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AN ASSESSMENT ON EARLY WARNING SYSTEM: INITIAL SURVEY ANALYSIS

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Abstract

In Cameron Highland, Lembah Bertam area and further downstream villages in Susu Dam area are prone and vulnerable to the highest occurrence of floods especially during monsoon season. Thus, Early Warning System (EWS) were set up to avoid or to reduce the impact of natural hazard turns disasters such as floods, landslides and storms with the aim to reduce the vulnerability and disaster risks that signifies the effectiveness of EWS in the realisation of affected community. To test the awareness and preparedness of community in the selected area, a questionnaire survey was employed as the data collection method. The questionnaire survey was conducted before the direct engagement on the EWS information with the community. Using the mixed sampling method of cluster random sampling, a total of 800 respondents from 11 villages, and 5 main ethnicity groups were involved in the survey. From the result, there was a positive relationship showing that respondents who claimed they knew about the EWS from information signage were those from the older age category and earning higher monthly income. On the other hand, there is a negative relationship between respondents' age and monthly income against other sources that indicates respondents who claimed they knew about the EWS from other sources were those in the younger age category and have low monthly income.

Keywords: early warning system; dam, hazard, Cameron Highland

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INTRODUCTION

Overall, there are 74 dams in Malaysia, which consist of various types and functions. Dams in Malaysia are owned and operated by different agencies such as the Department of Irrigation and Drainage, Water Supply Department, energy supply company (such as TNB), State Government and other agencies according to their respective needs and responsibilities.

Apart from other functions, provision of dams is also essential for the nation's infrastructure to provide for renewable energy of hydropower electricity. Hydropower is the only renewable energy technology that is presently commercially viable on a larger scale. It has four major advantages, namely it is renewable, it produces negligible amounts of greenhouse gases, it is the least costly way of storing large amounts of electricity, and it can easily adjust the amount of electricity produced to the amount demanded by consumers.

However, construction and dam development posed potential hazard to communities, the environment and property, often well beyond their locations. Among the impacts of dam include dam failure that could lead to flood event that cause potential flooding impacts to the community and assets (vulnerability). Thus, this paper explores the community knowledge on the dam failure and flood early warning system at Lembah Bertam and Susu Dam area.

BACKGROUND OF THE STUDY

Hazard is defined as phenomena that poses a threat to people, structures or economic assets and which may cause a disaster (UN-SPIDER, 2015). Disaster could be categorised either man-made or naturally occurring, while vulnerability is the extent to which a community are exposed to loss or damage that indirectly influence their perceptions and willingness to act(Jones et al, 2014).

As recorded in the Global Risks report (World Economic Forum, 2016), the world we are living in is facing issues of climate change, social instability, unmanageable inflation, large scale involuntary migration, biodiversity loss, terrorism, and so forth. It is forecasted that countries like in Asia are likely to experience major natural catastrophes with extreme weather events (World Economic Forum, 2016). Asia accounts for 70% of natural disasters in the world (ADB, 2012). The main reason for this is the fact that Asia Pacific lies within Pacific Ring of Fire, which accounts for 90% world's earthquakes and 70% of world's volcanoes (Jha & Brecht, 2011).

Malaysia is geographically located outside the Pacific Ring of Fire. Therefore, it is relatively free from certain severe crises found in neighbouring countries. However, as shown in Figure 1, Malaysia is vulnerable to natural hazards including floods, forest fires, tsunami, cyclonic storms, landslides, epidemics, and haze.

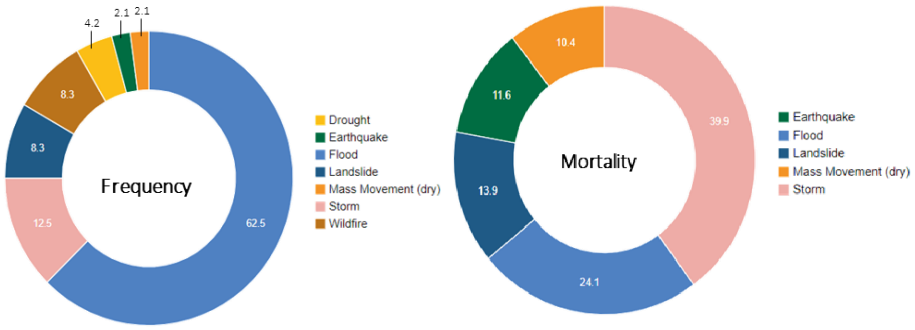

Figure 1 Disaster and risk profile of Malaysia
Source: EM-DAT (Feb. 2015)

Disaster is a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses, which exceed the ability of the affected community or society to cope, using its own resources (UNISDR, 2004). A disaster occurrence happens when an impact of hazard affected a vulnerable population that causes damage, disruption and casualties. Therefore, it is important for the Early Warning System (EWS) to be set up to avoid or reduce the impact of natural hazard turn disasters such as floods, landslides and storms with the aim to reduce the vulnerability and disaster risks that signify the effectiveness of EWS in the realisation of affected community. The official United Nations International Strategy for Disaster Reduction (UNISDR, 2009) defines the Disaster Risk Management as:

> *"The systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster."*

The Malaysian government has adopted UN World Conference global plan for natural disaster risk reduction, the Hyogo Frameworks for Actions (2005-2015) and Sendai Framework (2015-2030). Malaysia also undertakes initiatives to mainstream disaster risk management and reduction to be in line with the 11th Malaysia Plan, the nation's primary development plan. Disaster management has consistently been a focus of Malaysia's development policy. Malaysia's National Platform for DRR was formalised in 2013, which involves various stakeholders from different government agencies, as well as collaboration with the private sector. This is reflected through the amount of resources invested to minimise risk factors and facilitate sustainable development, and one of the initiatives is the implementation of the Early Warning System (EWS) to the affected community.

EWS is the representation of a set of capacities needed to generate and disseminate timely with meaningful warning information that enables at-risk

individuals, communities and organisations to prepare and act accordingly, and in sufficient time to reduce harm or loss. According to Mohd Hussain et al. (2018), EWS can be categorised into community managed EWS and community based EWS. A community managed EWS refers to the system managed by community but they are not completely involved in the establishment of the system. Whereas, community based EWS is a system developed, operated and maintained by the community itself. While developing the system, the community would explore external support from different individuals, communities, organisations and institutions. Thus it can be concluded that it is necessary that the community develops and maintains close coordination and links with the stakeholders.

As EWS tends to focus on warning and monitoring on hazards and threats only, hazards and vulnerability should be assessed together to reduce risks. A community which is highly exposed to hazard also experiences a high level of vulnerability and needs a more heads-up warning.

STUDY METHODOLOGY

The initial survey questionnaire was designed to elicit the perceptions of the community before EWS implementation in the settlements. The survey was conducted on a one-to-one interview basis with a total survey population of 800 respondents who reside in the Sultan Abu Bakar (SAB) Dam and Susu Dam areas.

This research employed the method of probability sampling in which it gives an equal opportunity to the population to be included in a sample. Brown (1947) elaborated that a probability or random sampling has the greatest freedom bias but may represent the most costly sample in terms of time and energy for a given level of sampling error. In selecting samples from the targeted sampling, cluster sampling was chosen as it assumed as the best sampling technique for this research. Cluster sampling is advantageous for those researchers whose subjects are fragmented over large geographical areas as it saves time and money (Davis, 2005). Overall, the number of respondents from each village represented 30% of the total village population.

The data retrieved from the questionnaire was analysed using IBM SPSS Statistics Version 23. The first phase of questionnaire survey was done before the community engagement programme with the population. This intended to gauge the response from respondents that could reflect their nature of understanding, awareness and preparedness of the community in Cameron Highlands before the EWS was installed.

The questionnaire survey for this research was divided into three main sections which consisted of Section A: demographic information of the respondents, Section B: information on experience before the implementation of EWS, and Section C: information on experience during the installation of EWS.

RESULT OF INTIAL SURVEY AND ANALYSIS

This section discusses on result of primary data collection in the study area. The discussion starts with analysis on background of respondents followed with descriptive analysis on their knowledge on EWS. Result on respondents' profile is presented in Table 1 below. Based on ethnicity distribution according to village in Table 1 above, the highest percentage for Semai ethnic group with 98.7% were respondents from Kg. Renglas, followed with 96.5% from Kg. Leryar and 93.4% from Kg. Teji. Meanwhile, for Temiar ethnic group, the highest percentage with 44.4% were respondents from Pos Telanuk.

Table 1 Ethnicity distribution according to village

Village	Ethnicity													
	Semai		Temiar		Melayu		Cina		India		Others		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Lembah Bertam	16	6.1	1	0.4	53	20.1	137	51.9	16	6.1	41	15.5	264	100
Sg. Tiang	100	90.1	1	0.9	1	0.9	1	0.9	6	5.4	2	1.8	111	100
Mensun	29	74.4	4	10.3	5	12.8	0	0.0	1	2.6	0	0.0	39	100
Leryar	83	96.5	0	0.0	1	1.2	0	0.0	1	1.2	1	1.2	86	100
Teji	57	93.4	3	4.9	1	1.6	0	0.0	0	0.0	0	0.0	61	100
Bako	10	90.9	0	0.0	1	9.1	0	0.0	0	0.0	0	0.0	11	100
Pos Telanuk	5	55.6	4	44.4	0	0.0	0	0.0	0	0.0	0	0.0	9	100
Susu	78	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	78	100
Habu	31	88.6	2	5.7	2	5.7	0	0.0	0	0.0	0	0.0	35	100
Senangkar	27	90	3	10	0	0.0	0	0.0	0	0.0	0	0.0	30	100
Renglas	75	98.7	1	1.3	0	0.0	0	0.0	0	0.0	0	0.0	76	100
Total	511	63.9	19	2.4	64	8.0	138	17.2	24	3.0	44	5.5	800	100

As shown in Table 2, from the total respondents from Kg. Bako, 54.5% of them claimed they never attended school while the remaining of 45.5% of them had attended at least secondary education level. Meanwhile, 54.1% of total respondents from Kg. Teji claimed they have attended primary school and 34.4% attended secondary school. In addition, from the total 18 respondents who claimed they have certificate or college qualification, 5.7% of them were from Kg. Habu, 5.4% from Kg. Sg. Tiang and 3.1% from Lembah Bertam. However, for respondents from Lembah Bertam, none of the respondents from other villages had obtained university level education.

Table 2 Respondents' educational level distribution according to village

Village	Educational level											
	Never attended school		Primary school		Secondary school		Certificate-college/ institute		University		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Lembah Bertam	41	15.6	75	28.6	129	49.2	8	3.1	9	3.4	262	100
Sg. Tiang	27	24.3	34	30.6	44	39.6	6	5.4	0	0.0	111	100
Mensun	8	20.5	19	48.7	11	28.2	1	2.6	0	0.0	39	100
Leryar	7	8.1	38	44.2	41	47.7	0	0.0	0	0.0	86	100
Teji	7	11.5	33	54.1	21	34.4	0	0.0	0	0.0	61	100
Bako	6	54.5	0	0.0	5	45.5	0	0.0	0	0.0	11	100
Pos Telanuk	0	0.0	3	33.3	6	66.7	0	0.0	0	0.0	9	100
Susu	17	21.8	16	20.5	44	56.4	1	1.3	0	0.0	78	100
Habu	6	17.1	6	17.1	21	60	2	5.7	0	0.0	35	100
Senangkar	3	10	11	36.7	16	53.3	0	0.0	0	0.0	30	100
Renglas	8	10.5	20	26.3	48	63.2	0	0.0	0	0.0	76	100
Total	130	16.3	255	32	386	48.4	18	2.3	9	1.1	798*	100

Note: *2 respondents did not answer the question.

As shown in Table 3, 84.8% of the total respondents claimed they had knowledge on the EWS, while only 15.2% claimed otherwise. A cross tabulation as shown in Table 4 recorded the responses between the source of information how respondents knew about EWS with their knowledge on EWS.

Table 3 Respondents' knowledge on EWS

Respond	Frequency (F)	Percentage (%)
No	122	15.2
Yes	678	84.8
Total	800	100

In Table 4 below, 22.6% of respondents who they knew about EWS claimed they got the information from 'information signage', 4.3% from television and 66.9% from other types of information sources. However, there were also respondents who claimed they did not know about the EWS but answered they heard it from the internet (99.4%), radio (98.4%) and newspaper (98.3%).

Table 4 Respondents' source of EWS information

Source of information	No		Yes		Total	
	F	%	F	%	F	%
Short Message System (SMS)	783	97.9	17	2.1	800	100
Television	766	95.8	34	4.3	800	100
Radio	787	98.4	13	1.6	800	100
Newspaper	786	98.3	14	1.8	800	100

Internet	795	99.4	5	0.6	800	100
Information signage	619	77.4	181	22.6	800	100
Others	265	33.1	535	66.9	800	100

As shown in Table 5, since the critical value of respondents' education level with television as source of information was less than 0.05, thus H_0 that stated no relationship between the variables can be rejected. In addition, information signage against education level (0.000), ethnicity (0.000) and village where respondents lived (0.016) as well as other sources of information with education level (0.001), ethnicity (0.000) and village where respondents lived (0.000) were less than 0.05, therefore the H_0 can be rejected. In other words, education level, ethnicity and village did have an influence on the sources from where respondents received information related to EWS.

Table 5 Chi-square Test between source of information on EWS with educational level, ethnicity and village

Source of information	Education level			Ethnicity			Village		
	%	CV	Value	%	CV	Value	%	CV	Value
Short Message System (SMS)	30	.680	2.305	41.7	.747	2.696	45.5	.443	9.972
Television	**20**	**.001**	**19.936**	33	.195	7.365	45.5	.000	63.958
Radio	40	.085	8.197	41.7	.594	3.697	**50**	**.007**	**16.928**
Newspaper	40	.428	3.843	**41.7**	**.045**	**11.320**	50	.367	10.876
Internet	**50**	**.002**	**17.188**	**50**	**.000**	**34.006**	**50**	**.000**	**71.031**
Information signage	**20**	**.000**	**21.865**	**8.3**	**.000**	**48.604**	**9.1**	**.016**	**21.909**
Others	**10**	**.001**	**17.751**	**0.0**	**.000**	**49.645**	**9.1**	**.000**	**52.402**

Note: % = % cell with count less than 5, CV = Critical value

Another test using the Spearman rho test (Table 6) was also conducted to test the sources of information on EWS with respondents' age, duration of stay and households monthly income. The results show that the significant values of respondents' age against information signage (0.005) and other sources (0.010), respondents' monthly income against information signage (0.000) and other sources (0.000) were less than 0.05, hence, the null hypothesis can be rejected. In addition, the results also show that there was a positive and low relationship between respondents' age (0.100**) and respondents' monthly income (0.124**) against their answer on information signage. The positive relationship shows that respondents who claimed they knew about the EWS from information signage were those in older age category and earning higher monthly income. Meanwhile, the negative relationship between respondents' age (-0.091**) and respondents' monthly income (-0.179**) against other sources indicates that respondents who claimed they knew about the EWS from other sources were those in younger age category and have low monthly income.

Table 6 Spearman Rho test between source of information on EWS with age, duration of stay and household income

Source of information	Age		Duration of stay		Households month income (RM)	
	CC	Sig. Value	CC	Sig. Value	CC	Sig. Value
Short Message System (SMS)	.021	.550	-.041	.246	.025	.481
Television	.053	.133	-.013	.713	.031	.383
Radio	.008	.829	-.056	.114	.062	.080
Newspaper	-.008	.826	.001	.986	.038	.281
Internet	-.012	.740	-.028	.427	.052	.140
Information signage	**.100****	**.005**	.025	.479	**.124****	**.000**
Others	**-.091****	**.010**	.064	.070	**-.179****	**.000**

CC= Coefficient correlation, Sig.value= Significant Value
* & ** Correlation is significant at the 0.05 level (2-tailed)

FINDINGS AND CONCLUSION

Data collection was conducted to gauge respondents' awareness and knowledge on the EWS. The target population was focused on Sultan Abu Bakar Dam and Susu Dam areas. The survey results indicated that only 15.2% claimed they did not know about the EWS. Meanwhile, respondents who knew about the EWS claimed they received the information mainly from 'information signage' (22.6%). In addition, Chi-square test result showed that respondents' education level, ethnicity and village did influence on sources from where respondents received the information related to EWS. On the other hand, Spearman rho test indicated there was a positive and low relationship between respondents' age and their monthly income against their answer on information signage. The positive relationship shows that respondents who claimed they knew about the EWS from information signage were those in older age category and earning higher monthly income. In contrast, the negative relationship between respondents' age and monthly income against other sources indicate that respondents who claimed they knew about the EWS from other sources were those in younger age category and have low monthly income. This shows that respective agencies and local authority should use various medium of information to disseminate awareness and knowledge on EWS to the community that able to cater all categories of community's age, education level and level of income.

Hence, variation in methods used by local agencies and authorities in ensuring the information on EWS and disaster awareness are important in catering the differences in demography and socio-economic background of the respondents. Among all methods, one to one or direct engagement of local authority and agencies with the community is significant to increase their understanding and awareness. In addition, the engagement also should be frequent to ensure the community are well prepared in facing the disaster.

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