

# Multi-Agency Collaboration in Flood Disaster Management in Sarawak, Malaysia

Noralfishah Sulaiman, Teo Wei She, Terrence Fernando, Shiau WeiChan,  
Ahmad Farhan Roslan, Siti Kursiah Kamalia Abdul Latib

## I. INTRODUCTION

**Abstract:** *In reducing the impact of current and future disasters so as to form a resilient future, disaster management deserves highest priority and plays a vital role in managing the risk of disaster. However, it cannot be addressed or undertaken by the government alone. It requires a strong supporting multi-agency collaboration to undertake various types of tasks at various stages of the disaster management cycle which has been mentioned as a key point of professionalism in disaster management activities. To accomplish a successful multi-agency coordination in Sarawak flood disaster management, collaboration among the relevant agencies plays a vital role for aim to reduce or avoid the potential losses from hazards, assure speedy and appropriate assistance to the victims of disaster as well as achieve rapid and effective recovery. Therefore, this paper reviews the concept of collaboration and collaboration of relevant agencies in disaster management through a case study in Sarawak, Malaysia. This paper is prepared by conducting a series of literature review in order to establish a foundation for a new insight of contribution to knowledge. Content analysis, a pure qualitative method is used to identify related agencies with disaster management in the state of Sarawak, Malaysia. The content analysis was conducted by reviewing content of 39 related agencies from Sarawak. It is envisaged that the findings of this study could be clinically useful for building a successful multi-agency coordination in Sarawak, Malaysia disaster management.*

Disasters were known as “Acts of God” or events beyond human control which are not seen to be alterable by human actions and brought massive disruption to community. In order to reduce the impacts caused by disasters, there is a need to move from traditional response efforts towards disaster management processes, especially from single agency to partnership or multi-agency (Samsudin & Hussain, 2016). Currently, floods are among Earth's most destructive and most common occurrence natural disasters. The higher the risk of flood occurrences, the more we need to develop interactions between agencies in managing it.

In Sarawak, flooding commonly happens almost every year due to the extremely high rainfall and the imbalance of their distribution (Sa'adi et. al., 2016). As indicated by Hamdan et. al. (2010), previously in the year of 2009 was known as the extreme year for Sarawak when two heavy rainfall episodes caused severe floods that almost covered whole Sarawak. Therefore, these events mandatory need the coordination of efforts and collaboration between the government, non-governmental Organizations (NGOs) and private sectors during response and recovery efforts.

Collaboration among multi-agencies has always been a strong foundation for disaster management. A strong supporting multiple Disaster Management Organizations (DMOs) collaboration including various government agencies (e.g. Police, Fire, Medical Services), non-government organizations (e.g. UN, Red Cross Crescent Society), and some private sector first responder organizations (e.g. utility, transportation, healthcare, construction firms). However, a strong collaboration between agencies requires a clear understanding of their roles and organizational structures in disaster management. Thus, this paper reviews the concept of collaboration and its application in disaster management through a case study in Sarawak, Malaysia. It gives an overview of the current situation of multi-agency disaster management in Sarawak with a view of suggests possible solutions to implement multi-agency collaboration for disaster management in Sarawak.

### Revised Manuscript Received on May 22, 2019.

**Noralfishah Sulaiman**, KANZU Research: Resilient Built Environment (RBE), Department of Real Estate, Faculty of Technology Management & Business, University Tun Hussein Onn Malaysia (UTHM), 86400, Johor, Malaysia.

**Teo Wei She**, KANZU Research: Resilient Built Environment (RBE), Department of Real Estate, Faculty of Technology Management & Business, University Tun Hussein Onn Malaysia (UTHM), 86400, Johor, Malaysia.

**Terrence Fernando**, THINKlab, University of Salford, United Kingdom.

**Shiau WeiChan**, KANZU Research: Resilient Built Environment (RBE), Department of Real Estate, Faculty of Technology Management & Business, University Tun Hussein Onn Malaysia (UTHM), 86400, Johor, Malaysia.

**Ahmad Farhan Roslan**, Construction Research Institute of Malaysia (CREAM).

**Siti Kursiah Kamalia Abdul Latib**, KANZU Research: Resilient Built Environment (RBE), Department of Real Estate, Faculty of Technology Management & Business, University Tun Hussein Onn Malaysia (UTHM), 86400, Johor, Malaysia.

## II. CONCEPT OF MULTI-AGENCY COLLABORATION

Collaborative is important for partner agencies for many reasons. However, it is a hard term to understand as stated by Gadja (2004). According to the study done by Chang (2012), there is still no agreement on how to define collaboration. Scholars applied a variety of perspectives, including those from inter-organizational relations, networks, and the logic of collective action (Thomson & Perry 2006).

For this study, collaboration can be well-defined as a situation where multiple agencies work together to solve the disaster problems and accomplish a shared outcome which single agency cannot solve or find hard to solve easily. In other words, an effective collaboration promotes team building, provides outcomes for partner agencies that may not have been accomplishable individually, provides the maximum resources for success and prevent duplication of effort by various agencies (Shoef et. al., 2014).

World Wildlife Fund (WWF) (2000) agreed that collaboration is a mutually beneficial relationship between two or more parties who work toward common goals by sharing responsibility, authority, and accountability for achieving results. Besides, it goes beyond people participating (passively or actively) in a process and also extends beyond communication, cooperation, and coordination, even though these are key elements in the process. WWF (2000) also revealed that collaboration may not work when there are fundamental ideological differences in negotiation, power is not evenly spread, key parties are not willing to participate, there is a stark difference in the vision and goals of different parties, there is not enough time to work through problems, there is “burn out” over previous attempts to collaborate, the price of collaboration will exceed the benefits gained and the institutional culture of a stakeholder organization is unresponsive taken whenever appropriate.

Besides, Chang (2012) revealed that collaboration stands at a higher level of sharing than cooperation and coordination. As he mentioned, only information, good will and good intentions are shared in the cooperation level.

## III. CASE STUDY AREA: SARAWAK, MALAYSIA

This study was conducted in the state, Sarawak, north-west on Borneo. Sarawak as one of two Malaysian states on the island of Borneo has known as Bumi Kenyalang (Land of the Hornbills, which is the national bird of the State). This historic region is the largest of 13 states in Malaysia, making up some 37.5% of the country's total area of 329,750 square kilometers (Sarawak Government Official Portal, 2010). Besides, the State is separated from Peninsular Malaysia to the west by the South China Sea with a distance of 600 kilometers. It comprises the northwestern part of the island of Borneo and is bounded by the sultanate of Brunei and Sabah (Malaysia) on the north as well as the South China Sea on the west.

According to the Sarawak Government (2018), Sarawak is a tropical state with an equatorial climate which means

temperatures are relatively uniform throughout the year, with an average of five hours' sunshine a day (Regional Corridor Development Authority (RECODA), 2018). Sarawak is also characterized by high humidity and copious rainfall (Sa'adi et. al., 2016). Due to the geographic location, it experiences two monsoonal changes (Northeast Monsoon and Southwest Monsoon) as well as two shorter periods of inter-monsoon seasons. Diong et. al. revealed that the rainfall over Sarawak follows a different regime from that found in the Peninsular Malaysia where there is only one peak in the rainfall distribution. The most prominent and maximum rainfall in Sarawak occurs during the Northeast Monsoon which usually occurs from November to January (Climate to Travel, n.d.). For the Southwest Monsoon, it occurs from May to September is usually milder and associated with relatively dry period during the active monsoon months. As reported by Sang et. al. (2015), Sarawak received below normal rainfall compared to Peninsular Malaysia usually received average rainfall throughout the Southwest Monsoon. For the inter-monsoon, it is on April and October respectively. Therefore, flooding commonly happens in Sarawak almost every year due to the extremely high rainfall and the imbalance of their distribution (Sa'adi et. al., 2016).

In order to solve the flood problems in Sarawak, management is needed at all stages of a disaster namely the disaster preparedness phase, mitigation phase, response phase, and recovery phase. This is achieved through various agencies including the government, NGOs, and other related agencies, engaged in the area of disaster management. Hence, disaster management agencies play a vital role when disasters occur. In the next section, agencies involved in Sarawak disaster management will be discussed.

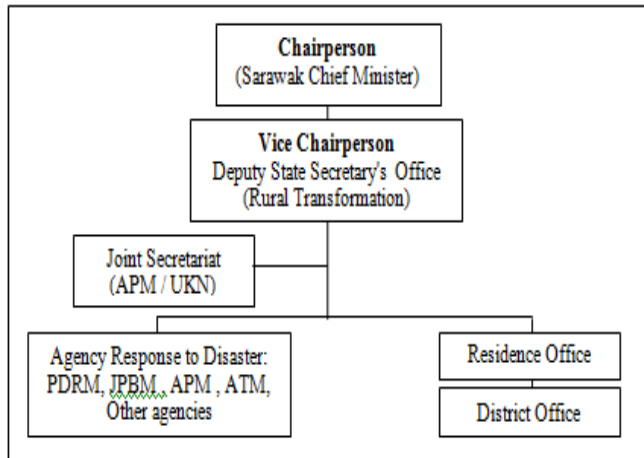
### The Agencies Involved in Managing Disaster in Sarawak

Disaster management in Malaysia has been placed under the Disaster Management and Relief Committee. This committee established as the decision-making bodies and formed consisting of three levels, namely, the central committee, state committee and district level committees in order to manage disasters more effective. Sarawak as one of the state in Malaysia, the whole disaster management and control has been taken by the Sarawak State Disaster Management Committee (JPBNS). The Sarawak State Disaster Management Committee (JPBNS) was established to ensure that Sarawak has a system which is robust, effective and flexible enough to cope with range of disasters experienced. Moreover, any press statement on the flood situation in Sarawak can only be issued by the Sarawak State Disaster Management Committee (JPBNS).

The Sarawak State Disaster Management Committee (JPBNS) comprises the chairperson, deputy chairperson, joint secretariat, representatives of relevant government and non-government agencies, resident officer for each division of



Sarawak and Community Emergency Response Team (CERT). The organization chart of JPBNS has illustrated in Figure 3.6. For the joint secretariat, it is supervised by the Sarawak Civil Defense Department (APM) together in collaboration with the State Security and Enforcement Unit. Besides that, there are various agencies involved in Sarawak State Disaster Management Committee (JPBNS) and their roles and responsibilities will be further discuss in the next session.



**Fig. 1 Organization Chart of JPBNS (JPBNS, 2018)**

There are various agencies involved in Sarawak State Disaster Management Committee (JPBNS). Each agency plays important roles in managing disasters in Sarawak and this will be further discuss in SECTION 5.0.

**Key Challenges in Strengthening Multi-Agency Collaboration to Manage Disaster in Sarawak, Malaysia**

According to the proposed National Disaster Risk Management Plan (NDMRP) (2018 – 2030) report, the most commonly found gap between planning and implementation exist mainly due to lack of institutional coordination among agencies involved in disaster management (Sri Lanka Disaster Management Centre, 2018). Priority 2 (Strengthening disaster risk governance to manage disaster risk) of Sendai Framework also specified that coordination within and across sectors, as well as participation of relevant stakeholders, are needed as it is great importance for an effective and efficient management of disaster risk (UNISDR, 2015). However, there are some challenges in strengthening agencies in Sarawak disaster management. Three main challenges are unwilling to share information during multi-agency disaster response, lack of a common platform for sharing information and lack of trust among the stakeholders.

There are a number of studies identified that poor information sharing and coordination among agencies in disaster response has a negative influence on collective decision-making and actions (e.g., Dawes et al. 2004; Helsloot 2005; Junglas and Ives 2007; Pan et al. 2005). In contrast, lack of coordination leading to a number of possible failures,

inappropriate allocations of first responder resources, and delayed evacuations, which often result in crisis escalation and even higher numbers of casualties. Therefore, ensuring clear routes for two-way communication between the agencies in order to exchange information and improve joined-up coordinated working. In addition, lack of a common platform for sharing information across agencies is also another challenge in strengthening multi-agency collaboration. With a common platform, all the information can be shared among the agencies as it is a medium for multi-agency to discuss and debates to prevent the creation of local disaster risks, periodic assessment of risks, reduction of existing risk and the strengthening of economic, social, health and environmental resilience. Moreover, lack of trust among the stakeholders also considered as a primary barrier to effective network-building efforts in disaster management. Much of the information that each agency carries is highly sensitive, so agencies find it difficult to simply let another agency to gain access or observe its sensitive information without first developing enough trust with the other agency. Hence, lack of trust could minimize the effectiveness of disaster management.

**IV. METHODOLOGY**

Understanding the concept of multi-agency collaboration and its application in disaster management through a case study in Sarawak, Malaysia requires a systematic case study protocol for reviewing or deriving useful disaster related agencies in Sarawak through the websites and electronic materials. For the purpose of this paper, a web-based content analysis method was used to kindle the roles, interests and functions of related agencies for tackling the flood disasters that happening in Sarawak. Therefore, 39 websites have been selected for data gathering. The research methodology framework comprise of five phases which has been categorized based on steps in TABLE 1below.

**Table. 1 Phases in Research Methodology Framework (The Researcher, 2019)**

Phases	Contents
Phase 1	Identification of Research Title and Research Problems
Phase 2	Literature Review
Phase 3	Implementation and Analyzing of Data
Phase 4	Finalizing the Relevant Agencies in Sarawak Disaster Management
Phase 5	Conclusion

**V. DISCUSSIONS**

From the web-based content analysis, 39 agencies have selected and worked together in Sarawak disaster management. Some of their roles have been identified and well-tabulated in TABLE 2.



Table. 2 Roles of Agencies Involved in JPBNS (Researcher, 2019)

No.	Agency	Roles / Objectives
1.	Sarawak Federal Secretary Office (SUPS)	Strengthening of Federal Government relations with Sarawak State Government. Managing the Federal building and quarters Sarawak Federal.
2.	Malaysian Armed Forces (ATM)	Offer emergency relief services when ATM is the first agency to reach the place of incident and will only hand over the responsibility when official authority on disaster arrived to continue works according to the issued directive.
3.	Royal Malaysia Police (PDRM)	Inform the relevant agencies of the occurrence of the disaster. Establish Control Post On Scene. Control movement at the scene of disaster. Search and rescue lives and properties. Carry out investigation on the disaster.
4.	Fire and Rescue Department Malaysia (JPBM)	Collect information and study the risk in order to advice the police on evacuation step. Cooperate with the police in establishing operation border/zone around the proper place of incident to enable JBPM carry out surveillance and control operation. Ensure the safety and security of victims and rescues involved in rescue operation. Cooperate with incident medical officer and ambulance in helping the victims who need helps and removing patients from the place of incident.
5.	Department of Social Welfare (JKM)	Make an arrangement and distributing food, clothing, disaster kit and other necessities at accessible area. Carry out registration on the victim for rehabilitation.





6.	Malaysian Meteorological Department (METMalaysia)	Identify and select flood-free locations. Establish automated weather stations at the watershed, and real-time river water monitors. Create integrated computer models for flood scenario generation.	Establish an Assessment and zoning (flood maps) of vulnerable areas. Identify all evacuation centres. Identify those responsible for issuing instructions / information accurately.
7.	Malaysian National Security Council (MKN)	Coordinate responses to disaster. Acts as the secretariat for the disaster management and relief committees at the central, state and district levels.	Responsibility for the activation of the Special Malaysia Disaster Assistance and Rescue Teams (SMART).
8.	Public Works Department (JKR)	Providing stores, transport and work force from JKR to do the jobs of cleaning up the scene of incident and transportation. Providing temporary shelter (canopy or tent) Approve and permit upgrading of existing roads.	Providing technical and skill services in the field of forensic, geo-technics, structures and etc. as in landslide or structure failure cases. Conduct a systematic management for logistics. Repair damaged roads immediately.
9.	Department of Environment (JAS)	Establish a preschool education on environmental awareness and how to handle disaster. Perform water sampling and early warning system at permanent sampling sites to monitor water quality.	Multiply the greening program to balance earth-climate change. Enforce State Government to give commitments in the conservation of biodiversity such as serious enforcement implemented and inspected periodically on every project.
10.	Radio Television Malaysia (RTM)	Disseminate information on disaster. Provide live coverage and reports nationwide so that the public could receive the latest and correct information on disasters.	Launched a Disaster Unit channel to broadcast the latest coverage and report on disasters via all television and radio stations in Malaysia.
11.	Sarawak State Education Department	In collaboration with civil societies and UNICEF has derived initiatives such as the Smart Support Team and School Watching Program in schools. Provide several programmes aimed at creating awareness on disasters and safety practices such as Safe Schools Programme.	Ministry of Education's Smart Support Team provide counseling to students who traumatized by disasters. Provide monetary assistance and school aids to poor students in the event of disasters via the Ministry of Education's Poor Student's Funds.
12.	Unit Keselamatan dan Penguatkuasaan Negeri (UKPN)	Conduct effective enforcement to create a conducive environment for socio-economic development; Provide various security services to enhance State security and the well-being of its people.	Be a catalyst to enhance the State security support its socio-economic development; Conduct security research for policy formulation and enforcement;

13. Sarawak Health Department (JKNS) State	Install an integrated flood warning system aimed specifically at health staff and identify officers responsible for declaring disasters. Ensure the tools of inventory needed for disaster is always in the state of readiness. Establish medical evacuation teams and continuous database-dependent treatment in hospital for example dialysis, chemotherapy. Identify outbreaks of infectious diseases, improve efficiency in detection and notification of cases, be efficient in cleaning up of waste debris caused by flooding, and also in supplying treated water.	Improve management of patient database; create SOP for transferring patients from flooded area to a nearby hospital. Involve trained volunteers, medical personnel, psychiatrists, psychological experts and counselors for providing psychological help. Recover documents and records immediately. Make sure there is a backup system for health records. Supply clean water, medical supplies and vaccine. Coordinate all resources under one central location and transport them to the authorized Operations Room.
14. Sarawak Rivers Board (SRB)	To take all necessary measures to keep the river free from filth, rubbish or refuse; To take all appropriate measures to prevent or reduce the rate of erosion of the banks of rivers and for the protection and restoration thereof; To determine the possibility of improving the navigability of all rivers as against the encroachment of debris and other refuse from industrial factories operating along the rivers;	To prevent the obstruction of any river or watercourse; To operate and maintain any barrage or shiplock and to control and regulate the passage of vessels through such barrage or shiplock; To carry out such other duties as the Majlis Mesyuarat Kerajaan Negeri (MMKN) may require. To provide buoys, moorings and lights including other aids to navigation and for the safety.
15. Royal Malaysian Air Force (TUDM)	Increased power to increase air and ground capabilities involving air-oil refills, surveillance and surveys, transport missions, "electronic counter measures" and air combat rescue operations.	Power strength to carry out the operation successfully. Deal with threats on the surface whether on earth or in the air.
16. The People's Volunteer Corps (RELA)	Assist with preparing /distributing food to victims/duty officers. Assist with providing places of evacuation. Assist with distributing of clothes and other necessity to the victims. Assist with crowd control at the scene of incident.	Assist with traffic control. Assist with the construction of control centres. Help to clean up public places like schools, mosques, government offices and victims' houses after the disaster. Assist with the evacuation of victims.
17. Forestry Department Sarawak	Sustainable forest management and conservation. Enforcement of forestry and forestry-related legislation. Conducting scientific research on Sarawak's rainforests and its products.	Management of protected/totally protected areas Training and education of employees, stakeholders and the general public Providing customers of Sarawak's forest products with reliable information and support. Reforestation and rehabilitation.

18.	Ministry of Communications and Multimedia	<p>Pays serious attention on the importance of national preparedness in managing disaster crisis especially from the aspect of communications.</p> <p>Establishing and operating the Management Center Media.</p> <p>Prepare draft statements and press releases.</p> <p>Provide appropriate and strategic place to the media for cover.</p> <p>Manage and supervise media movement as well as press coverage if be required.</p>	<p>Provide speakers at certain places when required.</p> <p>Provide mobile devices when required.</p> <p>Spread the required information and issue media reports.</p> <p>Establish a system with better information sharing between agencies involved.</p> <p>Provide communication tools that do not require regular electricity charge and have long battery life or can be charged using solar power.</p>
19.	Department of Irrigation and Drainage, Sarawak (DID)	<p>Maintain drainage system.</p> <p>Establish policies and action plans to protect watershed, river basin, flood plains and river mouths.</p> <p>Appoint an executive council from the government to monitor the enforcement of drainage system.</p> <p>Create integrated computer models for flood scenario generation.</p> <p>Conduct river improvement work.</p> <p>Upgrade the telemetric system to get real time data and linking them to central facilities for real time flood forecasting.</p> <p>Establish an assessment and zoning (flood maps) of vulnerable areas.</p> <p>Conduct water treatment process and physical refining.</p>	<p>Install a benchmark that is easily understood (by vehicle type, e.g. such as colour code and display).</p> <p>Redevelop drains and drainage systems and regular maintenance protocol.</p> <p>Increase river mitigation projects.</p> <p>Conduct campaigns for environmental awareness in drainage.</p> <p>Create work orders under a government executive council to coordinate and oversee the development and maintenance of drainage systems.</p> <p>Establish engineered approaches such as dredging, building embankments, levees, dams, outflow channels, constructed wetlands and inundation ponds.</p>
20.	Ministry of Finance	<p>Allocate yearly funding for disaster readiness.</p> <p>Create policies and procedures for financial disaster (small &amp; big scale).</p> <p>Establish SOP for special procurement and distribution of finance, special expenses during disasters.</p>	<p>Create special funds for disaster governance.</p> <p>Create Financial Committee for disaster.</p> <p>Require NGO to provide Expenses and Income Statement /Contributions for disaster.</p> <p>Create fund for unforeseen disasters.</p>
21.	Malaysia Civil Defence Force (APM)	<p>Backing in works to save life and victim's property.</p> <p>Backing in preparation and maintenance of evacuation centres and to provide food for the victims.</p> <p>Backing in offering first aid service to the victims, if necessary.</p> <p>Provide emergency treatment to victims at the disaster scene.</p>	<p>Provide ambulance services and transfer victims to Hospital / Health Clinic.</p> <p>Perform diving work for search and rescue lost victims / drowned / trapped.</p> <p>Carry out cleaning and rehabilitation tasks after disaster.</p> <p>Ensure the safety of all employees and public at rescue area.</p>
22.	Telekom Berhad	<p>To ensure that telephone and telecommunication services, maintenance and control are not interrupted throughout the time when disaster management and search and rescue operation is being carried out.</p> <p>To extend telephone direct line/self-circuit services needed by Disaster Operation Room.</p> <p>Expand the coverage of Government Integrated Radio Networking, GIRN</p>	<p>To provide other telecommunication services needed for the operation by the relevant agencies.</p> <p>To place enough officers and staffs to give counseling services and maintenance services on the telecommunication lines and other equipment being used.</p>



23.	Mineral Geoscience Department Malaysia	and	Create integrated computer models for flood scenario generation.	
24.	Ministry of Tourism and Culture	of and	Managing the repatriation of injured / injured foreigners / survivors from the disaster back to their origin country including dealing with the embassy and the High Commission of the country.	Register and manage the welfare of foreign tourists who are victims of Disaster with JKM.
25.	Atomic Energy Licensing Board		Provide trained staff and skill services at scene of incident to manage and coordinate technical matters in aspect of atomic power Provide all related equipment for search and rescue works in a nuclear and radiology accident. Carry out investigation and prepare report in relation to nuclear and radiology accident	Evaluate the accident and collect information in order to advise Disaster Operation Commander so that evacuation steps could be taken. Advice workers in security aspects of radiation protect before and during the search and rescue operation. Evaluate whether Malaysia Institute of Nuclear Technology (MINT) services when necessary.
26.	Sarawak Water Supply Department	Rural Supply	Development of a Water Supply Master Plan with systematic prioritizing of projects for implementation to cater for the ever-increasing demand for water supply; Extension of water supply coverage to all unserved areas; Enhancing project implementation and monitoring to ensure projects are completed according to schedule, budget and approved scheme values; Developing in-house capability for planning and design of water supply systems;	Reduction of non-revenue water (NRW); Improvement of Water Supply Systems to enhance efficiency, quality and cost optimization through the adoption of suitable new technologies in the water supply systems; and Development of a skilled, competent and motivated workforce for operation and maintenance of the water supply systems. Management of raw water resources and development of raw water sources to ensure sustainable raw water supply.

## VI. ACKNOWLEDGEMENTS

The authors express their gratitude to the Global Challenges Research Fund (GCRF) and the Engineering and Physical Sciences Research Council (EPSRC) for the financial support under the International Grant, VOT A127, titled “A Collaborative Multi-Agency Platform for Building Resilient Communities”. Besides, the authors would like to acknowledge KANZU Research: Resilient Built Environment and Construction Research Institute of Malaysia (CREAM) for their kind assistance and support throughout this study.

## VII. CONCLUSION

Flood disaster management in Sarawak, Malaysia frequently involves many agencies. Given the increasing frequency of flood disasters in Sarawak, the changing nature of such disasters, it is essential for all the relevant agencies to foster collaboration in order to mitigate the flood problem in Sarawak. Collaboration has the capacity to empower and connect all key disaster management actors and thus achieve effective and efficient disaster management. On the other hand, as collaborative process fosters greater understanding

and awareness among professionals and agencies through communication, collaboration can play a significant role in providing provides the maximum resources for success and prevents duplication of effort by various agencies in disaster management for aim to reduce or avoid the potential losses from hazards, assure speedy and appropriate assistance to the victims of disaster as well as achieve rapid and effective recovery.

## REFERENCES

1. Chang, K. (2012). Understanding Cross-Sector Collaboration in Emergency Management: the Dynamics of Vertical and Horizontal Networks.
2. Dawes, S., Creswell, A., & Cahan, B. (2004). Learning from crisis: Lessons in human and information infrastructure from the World Trade center response. *Social Science Computer Review*, 22(1), 52–66.
3. Diong, J. Y., Yip, W. S., MatAdam, M. K., Chang, N. K., Yunus, F., & Abdullah, M. H. (2015). The Definitions of the Southwest Monsoon Climatological Onset and Withdrawal over Malaysian Region. *Malaysian*





- Meteorological Department, (3), 1–30.  
<https://doi.org/10.13140/RG.2.2.24817.74085>
4. Gadjia, R. (2004). Utilizing collaboration theory to evaluate strategic alliances. *American Journal of Evaluation*, 25(1), 65–77.
  5. Regional Corridor Development Authority (RECODA). (2018). Sarawak's Geography | Home. Retrieved from <http://www.recoda.com.my/sarawaks-map/>
  6. Sa'adi, Z., Shahid, S., Ismail, T., & Mohsenipour, M. (2016). TRENDS IN ANNUAL RAINFALL MAXIMA IN SARAWAK , MALAYSIA, (August).
  7. Samsudin, K., & Hussain, A. R. H. (2016). SMEP 5203: Emergency Management, 246.
  8. Sarawak Government. (2018, November 16). The Geography of Sarawak. Retrieved from [https://www.sarawak.gov.my/web/home/article\\_view/159/176/](https://www.sarawak.gov.my/web/home/article_view/159/176/)
  9. Shoaf, K. I., Kelley, M. M., O'Keefe, K., Arrington, K. D., & Prelip, M. L. (2014). Enhancing emergency preparedness and response systems: correlates of collaboration between local health departments and school districts. *Public Health Reports (Washington, D.C.: 1974)*, 129 Suppl, 107–13.  
<https://doi.org/10.1177/003335491412965414>
  10. Sri Lanka Disaster Management Centre. (2018). National Disaster Risk Management Plan 2018-2030.
  11. Thomson, Ann Marie, and James L. Perry. 2006. Collaboration Processes: Inside the Black Box. *Public Administration Review* 66 (S1):20-32.
  12. UNISDR. (2015). Sendai Framework for Disaster Risk Reduction 2015 - 2030. Third World Conference on Disaster Risk Reduction, Sendai, Japan, 14-18 March 2015., (March), 1–25.  
<https://doi.org/A/CONF.224/CRP.1>
  13. World Wildlife Fund. (2000). Stakeholder Collaboration Building Bridges for Conservation, 54–57. <https://doi.org/10.1145/1145581.1145608>