergency situation and to convey messages about the emergency situation to those people who really need the information; also, the early warning system is very useful for helping people to react positively in order to avoid unforeseen circumstances during an emergency [11]. Nevertheless, for this study, most of the respondents involved were not satisfied with the early warning system provided. They felt that what had happened was very sad, because there is no difference between the sound of the normal siren and that of the emergency one. Therefore they could not be certain that the siren system signal was an emergency one that requires the local people to get ready for flash flooding.

Most of the respondents urged that the siren signals should be switched on regularly whenever the dam management wants to release water. It is normal for the dam management team to operate the siren signal before releasing water from the dam. According to respondent 10, “this had been exercised for the past 20 years and there was no difference between the siren signals for normal water release and the emergency signal for a flash flood”.

From the discussion above, one can see how important it is that the early warning system based on the siren system is used as a main communication channel to inform people about emergency situations [11]. They insisted that the system had been applied a long time ago but is still applicable now, and it is very helpful for conveying emergency messages to people who are scattered widely within the high risk area.

Nevertheless, this system was always ignored by local

communities because of their failure to understand which siren signal referred to a normal situation and which one is for emergency purposes. In the context of the study, the siren system had been operating since 9 pm but nothing had happened. Unfortunately, whenever the siren signal was switched on again at 12 midnight for releasing more water than usual, the local people ignored the emergency signal and did not react positively to the emergency siren because they failed to understand that the siren signal at 12 midnight was an emergency one warning about a flash flood. They considered that the siren was the same signal as usual.

Failure to react positively to the flash flood early warning system owing to a dysfunctional system had caused local people not to prepare themselves for flooding that might contribute to property damage and death. In this sense, most of the respondents agreed that they are the victims of a dysfunctional early warning system. In this context, understanding and responding positively to the early warning system could very probably reduce loss as a result of the disaster. If the emergency messages could be delivered at the right time and at the right place, this might lead to a reduction in damage [16].

In terms of the perceptions by respondents towards the role which should be played by the government for delivering early warning systems specifically for flooding, the findings show that most of the respondents argue that the management team of the Sultan Abu Bakar Dam had failed to deliver their responsibility, specifically before releasing water from the particular dam. This is because no early information had been conveyed to the local people, specifically about releasing the water. Indeed, the respondents claimed that the management team of the dam had failed to follow exactly all conditions of the Fixed Operating Regulations (PTO) in relation to operating the siren before releasing water. Based on the Fixed Operating Regulations (PTO), the agency responsible should inform the local people from time to time about the increase in the water level of the dam so that they can get ready to move to the relief centre provided by the government. In fact, the information of the warning should be conveyed quickly and accurately. With reference to the siren system, there must be a significant difference between the sounds for a normal water release compared with that of an emergency siren. If this could be exercised, community people will easily determine the emergency situations that require them to be prepared to leave their accommodation and move to a relief centre. In this context, understanding the early warning system becomes vital for local people, and it is the responsibility of local government to ensure that this can be achieved [5].

According to most of the respondents who were willing to participate in this study, this area had experienced flooding before, in 1988. During that time, the police force and fire brigade had taken drastic actions to inform the communities to get ready to move to relief centres before the dam water was released. They added that this effort was very helpful because everybody had been warned that they were in an emergency situation. Therefore, they were reacting positively towards the instructions from both agencies involved that required them to move to relief centres. In other words, if the message is clear and well delivered to the people before the water release, immediate actions will be taken by local people to avoid any unforeseen circumstances.

It was very different in the 2013 incident, when the local community was solely dependent on the early warning system only. No other agencies took part in providing information to the local people, as had happened during the flooding in 1988. Thus there is no doubt that most of the respondents were not satisfied with the mechanism used by the government, which is based only on the siren warning system to inform people about emergency situations. They also questioned whether, if in 1988 government agencies can knock on the doors of every house before the dam water was released, why in 2013 could they not practice the same mechanism? In this context, they urged that the government agency should take responsibility for implementing a warning system communication that can be applied and understood by the local people in high-risk areas, and so be prepared for any emergency situation [11].

At this stage one can see that the failure of delivering early information about emergency situations and dysfunctional siren systems during flash floods led to loss of property, and also the lives of 4 people. In line with this, the early warning system should be placed as one of the main policies related to disaster management [12]. Instead of that, the procedural aspect of releasing water from the dam should be strengthened in order to avoid flash flooding. For instance, the water of the dam should be released before it reaches a dangerous level. This is important because it was proven that once the water level had reached more than the dangerous water level, then any water released will normally contribute to flash flooding [9].

From the above discussion, one can see the importance of an early warning system in disaster management. Understanding the early warning system signal may lead to a reduction in risk for local people around the high-risk area, whereby they can prepare themselves once the warning system begins operating. In this context, instead of informing people manually by knocking on doors, the early warning system can be perceived as a scientific approach, since it is based on technology development; it is also convenient for management purposes, as well as being considered as one of the principal communication channels in disaster management [5]. The tragedy of Sungai Lembah Bertam has demonstrated the dissatisfaction of local communities towards the responsibility of the government, specifically toward the agency responsible for releasing water from the dam, because they noticed that the water had been released without the Fixed Operating Regulations having been followed, and this led to property damage and death. Therefore, the local people asked that fair compensation should be paid to them. Indeed, most of the respondents were unhappy whenever they heard that this location was not safe for occupation. In this sense, they realized that one day they would be asked to vacate possession of the place. Nevertheless, few respondents were unhappy with the news that one day they would need to move away from the area. This is because they had occupied the land for

more than 40 years, and they questioned why the government had recently introduced the idea that this area should be vacated. They also wanted to know why they should move. If they really must move, where should they go? In this context, most of the respondents agreed that the government should meet them for further discussion and not make any proposals without consulting local people.

Another issue relating to the incident of flash flood at Sungai Lembah Bertam and highlighted by the respondents was the poor maintenance of particular rivers. They stressed that the maintenance works of the river were not properly done. One of the respondents claimed that the maintenance work on the river will only be undertaken if there is a special event in the Cameron Highlands.

Despite the dysfunctional early warning system and also improper maintenance of the river, the respondents agreed that the cultivation activities might contribute to the incident of flash flooding, because most of the entrepreneurs involved in vegetable cultivation were not particular about keeping the river clean, as evidenced by their throwing plastic bags and other rubbish into the river. This action has made the river become shallow and once the rainfall becomes very heavy, the river will overflow and finally will cause flash flooding.

IV. Conclusion

From the discussion on the failure of flash flood victims to react positively to the flood early warning system, one can see that the effect was terrible, since this failure contributed to property damage and death. This means that the early warning system has become one of the most important communication channels to convey emergency signals to local communities. Therefore, the signals must be well understood by the local people so that they can take immediate action to move out of the area at risk. What had happened to the flood victims of Sungai Lembah Bertam in the Cameron Highlands was very unfortunate, because they were not able to differentiate the flash flood early warning based on the siren system from the normal siren signal, owing to a dysfunctional system. In this context, there is no doubt that the early warning system was very important as a communication channel for warning local people, but other approaches during heavy rain falls should be integrated, such as keeping local communities informed from time to time through other mechanisms, e.g. electronic media and social media, about the dangerous/emergency situation that requires them to prepare to move out from the risk area as quickly as possible. Any government agency given specific tasks must perform these very well, based on the Fixed Operation Regulations (PTO) established by the government. Therefore, if something should happen after all the procedural aspects of disaster management have been undertaken according to the Fixed Operation Regulations, nobody should be blamed.

In respect of the flood early warning system, especially for dam management, the government should investigate it to ensure that the siren system for releasing dam water in a normal situation is different from the siren system for emergencies. Indeed, to avoid any tragedy, such as that in the Cameron Highlands, the government should review the Fixed Operation and Regulations related to the release of dam water.

Furthermore, the government agency should be prepared early to face any unforeseen circumstances caused by flood disaster that might occur following heavy rain falls. In this sense, the government agencies need to keep informing local communities about the increasing of water levels from time to time. This means that local people will not depend solely on the siren systems during emergency situations.

Finally, the people who have occupied the area for so long also need to take care of the area, specifically to make sure that the river is clean, in order to ensure that the drainage system is in good condition to aid the flow of water, especially during heavy rains.

Acknowledgment

This work was supported in part by the Ministry of Higher Education Malaysia under the Long Term Research Grant Scheme (LRGS/b-u/UUM/Communication Technology and Information).

References

[1] Arahan No. 20, Dasar dan mekanisme pengurusan bencana negara. Majlis Keselamatan Negara, Jabatan Perdana Menteri Malaysia, 2012.
[2] Balek, J., Hydrology and water resources in tropical regions. Amsterdam: Elsevier, 1983.
[3] Becker, S. M., Emergency communication and information issues in terrorist events involving radioactive materials. Biosecurity and Bioterrorism: biodefense strategy, practice, and science, 2(3), 195-207, 2004.
[4] Chan N. W. & Parker, D. J., Response to dynamic flood hazard factors in Peninsular Malaysia. The Geographical Journal 162(3), pp.313-325, 1996.
[5] Collins, M. L., & Kapucu, N., Early warning systems and disaster preparedness and response in local government. Disaster Prevention and Management. 17(5), 587-600, 2008.
[6] Chia, C. W., Managing flood problems in Malaysia. Buletin in Genieur, 38-43, 2004.
[7] Diaz, J. H., The public health impact of hurricanes and major flooding. The Journal of the Louisiana State Medical Society. 156(3), 145-150, 2004.
[8] Du, W.. Policy analysis of disaster health management in china. Diambil dari tesis PhD, Queensland University, 2010.
[9] Harian Metro, Tengku Mahkota Pahang mahu SOP di kaji semula, 25 Oct. 2013.
[10] Loi, H. K., Flood mitigation and flood risk management in Malaysia. Department of Irrigation and Drainage Malaysia, 1996.
[11] Muhammad Barzani Gasim, Salmijah Surif, Mazlin Mokhtar, Mohd. Ekhwan Hj. Toriman, Sahibin Abd. Rahim & Chong Huei Bee, Analisis Banjir Disember 2006: tumpuan di kawasan bandar segamat, johor. sains Malaysia. 39(3), 353–361, 2010.
[12] Mileti, D. S., & Sorensen, J. H., Communication of emergency public warnings. Federal emergency management agency. Washington D.C., 1990.
[13] McBean, G., Risk mitigation strategies for tornadoes in the context of climate change and development. In C. Haque (Ed.), Mitigation of natural hazards and disasters: International perspectives. pp. 25-34, 2005.
[14] S.H.M. Fakhruddin, Emergency communications for disaster management. Asian Disaster Preparedness Center. 13(1), 1- 25, 2007.
[15] United Nations. International Strategy for Disaster Reduction (UNISDR), Living with Risk. A global review of disaster reduction initiatives. United Nations publication. I: ISBN 92-1-101064-0, 2004.
[16] Zhen-Yao Wang, Yuan-Chang Zhen & Ji-Xun Li, Early warning systems for the reduction of natural disaster in China. In Zschau J. &

Kuppers A. (eds), Early warning system for natural disaster reduction (pp. 15-18). New York, 2003.

Mohamad Sukeri Khalid is a senior lecturer at School of Government, College of Law, Government and International Studies, Universiti Utara Malaysia. He obtained a doctoral degree from Heriot-Watt University, Edinburgh UK. Before joining academia, the author was involved with industry for 5 years. His job was based more in property management and property development. After gaining practical experience in industry, the author developed his career as an academician with Universiti Utara Malaysia in 1999. The author's research interest is directed more on property market analysis, property development, property management, property economics and research into entrepreneurship. He is actively involved in teaching, research, publication and community works.

Che Su Binti Mustaffa was born in Kodiang, Kedah, Malaysia, on October 2, 1963. She graduated with a Bachelor of Arts in communication (Minor History) from Universiti Kebangsaan Malaysia in 1987, an M.Sc. (Journalism and Mass Communication) from Iowa State University, USA in 1990 and a Ph.D. in Organizational Communication, from the Universiti Utara Malaysia/University of Memphis in 2000. She possesses vast experience with more than 23 years of working experience in the field of communication. She served Universiti Utara Malaysia as a tutor in 1988 and became a lecturer in 1990. She was promoted to associate professor in 2000. Currently, she is a professor of communication at College of Arts and Science, Universiti Utara Malaysia.

Najib Ahmad Marzuki is a professor at the Department of Psychology & Social Work, School of Social Development, College of Arts and Sciences, Universiti Utara Malaysia. He received his B.A. (Hons) in Psychology from the UniversitiKebangsaan Malaysia, Master in Industrial and Organizational Psychology from the University of New Haven, Connecticut, USA, in 1989 and his Ph.D. in Psychology from the University of Nottingham, the United Kingdom. The author is currently a Registered Qualified Test User (RQTU) in Occupational Testing from the Psychological Testing Centre, British Psychological Society, United Kingdom. Professor Dr. Najib Ahmad Marzuki has served Universiti Utara Malaysia for more than 23 years.

Mohd Fo'ad Sakdan was born in Muar, Johor, Malaysia on November 19, 1964. The author graduated with a B.A. and M.A. (Political Science) from Universiti Kebangsaan Malaysia in 1988 and 1990 respectively. The author obtained a Ph.D. in Conflict Management from University of Hull in 2006. He possesses vast experience with more than 23 years of working experience in the field of politics. He joined Universiti Utara Malaysia as a tutor in 1989 and became a lecturer in 1992. He was also an associate professor attached to the College of Government, Law and International Studies (COLGIS), Universiti Utara Malaysia. Beside academic responsibilities, he has also held an administrative position as the Director of the Research and Innovation Management Center (RIMC) of the Universiti Utara Malaysia. Assoc. Prof. Dr. Mohd Fo'ad Sakdan is now the Deputy Vice-Chancellor (Student Affairs and Alumni) of Universiti Malaysia Perlis.

Sapora Sipon is an associate professor in the Faculty of Leadership and Management, USIM. As a licensed counsellor and psychologist, she is an active columnist in a local newspaper, and participates in numerous research studies, paper presentations and conferences locally and internationally. She has published several books related to her field of counselling and psychology. She has won several innovation and invention awards in her years with USIM. She is currently the project leader for this research grant under the Ministry of Education Malaysia.

Mohd Taib Bin Ariffin was born in TelukIntan Perak, Malaysia, on June 10, 1959. He graduated with a Bachelor of Communication from Universiti Kebangsaan Malaysia in 1983 and Master of Arts of Interpersonal Communication from Ohio University, USA, in 1989. He served at the National Productivity Centre, Petaling Jaya, Selangor, Malaysia, from 1983 to 1987 and became a lecturer and associate professor at Universiti Utara Malaysia in 1987 and 2001 respectively. Currently, he is an associate professor at UniversitiPendidikan Sultan Idris, TanjungMalim, Perak, Malaysia.

Shazwani Binti Shafiai was born at Kampung Banggol Sena, Mata Ayer, Perlis, Malaysia on December 9, 1986. The author graduated as Bachelor of Public Management and Master of Public Management from Universiti Utara Malaysia, Sintok Kedah in 2010 and 2012 respectively. The author is currently pursuing her PhD at the same university and the major field of her study is Public Management. She is currently a research assistant attached to the School of Multimedia Technology and Communication, Universiti Utara Malaysia.