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Building Human Resilience: The Role of Community Based Training and Awareness Programme (CBTAP) for Dam Related Flood Risk Management

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The structural elements of dams are prone to defects and potential failures despite continuous upgrade on design, variety of construction materials used, daily operation and maintenance efforts of dams to improve the safety of the dams, the possibility of unforeseen events of dam failures is still possible. Dams in Malaysia are observed to integrate community in which socio-economical activities are carried out within its vicinity. Hence, severe loss of properties and most critically, human lives might bring about should dam failures occur. It is apparent that an emergency response system should be built to reduce any loss of properties or lives as well as utilising the resources within the community. A community engagement programme is designed to guide the people about the possible threat and emergency response action aligning with the protocol or guidelines set by the dam management teams and its stakeholders. The preparedness of the community and their familiarity with the dam disaster evacuation response system could ensure higher possibilities of effective evacuation, hence minimising further losses. This paper presents such community engagement programme conducted for residents in Cameron Highlands, Kuala Berang, Kampong Gajah and Kuala Kangsar. Programme activities organised since 2015 include briefings on disaster awareness, workshops with key community leaders, and evacuation drills. Through these activities, we aimed to educate the residents in these towns, who are vulnerable to flood resulting from dam failure, to be more prepared and resilient to disasters.

Keywords: dam, disaster, flood, awareness, preparedness, human resilience

I. INTRODUCTION

The contribution of dams to the society and its stakeholders is undeniably essential in various respect including economic, environmental and societal benefits. Despite that, the structural elements of dams are prone to defects and potential failures despite continuous upgrade on design, variety of construction materials used, daily operation and maintenance efforts of dams to improve the safety of the dams, the possibility of unforeseen events of dam failures is still possible. Dams in Malaysia are observed to integrate community in which socio-economical activities

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are carried out within its vicinity. Dam failures can be regarded as one of the major "small probability, large consequence" events that affect lives in a large scale in which it can come abruptly without sufficient preparedness to its consequences. One of the major consequences of dam failure is devastating floods which would result in severe loss in lives and property damages in which every major decision made by the authority and its stakeholders is critically assessed (McClelland and Bowles, 2002). Othman (2006) reported that 60% of the dams are of earth-fill types (up to 51 recorded dams) are operated under different ownerships or protocols. The occurrence of a fatal tragedy at Bertam Valley, Cameron Highlands on the 23^{rd} October 2013 has been regarded as an 'infamous' event for the community to question their preparedness to face such disaster relating to dam failure (Kaur *et al.*, 2013). Figure 1 and 2 demonstrated the highlights of the events and this should serve as the forewarning event of other possible scenarios like normal riverine flooding. The aging dams would prove to be hazardous and where public safety is concerned, it is apparent that an emergency response system should be built to reduce any loss of properties or lives as well as utilising the resources within the community.

Dams have been regarded as one of the 15 national strategic targets ("Sasaran Penting Negara") by the Chief Government Security Office (CGSO) Malaysia (CGSO, 2013). It is essential to strengthen national preparedness, timely response, and rapid recovery of this critical infrastructure should the dams give way to major calamities which include significant destruction to infrastructure, loss of lives, massive property damage and permanent effect which might be caused by it. In particular, the loss of lives is not tolerable at all costs from all parties. For instance, "the 1963 failure of Vajont Dam in Italy caused 2600 deaths, the 1976 failure of Teton dam in America caused hundred deaths and economic loss about USD1 billion, and the 1993 failure of Gouhou Dam in China caused 300 deaths" (Luo *et al.*, 2012). Othman (2006) also reiterated that regular yet stringent maintenance of dams should be carried out starting from the oldest dams. According to Graham (1999), the loss of life due to dam break failure is determined by the main three factors:

1. Population occupying the flood plain downstream the dam
2. The amount of warning time given to the people
3. The severity and magnitude of the flooding

"Evacuation is the process between the start of leaving the risky area and the arrival at a safe place. Evacuation is not solely about ordering people to move from one place to another. It is imperative to persuade people to move, which relates to warning processes, actual movement process and its management. A vital element in-lieu to this effort would be effective utilization of time. Careful consideration of the time variable is necessary to ensure that the evacuation of all those at risk can actually be affected" (Norshamirra Hijazzi *et al.*, 2016). Keys and Opper (2002) asserted that the ability to carry out any evacuation procedures is highly dependent on four key factors: (1) emergency response planning; (2) training of personnel; (3) commu-

nications systems and methods; and (4) exercising activation and the delivery of specific response procedures.

The current Emergency Response Plan (ERP) only resolves some of the key factors mentioned above. Presently, only station personnel are involved in following procedures should an adverse event occur due to heavy rainfall, act of sabotage, or even earthquake. Although proper notification mechanism to the authorities (relevant district, state and federal agencies) has been clearly outlined in the ERP, members of the community are not included in this notification. This was one of the issues raised after the Sultan Abu Bakar Dam's incident on 23^{rd} October 2013, where the residents claimed that either sirens were not heard or they did not understand what it meant (The Star Online). To save lives and minimise damages to properties, immediate response from the community members are vital. Sirens installed are only tools but what is more important is the knowledge on how to quickly react from the impending disaster. The proposed Integrated Community Based Disaster Management (ICBDM) is aimed to create the synergy between the three major stakeholders: the community, relevant authorities, and TNB, minimising loss of life and property damages in the event of a dam-related disaster. A comprehensive study on evacuation modelling and developing a decision making framework revolving emergency planning specifically for the three TNB dam schemes were undertaken in the project. The proposed research framework, as shown in Figure 3, stands upon five main pillars which highlight the overarching meaningful scopes of this study.

In addition, if the people living near the dam are not aware of any relevant response plan, the consequences they might suffer can be overwhelming. Besides saving their lives, their livestock, crops, properties and even the infrastructure built around the vicinity of the dam could be destroyed and affect their livelihood for a long period of time. Since some of the places are touristic spots, if this matter is not handled well, the number of tourists visiting Cameron Highlands and Kuala Berang could be affected. The cost of all these losses could be minimised with an integrated plan for better evacuation and preventive measures target at flood prone areas as well as around the dam site.

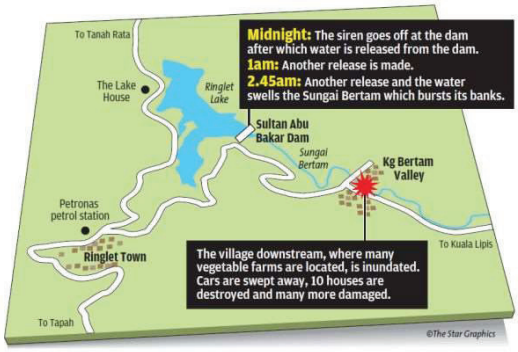

Figure 1. Bertam Valley incident on 23^{rd} October 2013 (Source: The Star)

Figure 2. Aftermath of Bertam Valley incident

This research only focuses on the effort reported in the scope of Community Based Train-

Figure 3. Proposed Integrated Community Based Disaster Management (ICBDM) Scopes

ing and Awareness Programme (CBTAP). The research effort was carried out in several key areas namely, the dams of Cameron Highlands, Pahang; Sungai Perak, Perak; and Kenyir, Kuala Berang, Terengganu. The effort of the study is still an on-going holistic research which employs frameworks from several key concepts of community engagement. The framework of this study is summarised in Figure 4. Firstly, the concept of Corporate Social Responsibility (CSR) is viewed as a form of treatment to new arising matters (Schrempf-Stirling *et al.*, 2015), relating to environmental and humanitarian associations which requires consideration of social and environmental impacts on business activities (Reinhardt and Stavins, 2010; Carroll, 2015). Azwan Abdullah *et al.* (2017) sums up that "CSR refers to the voluntary integration by the company of social, societal, environmental and governance concerns within its strategy, its management and its relations with its partners". Thus, without this notion in mind, this study will not materialise.

On the other hand, the concept of Social Impact Assessment (SIA) was considered and incorporated into the framework of the study especially on understanding, managing, and controlling change caused by social impact risk of disaster as advocated by Burdge and Vanclay (1996). This notion helps to develop and implement the monitoring programmes to classify unforeseen social impacts as a result of the social unrest due to post-disaster (risk) (see Burdge and Vanclay, 1996). Lastly, the evaluation process should take place to ensure better implementation of various policy changes, proposed development and projects. This study serves as an introductory holistic contribution or effort to the overall disaster risk prone areas especially those residential areas surrounding the dams. Rustam Khairi Zaharia and Raja Noriza Raja Ariffin (2013) suggested that "Community Based Organization has a crucial responsibility in managing disasters affecting their communities especially in ensuring community members are ready for any eventualities and reducing their vulnerabilities".

In order to identify the dam-related disaster preparedness insight and community information through capability formation and capacity building, the Community-based Training and Awareness Programme (CBTAP) was created to conduct awareness activities and training. It aims to collect data on required knowledge, skills and awareness efforts to ratify various contingency planning within a minimum possible response time (before, during, and after dam related disasters). Besides that, it is believed this collective and integrated effort could foster a more effective effort in terms of collaborative exchange and dissemination of data by sharing close to real time (up-to-date) information on prediction, forecasting, assessment, monitoring and early warning purposes and response action between TNB and other governmental agencies

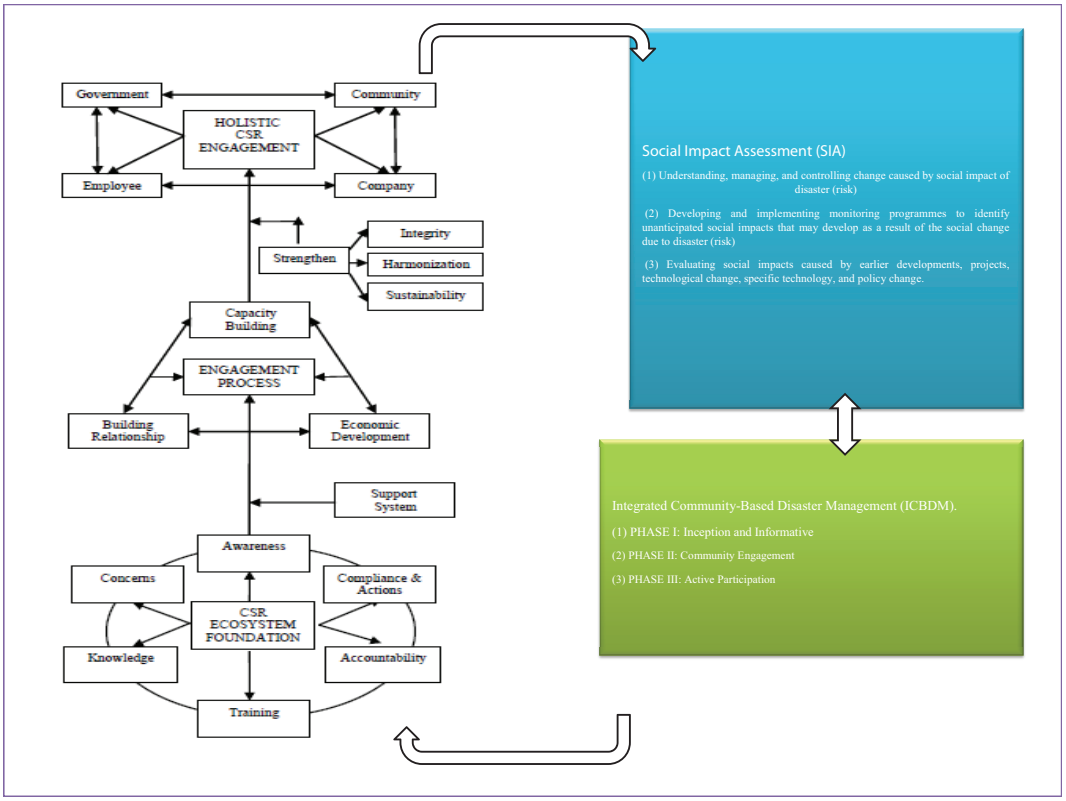

Figure 4. Framework of the research (adapting holistic framework that of Azwan Abdullah *et al.*, 2017; Burdge and Vanclay, 1996)

in order to enhance disaster risk reduction and improve resilience. The objectives of the study include:

a) To disseminate concise and accurate information to the community at large on disaster and emergency management

b) To engage relevant agencies, emergency authorities and the community at large with regards to disaster management

c) To conduct training and awareness programmes customised for the relevant agencies, emergency authorities and the community at large

II. METHODOLOGY

It is good that CSR and SIA are able to get directly involved in an arising matter in a democratic society. Successful community engagement has significant advantages for the administering bodies and organisations as well as other stakeholders. It is a noteworthy effort in having the capacity to provide a platform to associate the governmental bodies, local authorities as well as the community to create a comprehensive, beneficial and savvy engagement within the given for the betterment of the community especially safely and property loss. It is essential that choices about how best to connect with the group be made ahead of schedule in the arranging phase of strategy, pro-

gramme or administration improvement. CB-TAP incorporates three distinct phases for operational planning and implementation of the Integrated Community-Based Disaster Management (ICBDM). The methodology proposed for this study is as follows:

A. Phase I: Inception and Informative

Inception and informative phase covers the dissemination of information by the local authorities to community via various avenues such as the mass media (e.g. radio and television broadcast), telephone, publications and websites. The effective information that is sent out should have the following characteristics:

i. Accurate and easy to understand

ii. Easily accessed

iii. Meaningful to the intended audience

iv. Delivered via suitable channels

v. Directed message to the community for further step-by-step action

B. Phase II: Community Engagement

Community engagement involves a two-way relationship in which the local authorises and agencies, including the stakeholders to provide consultation to the community on programmes that affect and help them directly and they provide their explicit feedback on how they wish to be helped. The process of planning or developing programmes frame an issue where the community can highlight or raise their views on issues which are more concerning to them. The critical feedback from them will shape and frame the backbone of the content of the programme further. Without such engagement, their main concerns or needs are all but not heard and fully comprehended for the next course of action.

C. Phase III: Active Participation

Active participation encourages the community to take part in proposing and determining their desired or ideal programmes. Active participation encourages participants to take full responsibility and accountability for their contribution to shared solutions. Although at times, the core responsibility for the final decision might depend on the final decision of the authority, in some instances, through such programmes of heart-felt sharing from the community to the stakeholders, the final decision could be reached collectively. Deliberative processes utilise resources to build awareness and knowledge needed for the community on the arising matter before they can contribute (back) to their community to deal with such situations more effectively.

III. RESULTS AND DISCUSSION

This paper reports the current effort carried out at several target areas (Cameron Highlands, Sungai Perak and Kenyir, Kuala Berang) with some illustrations of the activities carried out to serve the purpose of the study (on-going process). Once the whole research is completed, collective data will eventually be produced to serve or contribute to the big data of disaster risk management, especially dam related disaster for the benefit of the community and related

parties. The expected outcome once the project is completed which include deliverables such as:

a. Analysis and full report of interviews and questionnaire surveys

b. Educational teaching and learning tools for children, young people and adult relating to dam disasters

c. Concise and precise information packed in the form of fact sheets, newsletter, bulletin, or visual posters

The programme started in Cameron Highlands on 21st September 2015, with "*Program Bersama Orang Asli Cameron Highlands*", held in Kampung Leryar, Kampung Menson and Kampung Sg. Tiang. Typically, community engagement effort involves only for community at Bertam Valley due to the previous incident. This is the first community engagement that involved *Orang Asli* in this programme. From this event, participants are exposed to the impact of dam failure and the appropriate response when early warning systems are activated.

Figure 5. *Program Bersama Orang Asli Cameron Highlands* (21st Sept. 2015)

On 8th March 2016, a workshop of "*Pengenalan Kepada Pengurusan Bencana Berteraskan Komuniti Secara Bersepadu* (ICBDM)" was held at Century Pines Resort, Cameron Highlands. 120 participants were recorded which included community leaders from Lembah Bertam town and Kampung Orang Asli, teachers and parents from *Sekolah Jenis Kebangssaan Cina Lembah Bertam* and *Sekolah Kebangsaan Menson*, and various agencies including representatives from Malaysia Civil Defence Department, Police Department, and Fire Department. The opening ceremony was officiated by Cameron Highland District Officer, Yang Berbahagia (Y.B.). Dato' A. Rahman bin Hamzah.

Figure 6. The workshop of Integrated Community-Based Disaster Management (ICBDM)

The same workshop was also conducted at *Akademi Binaan Malaysia* (ABM), Kuala Berang on 19th May 2016 with 278 participants from various stakeholders. The objective of this workshop was to give an introduction to ICBDM programme as well as sharing information on disaster risk reduction strategies to reduce loss of lives and property damages.

Figure 7. Participants of *Taklimat Inisiatif Pengurusan Bencana berteraskan Komuniti* (ICBDM)

On 4th September 2016, *Stesen Janaelektrik Chenderoh* hosted a safety awareness campaign

with Perak Civil Defence Department, by welcoming communities from Kuala Kangsar and Kampung Gajah to their dam. More than 500 residents from the two large communities attended the event. Various agencies such as Police Department, Fire Department, *Jabatan Kesihatan Negeri Perak* and *Jabatan Kebajikan Masyarakat Negeri Perak* shared their expertise as well. Similarly, the programme was also conducted in *Kuala Berang by Stesen Janelektrik Sultan Mahmud*. The objective of this campaign was to create opportunities for residents to seek information from various agencies on their disaster management and preparation plan, as well as to experience the power of water by touring the dam area.

Figure 8. Participants of *Program Kesedaran Keselamatan Bencana Negeri Perak*

Various activities were conducted during this campaign, which includes exhibitions by state government agencies, medical check-up services and blood donation by *Jabatan Kesihatan Negeri Perak*, as well as safety demonstration by Perak Civil Defence Department, Police Department, and Fire Department. From these activities, residents who previously were not aware of the existence and roles of these disaster management agencies are now more well-informed. On top of that, this event is a platform to promote the importance of dams in controlling floods besides than its main function of generating electricity.

Figure 9. Activities conducted throughout the programme

On 1^{st} and 2^{nd} March 2017, an environmental awareness and dam safety programme was conducted at *Sekolah Jenis Kebangssaan Cina Lembah Bertam* and *Sekolah Kebangsaan Menson*. It was an outreach programme to the students and teachers of both schools. The programme was jointly organised with Department of Environment and Cameron Highland Civil Defence Department. The objective of this programme is to share information on basic dam operations and to instil awareness among students on safety and health in order to reduce the fatalities and injuries in a flood disaster. This programme was greatly welcomed by school authorities so that they can be more prepared in formulating an evacuation plan when facing a disaster. Unlike any previous events, this programme targeted primary school students. Hence, the activities conducted were more children centric such as video shows, quizzes and games to attract their attention.

After the series of workshops and road-

Figure 10. Programs held especially for school on environmental and dam safety awareness

shows, the survey instruments were constructively framed to suit the purpose of the study. Community-based Training and Awareness Program (CBTAP) Survey framework has been identified in Figure 11 which will be the basis of the surveys to be done. The next phase of the research will revolve around survey questionnaires, interviews and more community engagement programmes to increase their awareness on dam related safety and environmental issues as well. By involving more stakeholders and agencies, the community will obtain more information and engage more collaboration and cooperation prior to facing any calamities.

This study is limited solely to create awareness and engage the community on dam related safety and environmental issues. The possibilities of having any outbreak of diseases have not been taken into consideration of the study as that would involve more experts to be brought into the research. In addition, the researches have not been able to assess or estimate the losses (risk management) should the livestock and crops as well as other amenities are affected by the dam break or flood. These steps would require further research and resources and are recommended for future study.

IV. CONCLUSION

The preliminary observation shows that the concerning and target community living around the dam vicinity is truly in need of care and attention from various agencies and stakeholders to ensure their safety and well-being. The study also illustrated that various cooperation from various prominent agencies in Malaysia can be achieved with properly engineered and planned programme targeting to fulfilling the calls of CSR and even supporting the SIA effort. Community-based engagement is the right platform to synergise and empower every individual to contribute to the betterment of integrity, harmony and sustainability in an environment that is more conducive to all parties. Although this study has not been completed, the impact it will have in the society (community) in terms of preparedness will be meaningful. The expected outcome when the project is completed will be able to provide an analysis and full report of interviews and questionnaire surveys from various parties, educational teaching and learning tools for children, young people and adult relating to dam disasters. In addition, the proposed once completed study aims to provide concise and precise information packed in the form of fact sheets, newsletter, bulletin, or visual posters to be shared among the communities facing similar issues and beyond.

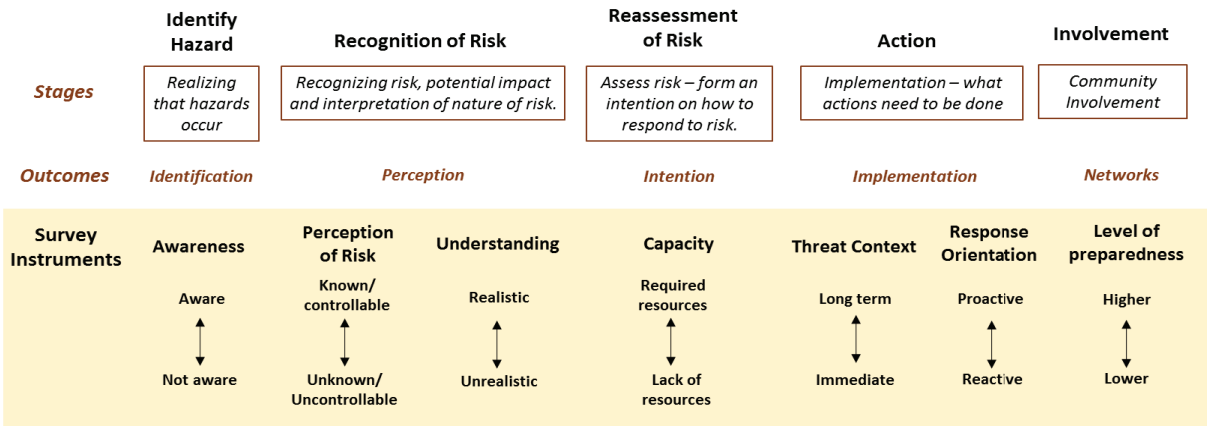

Figure 11. Framework of the Survey Instrumentation

V. ACKNOWLEDGEMENT

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