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COORDINATION OF INTER-AGENCY IN FLOOD CATASTROPHIC EVENT: PROPOSED STUDY

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ABSTRACT

Nowadays, natural and manmade disasters are often occurred which caused the chaos and worries in society. It cannot be avoided, but possible to predict by existing emergency respond in every country. There are several disaster such as floods, plane disasters, storms, sink holes and landslides. This research focuses on the flood regarding the management, respond and handling system. The disaster resulting loss of live, cost damage and environment damage which cause stag the human activity during and temporary after disaster. The disaster requires the management which involves resources, equipment, frequency and extensive manpower from various agencies as well as effective coordination. The individual is not concerned with the management process, they respond more to their heart connection and response of uncertainty sense. Therefore it is essential to ensure that each person have a system in place that will provide and inspire the ability to maintain their character and solidarity within themselves. The emergency respond plan system is exist in every country especially in Malaysia. However, there are several problem in information distribution to the society such as change the contact number, no signal, no contact number of interagency and less communication. Therefore, this research will approach the system which effective to undertake the disaster earlier and also linked to the every interagency in each area of Malaysia. It believed that will be high impact to the decreasing victims, cost damage and cost to recovery.

Keywords: emergency and respond plan, natural disaster, flood, inter agency.

1. INTRODUCTION

Malaysia is one of the tropical countries which are produce high water levels. Therefore, it causes inundation on the land which adjacent to the lakes, rivers and other water bodies [1]. It possible cause the natural and unnatural disaster. Catastrophic event in the world not always occur every year but every country have different catastrophic typical even in Malaysia. The catastrophic event in Malaysia is divided into several classes as shown in Figure-1.

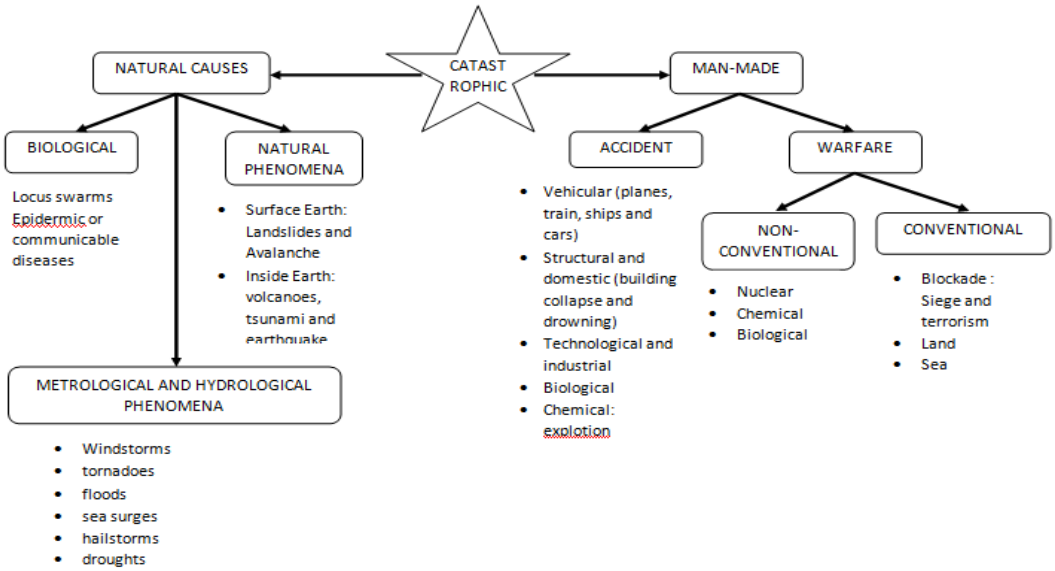

Figure-1. Classification of catastrophic event in Malaysia [2].

In Malaysia, the most significant of natural hazard is flood (WECAM, 2013) [3] and it more escalated while the country is more developed. There are major floods which occurred in Malaysia since the sixties of the

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last century such as in the years of 1926, 1931, 1947, 1954, 1963, 1965 [4], 1967, 1969, 1971, 1973, 1979, 1983, 1988, 1993, 1995, 1999, 2000, 2001, 2003[1], 2004, 2007 [4], 2010 and the current flood is occur at 2014. It affecting more than 15% of the total population in Malaysia and cost damage is estimated to be a million of ringgit Malaysia [1]. According to EM-DAT (2011) [5], the frequency of major flooding in Malaysia for the past 50 years, frequency of occurrence, the number of killed, affected and loss damage is very high. Highest frequency of flood is occur in Kelantan or Terengganu area with the percentage area is 38%, followed by Johor of 19% Kedah of 14% and the other province is below than 10% from the total area [5]. Highest frequency of occurrence, number of people killed, people affected and estimated damage is shown on 2010. However, flooding which is occurred on 2014 is higher than 2010 such as reported by [6] that the flood victims is around 100,000 peoples.

As mention above that the flooding is occur in several provinces both of peninsular and west Malaysia as shown in Figure-2.

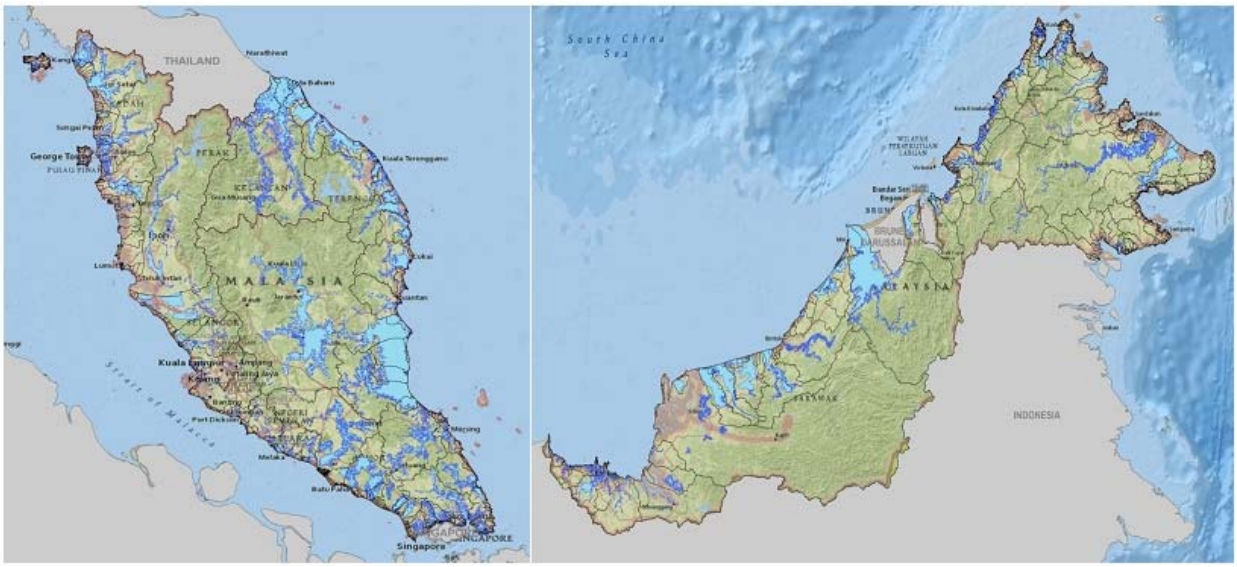

Figure-2. Flood area in Malaysia [1, 4, and 7].

According to Wong *et al*., (2012) [7], they Reported as of year 2010 that the total of flood-affected area is 32,460 km^2 or 9.8 % of Total area of the country (330,803 km^2). One of the most methods to decrease the catastrophic event is conducted by managerial disaster [8]. Disaster management of the natural hazards especially for flood is very needed to overcome it. Regarding to the national security divisions (NSD) is responsible to manage the activities related to disaster. There are several agencies under National Security Council (NSC) which involved in disaster management in Malaysia such as The Royal Malaysian Police, The Royal Malaysian Army, Special Malaysia Disaster Assistance and Rescue Team (SMART), Malaysian Meteorological Service (MMS), Drainage and Irrigation Department Malaysia (DID), The Public Works Department (PWD), Social Welfare Department, The Local Authority, Non-Governmental Organizations (e.g. Malaysian Red Crescent Society and Scout Society), Civil Defence Department and International Cooperation [9].

NSC was issued the guideline on the disaster management which includes the responsibility and function of each agency. However, it is not fully effective to manage disaster in Malaysia. In addition, in the last decade the disaster had increased in terms of magnitudes and frequencies and had created discomfort to the Malaysian. The potential risk of environmental hazard and the impact of consequent disaster on Malaysia would pose two severe setbacks, namely the direct loss of existing national assets in various forms and the diversion of national resources and effort away from ongoing subsistence and development [9, 10]. This had indicated that Malaysia need to develop a comprehensive approach of hazard management in order to reduce the occurrence of potential disasters [9, 10].

There are several the problems of the flood management in Malaysia which are flood plains are being developed, residents or stakeholder have high expectation and less tolerance towards flooding, high cost of structural flood management, non-structural approach is not accepted well and increase the global climate change. Therefore, the improving the emergency respond plan to handle the catastrophic is quite urgent to develop. However, synchronization of the structural and non-structural elements are become main step to grow the awareness on the catastrophic in Malaysia, especially on flood disaster.

This research is May effect to structural system in government policy under the NSC. It can improve the coordination system which influence to the effectiveness

of government agency such as Police, Bombay, JPAM, Army, RELA, Hospital and the rest of the uniform body such as St. John Ambulance. Voluntary agencies such as MERCY, Psychology officer and other will be directly put into the system. Therefore, the coordination will be fully integrated.

2. METHODOLOGY

Methodology approached is refer to existing method for handling the catastrophic event. Based on that, the improvement system will be approached to decrease the defect of the disaster.

a) The initial method to handle or prevent the flooding

As reported by DID (2009) [4] that the approach method to manage the flood through the river conservancy, river training work, coastal bunds and tidal gates depending in area which adjacent to seawater attack and sanitary. Hydrological data is also collected to improve the planning and design of irrigation and agriculture drainage system. Therefore, it can use as flood forecasting and warning cervices. In this research the socio technical disaster model is listed in Table-1.

Table-1. Socio-technical disaster model.

Period	Phase	Description
Pre-disaster	I	Operation
	II	Incubation
	III	Forewarning
	IV	Activation
Disaster	V	Onset
	VI	Rescue and recovery
Post-disaster	VII	Inquiry and reporting
	VIII	Feedback
	IX	Social justice
	X	Social and legislation reform

b) Management levels

Level 1 (District)

- localized, contained, controlled by local authorities and no potential of spreading
- manage by local authorities at the district level by using their own facilities and resources

Level II (state)

- More serious, covering wide area or more than two (2) Districts and has the potential of spreading to other areas
- Authority at the State level assists in terms of financial, assets and human resources

Level III (Central)

- More complex, covering wider area or more than two (2) States
- Authority at the Central level assists in terms of financial, assets and human resources
- Assistance from foreign countries

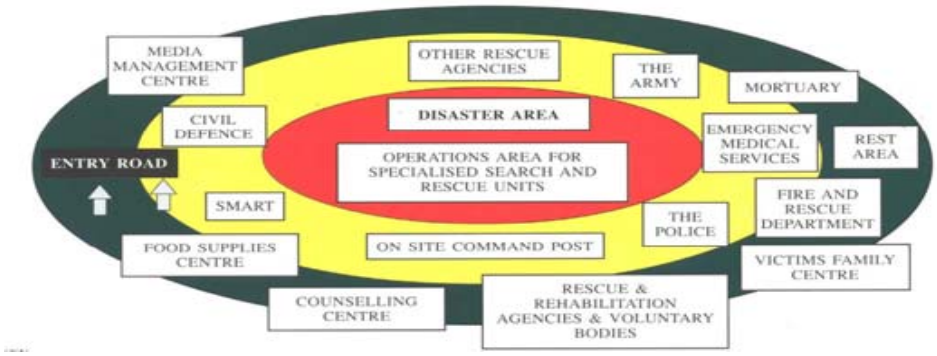

Figure-3. Catastrophic and relief management regarding to the zones [11].

Keys:

Red Zone: Work area for specialized rescue teams with special expertise

Yellow Zone: placement area for onsite command post and main as well as supporting rescue post

Green Zone: placement area for media management, victim's family centre, counselling centre, food supplies centre, supporting and rehabilitation agencies and voluntary bodies

⇧ Sanitary Post

Note: Movement from one zone to another is not allowed except with the permission of the commander of disaster operations.

c) Descriptive of methodology

The study will be carried out in the following main three phases; Subject and Physical & Facilities Measurement, Development of simulation system and Verification of the Developed simulation. The followings will explain in detail each phases accordingly.

Phase 1: Subject, physical and facilities measurement

The first phase is to conduct data collection. Two type of measurement will be carried out; which is; 1) Subject measurement including man power and inter agency man power and sub (NGO, Voluntary), 2) Physical and Facilities measurement including building and related shelter, equipment and relates instrument and mode of transportation.

The first questionnaire will be used to collect information on what type of man power (permanent, contract, temporary or daily basis) based on the structure and non-structure organization. The developed of build a manpower capacity preferred for healthy and fully committed to emergency and response skill. It is important that the survey question must be valid and reliable before distributed to the manpower in the organization. Step to reserve the confidentiality of the information obtained will be taken.

The second questionnaire gathers the information of Physical &Facilities measurement in terms of Building & related shelter, Equipment and relates instrument and Mode of Transportation of the related agencies and organization. In this case, the level will be divided into 3 level which is Level I (District), Level 2 (State) and Level III (Central).

In order to validate the data, the record must be presented (fully documented not only say and show the equipment, instrumentation and mode of transportation) must be conducted. Series of on-site visit and measurement will also be carried out. The data taken should be analysed statistically to represent true population in normally distributed data. A standardize method for the facilities, analysis will be used to maximize the validity and reliability of the data. (To make sure the readiness of the facilities said above)

Phase 2:Development of simulation system

There are currently many different methodologies employed for development of simulation system projects. Many methodologies are driven by the application development tools, by the software which the simulation will be operated. The simulation system development should progress through the six phases namely system initiation, system survey analysis, system design, simulation system construction, running simulation and riview and simulation system implementation. The development of simulation system is shown in Figure-4.

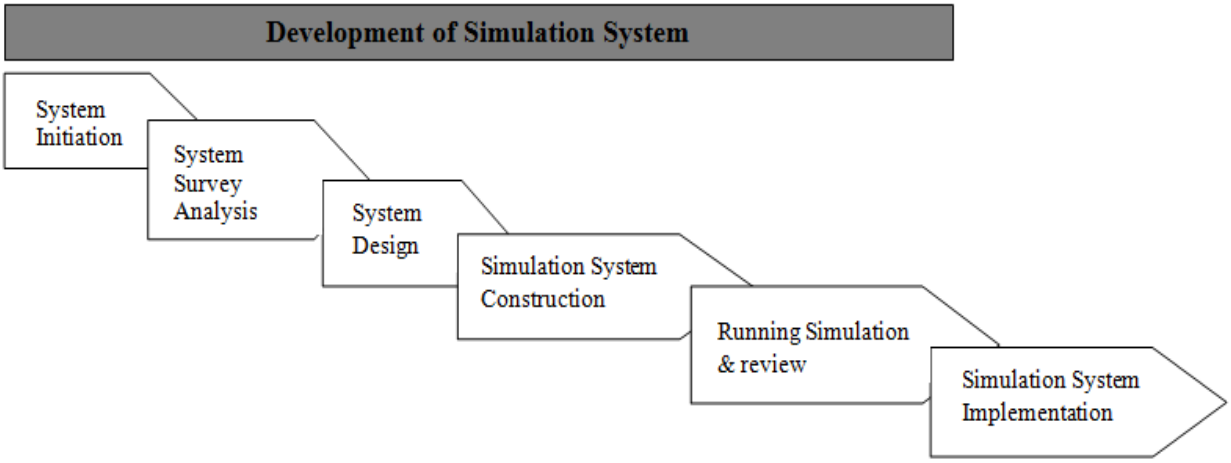

Figure-4. Development of simulation system.

From the Figure-4, the challanges for simulation system development is aligning the need of each components. The components characteristic are decsribed below and listed in Table-2.

i. System initiation

In which the Case and Proposed Solution developed during Project Origination are re-examined to ensure that they are still appropriately defined and address an existing organizational need. This validation effort provides the Project Team with the basis for a task of each structural and non-structural organization in each distric and state which controlled by cetral (MKN) in order to obtaine the smoothly coordination between that organizations. In addition, a high level coordination system is developed for subsequent simulationphases.

ii. System survey analysis

In which the needs of the society and organizations are captured in as much detail as possible. The researcher leads in working with the society or structural and non-structural organization to define the

simulation system framework that will be developed. By obtaining a detailed and comprehensiveunderstanding of the organizations, the system can develop the functional specification that will drive the system design.

iii. System design

In which builds upon the work performed during system survey analysis, and results in a translation of the functional requirements into a complete technical solution. This model simulation system is propose the technical flow of man power or organization in each area whent the catastrophic event is occur and how to implamented to the victims. Simulation system is developed in order to know the flow chart of every organization to solve the catastrophic event. The completion of System Design also marks the point in the project at which the research should be able to plan, in detail, all future project phases.

iv. Simulation System Construction

Throughout which the researcher builds andtests the various simulation models of the application, including any utilities that will be needed during running simulation system and simulation system implementation. As the simulation system is developed, the integrated organizations is needed to faster respond to the event and eraly respond of individual victims to follow the instruction from the in site organization. Documentation and training are also developed during this phase.

v. Running simulation and review

During which the focus of system validation efforts shifts from those team members responsible for developing theapplication to those who will ultimately use the simulation system in the executionof their daily responsibilities. In addition to confirming that the system meets functional expectations, activities are aimed at validating all aspects of data conversion and system deployment.

vi. Simulation System Implementation

The final phase of the lifecycle, which comprises all activities associated with the distribution of the application.These efforts include training, simulation coordination to achieve the first respond when the event is occure and transition from old version coordination to new simulation system of coordination flow.

Table-2. The development phase, instrument, approaches and detail documentation.

Phase	Instrument and approach	Detail
System Initiation	Problem Identification (4W, 1 H) Documentation	Occupational Safety and Health Management System (OSHMS) Work process OSH documentation
System Survey Analysis	Workers exposure Questionnaires QFD	Work environment Work-related symptoms System development (use QFD approach) Case study
System Design	QFD approach System architecture Database on work environment	Formulate House of Quality (HoQs)
Simulation System Construction	Visual basic Graphical user Interface System integrations with instrument software	Develop the new simulation system for high level coordination
Running simulation and Review	Experimental, Testing and Validation.	Refer to system testing methods Case study
Simulation System Implementation.	New Approach (Formulate a new simulation system of Coordination bot the structural and non-structural organization)	New approach is able to control the flow of coordination of each organization in each District and state

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Phase 3:Verification of simulation developed system

The system has become a new approach of simulation system of interagency. With this simulation system implementation, the work of inter-agency can transferred in the system, present report generation, documentation and also data analysis of catastrophic event especially for flood event. It will be the basic solution to the management to solve the coordination problem. The new approach of simulation system and system of inter-agency is illustrated in Figure-5 and Figure-6. Figure-5 shows how the simulation system works in catastrophic handling. Meanwhile Figure-6 shows the approach emergency response plan system which includes all state, district and area of Malaysia. Every area is consist of the inter-agency which work depend on their job. It completed by contact number of every interagency in charge.

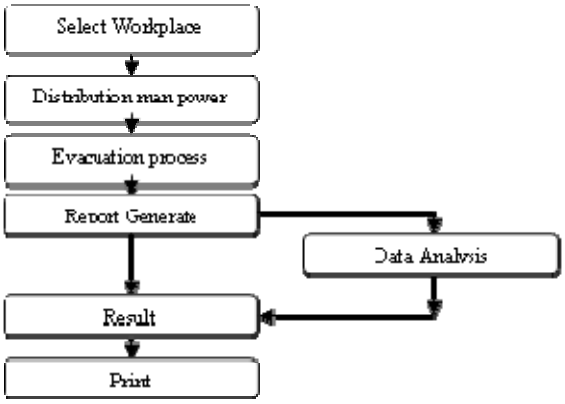

Figure-5. Simulation system function.

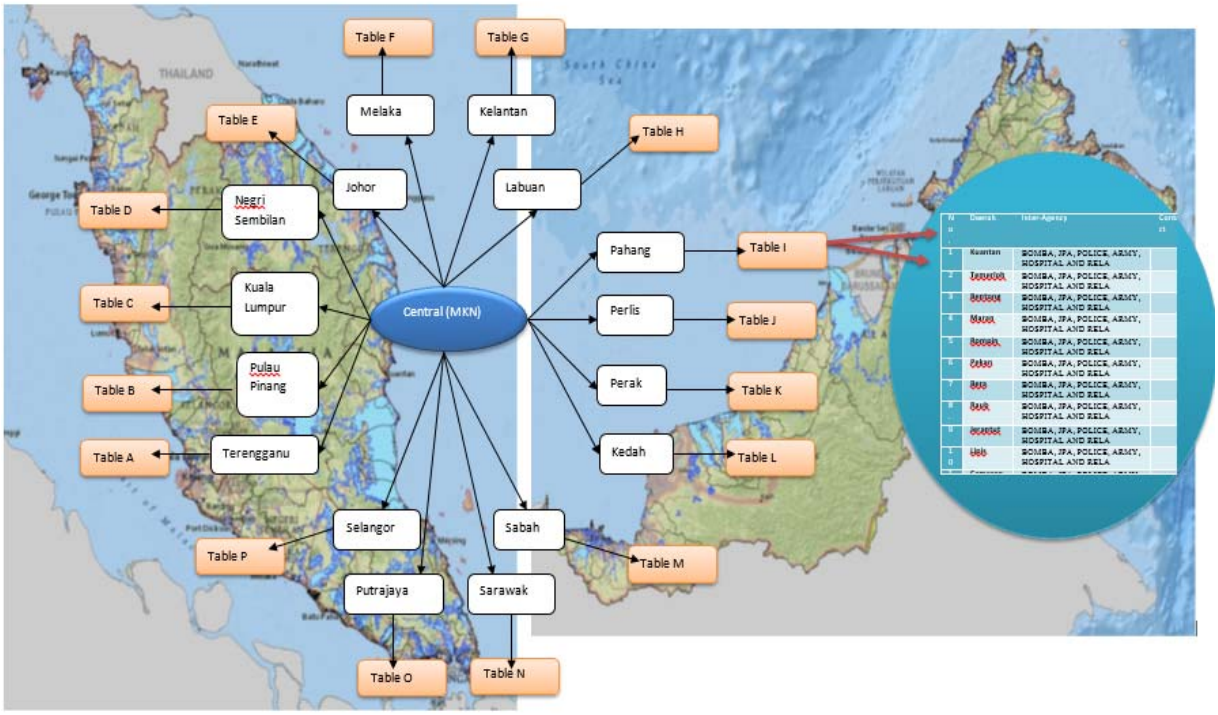

Figure-6. System of inter-agency.

3. EXPECTED RESULTS/BENEFIT

The results will be confirmed by effectiveness of new emergency respond plan t handling the catastrophic event in Malaysia. It obtained by training and questionnaire to the society and integrated inter-agency.

a) New findings/knowledge

It is expected that better understanding of ERP communication in Malaysia's related agencies and industry will be obtained in order to promote the readiness and the protection through legislation, health communications strategies or behavioural intervention where such data are needed. It is expected a higher system value will results in higher number of user can apply this simulation based on the flood or other event.

b) Specific or potential applications

The ERP simulation system can be a scale for comparing and rank different agencies and organization in the floor or others working environments and predicts level of persistent man power experience by the event. It also can simplify the complex issues of occupational safety and health can to be comprehended easily by the government bodies and related structures of the ERP process.

4. CONCLUSIONS

In this research is approach new simulation of coordination model as beginning respond to decrease the possibility of major flood in Malaysia. The research benefit is also effect to the economic sector such as can to decrease the cost damage of each disaster areas and decrease the cost to recovery area.

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REFERENCES

[1] Thamer A. M., Saleh A. H. and Abdul H. G. 2011. Prediction of Flood Levels along a Stretch of the Langat River with Insufficient Hydrological Data. Pertanika J. Sci. & Technol. 19 (2): 237– 248.

[2] Shaluf I. M. and Ahmadun F. 2006. Disaster Types in Malaysia: An Overview. Disaster Prevention and Management. 15(2): 286-298.

[3] Water and Energy Consumer Association of Malaysia (WECAM). 2013. Flood Mitigation and Adaptation Memorandum 2013.

[4] Department of Irrigation and Drainage (DID). 2009. Flood Management. Vol. 1.

[5] EM-DAT. 2011. The OFDA/CRED International Disaster Database. Universite Catholique de Louvain, Brussels, Belgium

[6] Kemas Kini. 2014. Jumlah Mangsa Banjir 2014. Retrieved February 27 2015, http://www.astroawani.com/berita-banjir/jumlah-mangsa-banjir-hampiri-100-000-orang-50926

[7] Wong W. S., Mazura N. Z. and Cheon H. S. 2012. Flood Mapping as a Planning and Management Tool. My WRM Forum.

[8] Billa L., Shattri M., Mahmud A. R. and Ghazali A. H. 2006. Comprehensive Planning and the Role of SDSS in Flood Disaster Management in Malaysia Disaster Prevention and Management. 15(2): 233-240.

[9] Badruddin A. R. 2012. Issues of Disaster Management Preparedness: A Case Study of Directive 20 of National Security Council Malaysia. International Journal of Business and Social Science. 3(5).

[10] Shaluf I. M. and Ahmadun F. 2006. Technological Emergencies Expert System (TEES). Disaster Prevention and Management. 15(3): 414-424.

[11] Fakhru'l-Razi A. 2009. Disaster Management in Malaysia. University Putra Malaysia (UPM).