COMMUNITY PREPAREDNESS FRAMEWORK FOR DISASTER RISK REDUCTION OF HYDROELECTRIC DAMS IN CAMERON HIGHLANDS

BY

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ABSTRACT

Dam Related Disaster (DRD) occurrences are an unexpected event that might occurs suddenly without warning, which seriously impacts people's lives that exceed their ability to survive. It has become very alarming, resulting in a catastrophic break followed by a flood wave at high speed with considerable loss of life, and the eventual catastrophic damages to infrastructure and the environment. The surrounding communities are an integral part of disaster management efforts to increase their knowledge to respond toward the disaster. Given these circumstances, the appropriate community preparedness for Disaster Risk Reduction (DRR) is important to strengthen disaster response strategies. It helps the community to understand the situations to face disaster and interact with present conditions with efficient manners. The research aims to investigate the community awareness and preparedness and the effectiveness of early warning systems toward dam-related disaster. The research is exploratory research that employs qualitative and quantitative methods in eliciting the data. This research engages the case studies method of collecting data, including questionnaire surveys, focus group discussion (FGD) and aerial-mapping analysis of the selected sites. In this research, two dams in Cameron Highland have been selected: Sultan Abu Bakar (SAB) Dam and its vicinity in Lembah Bertam; and Susu Dam and its vicinity in Pos Telanok. The Statistical Package for Social Science Software (SPSS) (Version 25) was used to analyse data from survey questionnaires. The content analysis was used to analyse data from the FGD. The mapping analysis was used to analyse and quantify the disaster impact in the study areas. The findings indicate that the community's awareness is affected by seven factors: disaster experience; causes and indicators of disaster; recognition of hazardous disaster; response towards DRD; disaster knowledge; information on safe location; and signage and mode of transportation. There is a strong contribution of the relationships between community characteristics with their awareness and preparedness towards dam-related disaster. Community participation and involvement in the DRR program, such as awareness program and evacuation drill exercises are very important in developing better community resilience to face disaster. Subsequently, it was discovered that education, experience, and training significantly influenced people's preparedness. These factors need to be nurtured based on local knowledge, experience on the disaster, emergency warning and simulation exercises, and emergency action plan. The mapping analysis proved that the assessment of the potential hazard at both dams becomes another indicator particularly for the dam's owner to alert the communities in advance when there is a potential of flood risks and other emergency calls. This proved that not only for the dam's owner, but the information will be shared directly to the community involved and also the local agencies and authority of Cameron Highlands. These factors have been put forward as the requirement for developing an emergency preparedness framework for dam-related disasters. The framework developed helps the dam owners and local agencies in enhancing community preparedness and building a resilient community to withstand the DRD. The frameworks displayed community-based programs' continuations to ensure community preparedness's sustainability. The framework can assist local agencies and dam owners in formulating strategic DRR programs. These can be done by establishing effective early warning and planning appropriate evacuation strategies to increase people's preparedness toward DRD. The identification of these pertinent factors and framework enables a greater understanding of the community's preparedness for DRR in both dams of Cameron Highlands.

ملخص البحث

الكوارث المتعلقة بالسدود هي من الأحداث المفاجئة التي قد تقع بدون أي إنذار مسبق تؤثر سلبيا على حياة الناس وتقضي على مقدرتهم على البقاء. وقد أسفرت هذه الحوادث عن انهيار السد يليه موجات فيضان شديدة السرعة تقضي على الحياة إضافة إلى الأضرار في البيئة والمرافق. تعد المجتمعات جزءا من جهود إدراة الكوارث لتحسين معرفتهم لمواجهة الكوارث. وتحت هذا الضوء، يعد مدى الاستعداد المجتمعي للتخفيف من حدة الكوارث أمرا بالغ الأهمية في تعزيز استراتيجيات لمواجهة الكوارث لأنها من شأنها أن تساعد المجتمع في إدراك الأحوال لمواجهة الكوارث والتعامل تعاملا فعالا معها. تهدف الدراسة إلى التحقيق من وعي أفراد المجتمع ومدى استعدادهم وفعالية أنظمة تحذير مبكر في حالة حدوث كوارث السدود. الدراسة دراسة استكشافية تستفيد من الأساليب الكمية والنوعية في جمع بياناتها وتعتمد كذلك على أسلوب دراسات الحالة والاستبانات ومناقشات جماعية مركزة واستخدام رسوم الخرائط الجوية لتلك المواقع المختارة. وقد تم اختيار سدين في مرتفعات كاميرون: أولهما سد السلطان أبو بكر في وادي "برتام" وسد "سوسو" في "قوس تلاندوك". وتستخدم الدراسة برنامج حاسوبية إحصائية للعلوم الاجتماعية (النسخة ٢٥) لتحليل الأجوبة في الاستبانات. كما تستخدم الدراسة طريقة تحليل المحتويات لتحليل البيانات من المناقشات الجماعية المركزة. ويستخدم نتائج الخرائط الجوية لتحليل آثار الكوارث وقياسها في تلك المواقع. تستخلص الدراسة بأن وعي المجتمع متأثر بسبعة عوامل: خبرة التعامل مع الكوارث، أسباب الكوارث ومؤشراتها، التعرف على الكوارث المفجعة، الاستجابة لجهود التخفيف من حدة الكوارث، المعرفة عن الكوارث، توفر المعلومات عن المواقع الآمنة، اللافتات وطريقة النقل. هنالك أثر ملحوظ من العلاقات بين الخصائص الاجتماعية ووعيهم ومدى استعدادهم في مواجهة كوارث السدود. وتعد مشاركة المجتمع في برنامج التخفيف عن حدة الكوارث وعقد برامج التوعية وتدريبات عمليات الإخلاء مهمة للغاية في تطوير قدرتهم لمواجهة الكوارث. كما تفيدنا الدراسة أيضا أن مدى الاستعداد متأثر أيضا بالتعليم والخبرة والتدريبات. وينبغي الحرص على هذه العوامل بناء على المعارف المحلية، خبرة مواجهة الكوارث والإنذار المبكر وتمارين المحاكاة وخطة مواجهة الطوارئ. وأثبت تحليل الخرائط الجوية أن تقويم المخاطر المحتملة في كلا السدين يمكن أن يكون مؤشرة أخرى يستفيد منها صاحب السد ليقوم بتحذير المجتمعات المحيطة مسبقا في احتمال حدوث فيضان وغيرها من الطوارئ. ولقد تمت الاستفادة من هذه العوامل كمطلب في تطوير إطار مدى الاستعداد لمواجهة للكوارث المرتبطة بالسدود. وسيساعد الإطار أصحاب السدود والسالطات المحلية في تطوير مدى استعداد المجتمع لمواجهة الكوارث وتحسين قدرته على التعامل معها. هذه الأطر تعرض استمرارية البرامج الاجتماعية لضمان استدامة إمكانية المجتمع في مواجهة الكوارث. كما تساعد هذه الأطر أيضا الهيئات المحلية وأصحاب السدود في تنظيم برامج التخفيف من حدة الكوارث بوضع نظام إنذار مبكر تبني خطط الإخلاء الملائمة لزيادة إمكانية استعداد المجتمع. وأخيرا، التعرف على هذه العوامل الخاصة والأطر تُمكّن من فهم إمكانية استعداد المجتمع لجهود التخفيف من حدة الكوراث في كلا السدين في مرتفعات كاميرون.

APPROVAL PAGE

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DECLARATION

I hereby declare that this thesis is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

Rahsidi Sabri Muda

Signature ..... Date ....15.7.2021.....

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ABBREVIATIONS

ADPC	Asian Disaster Preparedness Center
APM	Angkatan Pertahanan Awam Malaysia (Malaysia Civil Defense Department)
BOMBA	Jabatan Bomba dan Penyelamat (The Fire and Rescue Department)
CB	Community Based
CBDRM	Community-Based Disaster Risk Management
CBDRR	Community-Based Disaster Risk Reduction
CBMRC	Central disaster management relief committee
CBTAP	Community Based Training and Awareness Program
CDERT	Civil Defence Emergency Response Team Community
CDF	Clear Day Failure
CEMAS	Community Disaster Management and Awareness
CFEDM	Center For Excellence In Disaster Management And Humanitarian Assistance
CFRD	Concrete Face Rockfill Dams
CHBPS	Cameron Highland Batang Padang Hydroelectric Scheme
CIC	Community Information Center
COC	Community Operation Center
DDMRC	District Disaster Management and Relief Committee
df	degrees of freedom
DID	Department of Irrigation and Drainage
DMRC	Disaster Management and Relief Committee
DOE	Department of Environment
DPA	Damage To Physical Asset
DRD	Dam Related Disaster
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DRRE	Disaster risk reduction education
DSERP	Dam Safety Emergency Response Plan
EAP	Emergency Action Plan
EL	Elevation Level
ERP	Emergency Response Plan
ETP	Economic Transformation Program
EW	Early Warning
EWS	Early Warning System

FAT	Flood Arrival Time
FEMA	Federal Emergency Management Agency
FGD	Focus Group Discussion
FSL	Full Supply Level
GCB	Generation Control Building
GIS	Geographical Information system
GSM	Global System For Mobile Communication
HADR	Humanitarian Assistance and Disaster Relief
ICBDM	Integrated Community-Based Disaster Management
ICOLD	International Commission on Large Dams
ICT	Information and communications technology
IPK	Ibu Pejabat Polis Kontinjen
JAKOA	Jabatan Kemajuan Orang Asli
JAS	Jabatan Alam Sekitar
JKM	Jabatan Kemajuan Masyarakat
KeTTHA	Kementerian Tenaga Teknologi Hijau Dan Air
KKM	Kementerian Kesihatan Malaysia
LA	Local Authority
LED	Light Emitting Diodes
LHZ	Landslide Hazard Zonation
LSM	Life Safety Model
MADA	Muda Agriculture Development Authority
MDCH	Majlis Daerah Cameron Highlands
MKN	Majlis Keselamatan Negara
MNSC	Malaysian National Security Council
MOE	Ministry of Education
MPKK	Majlis Pengurusan Komuniti Kampung
MSEP	Multi stakeholder Engagement Program
MSL	Minimum Supply Level
MyCOLD	Malaysian National Committee on Large Dams
MyDams	Malaysia Dam Safety Management Guidelines
MyDAMS	Malaysia Dam Safety Management Guidelines
NADMA	National Disaster Management Agencies
NDMRC	National Disaster Management and Relief Committee
NGO	Non-Government Organization
NSC	National Security Council
PAR	Population at Risk
PDRM	Polis Diraja Malaysia
PDTCH	Pejabat Daerah dan Tanah Cameron Highlands
PEWS	Public Early Warning System

PKTK	Pusat Kawalan Tempat Kejadian
PMF	Probable Maximum Failure
PPE	Personnel Protective equipment
PWDs	People with Disabilities
RCC	Roller Compacted Concrete
RII	Relative Importance Index
RTD	Rancangan Tempatan Daerah
RTU	Remote Thermal Unit
SAB	Sultan Abu Bakar
SDG	Sustainable Development Goals
SDMRC	State National Disaster Management and Recovery Committee
SFDRR	Sendai Framework for Disaster Risk Reduction
SJKC	Sekolah Jenis Kebangsaan China
SK	Sekolah Kebangsaan
SMS	Short Message Service
SOP	Standard Operating Procedure
SPSS	Statistical Package For Social Sciences
SSJ	Stesen-Stesen Janaelektrik
SSJCH	Stesen-Stesen Janaeletrik Cameron Highlands
TNB	Tenaga Nasional Berhad
TNBR	TNB Research
TOT	Training of Trainers
TTP	Time to Peak
UN	United Nations
UNDRR	United Nations Office for Disaster Risk Reduction
UNICEF	United Nations International Children's Emergency Fund
UNISDR	United Nations International Strategy for Disaster Risk Reduction
UNITEN	Universiti Tenaga Nasional
USACE	US Army Corps Of Engineers
USBR	United State Bureau Of Reclamation