



DEVELOPMENT OF INTER AGENCY INFORMATION SYSTEM FOR FLOOD CATASTROPHIC PREPAREDNESS IN MALAYSIA

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ABSTRACT

Emergency response management is needed to reduce the disaster event. This paper presents the functions exist in a prototype was developed for emergency response management during disaster. The prototype is potentially useful in Malaysia that is face to natural disaster such as monsoon flood and flash flood. In this research, develop the emergency respond plant system base on online system which easy use and easy to find out. The system will be request to link with National Security Council (NSC) website in order to suitable for NSC database. The result of this research is the system which is beneficial for the flood management related agencies in order to plan further improvements in the current procedure for flood response. Developed system is completed by contact of each interagency in every area. It showed for fast disaster responsibility in order to decrease the possibility of victims and cost damage.

Keywords: emergency response, emergency management, flood, disaster.

INTRODUCTION

Since last few years ago, Malaysia always experienced the flooding disaster in certain state of Malaysia especially in the East Coast of Peninsular Malaysia. The impact of the flood disaster is frequently increased every year because of environmental degradation, such as deforestation, intensified land use and the increasing population [1]. Intensity and duration of the rain are also the most influencing factors for flood hazards [2].

Unfortunately, the effect of floods in less developed countries is more vulnerable [2]. It has lot of problems with emergency response and early warning preparation [2]. Human involvement to control flood disaster by using immense with different technology can facilitate stakeholder to have an early warning for flood and know what impact which generated by flood [3]. In addition, according to Mansourian *et al.*, (2006) [4], the state which experience disaster need to fast respond and decision-makers which always updated on the latest emergency situation. Disaster response is also time-sensitive with little allowance on delay in decision-making and response operations.

Nevertheless, some stakeholder in Malaysia are unable to handle the flood disaster problem effectively even though it occurring every year. Therefore, the sustainable implementation should be emphasized to overcome the problem especially with sustaining disaster management system. The disaster management system have four phases including preparedness, response, recovery and mitigation or prevention. The Department of Irrigation and Drainage was provided Drainage was

provided flood forecasting and warning services using Short Message System (SMS) to deliver the message before flood event. Moreover, *infobanjir* webpage was created such an early flood warning to public. The Malaysia Disaster Prepared Centre was built by stakeholder to promote the improvement of awareness, knowledge and adoption of disaster reduction practice. Even though the improvement is conducted to the emergency respond plan but the flooding are still occurred in Malaysia.

Therefore, the aimed of this paper to develop the new system for the flood response operation in Malaysia. This research was developed the prototype which implemented in Malaysia. It believed can overcome the flood disaster through good emergency response management. It also impact to the decreasing victims and damage cost.

FLOOD DISASTER IN MALAYSIA

The worst flood disaster was happened in the certain state in Peninsular Malaysia last year at the end of year 2014. From the Table-1 shows the summary of number flood victims divided into the state, district and critically of flood on Dec 2014 [5].

**Table-1.** Number of victims [5].

State	No. of flood victims as at 29 Dec 2014	Districts	Criticality (Last recorded: Danger level), Criticality level (%)
Kelantan	31,441	Gua Musang, Jeli, Kota Bharu, Kuala Krai, Machang, Pasir Puteh, Tanah Merah, Tumpat, Kota Bharu.	-Tangga Krai Sungai Kelantan (34011m: 25m), 36% -Jambatan Guillemard (22.63m: 16m), 41%
Terengganu	32,736	Kemaman, Dungun, Kuala Terengganu, Besut, Hulu Terengganu.	-Sg Kemaman (37.63: 36m) 4.44
Perak	7,774	Hulu Perak, Kuala Kangsar, Perak Tengah.	-Tasik Temengor, Hulu Perak (247.69m)- alert level -Sg Selama, Selama (14.86m) alert level
Johor	328	Mersing	n/a
Pahang	29,423	Kuala Lipis, Kuantan, Muadzam, Jengka, Temerloh	n/a

**Figure-1.** Interface of system.**Figure-2.** List of state in Malaysia.



Figure-3. Example list of district in perlis state.

BOMBA	JPA	POLICE	HOSPITAL	RELA
Balai Bomba dan Penyelamat, Arau: 04 - 986 4444	Pejabat Unit Pertahanan Awam Arau : 04-9886342	Ibu pejabat Polis Daerah Arau : 04-9861222	Klinik Desa Jejawi: 04-9774360 Klinik Desa Guar Sanji: 04-9866382 Klinik Desa Padang Siding: 04-9864957 Klinik Desa Pau: 04-9864737 Klinik Desa Tambun Tulang: 04-9864768 Klinik Desa Sungai Baru: 04-9809699 Klinik Desa Sungai Padang: 04-9774273	Pejabat RELA Daerah Arau Tel: 04-9764497 Faks: 04-9770979
Balai Bomba dan Penyelamat, Kuala Perlis: 04 - 985 5332		Balai Polis Arau: 04-9861222 Balai Polis Mata Ayer: 04-9382146 Pondok Polis Pau: 04-9860868 Pondok Polis Kok Klang :04-9865723		

Figure-4. List contact number inter agency based in Arau area.

According to the National Security Council reported 101, 72 people from Kelantan, Terengganu, Johor and Perak have been placed at flood relief centres.

Flood is a major concern in Malaysia. Two major types of flood occur in Malaysia which are monsoon flood and flash flood. The monsoon flood occurs mainly from the Northeast Monsoon which prevails during the months of November to March with heavy rains to the east coast states of the Peninsula, northern part of Sabah and southern part of Sarawak [2]. While flash flood is governed by heavy and long duration rainfall, more localized flooding which covers a large area has been reported in recent years [2].

Landslides, floods, wind storms, epidemics, wave surges, droughts, and wild fires are among the natural disasters that are likely to occur in Malaysia [5]. Flood

disaster in Malaysia mentions the factors as the root cause such as inadequate safety precautions at hill-site developments, rapid development and environmental degradation resulting from massive deforestation, and uncontrolled hill-slope construction projects. According to O'Arbayah *et al.*, (2009) [6] mention that the floods in Johor in 2006–2007, which displaced more than 312,386 residents, were extraordinary and tested the preparedness to everyone.

The control centre for disaster relief operations plays a pivotal role as the primary centre for storing data and information required to carry out emergency responses in a timely manner [7]. According to Haghani, (2009) [8], there are four phases in an emergency management cycle, namely preparedness, response, recovery and mitigation, where each phase is an integral part of an action plan and



justifies further discussion. Preparedness refers to activities to enhance the ability to respond immediately after disaster. Response is an activity which occurs during or immediately after a disaster to meet the immediate needs of disaster victims. Recovery is an action which commences after the disaster when the urgent needs have been initially met finally. Mitigation is an activity that partly or fully prevents disasters reducing the likelihood of the disaster occurrence, or otherwise lessens the damaging effects of disaster.

PROTOTYPE DEVELOPMENT

There are vary disaster management, emergency and response systems, such as the Sahana Disaster Management System for tsunamis 2004, DERMIS [9], Case Management System in Singapore for SARS 2003, Andean Information System for disaster prevention and relief, in Andean Community and Viable System Model (VSM to structure information processing complexity in disaster response [10]

Effective information processing is essential with disaster responders need information quickly to make decisions that save lives [10]. Hence, detailed system plan for developing such a prototype is needed to suit local requirements [10]. Given the requirement for the system to become community centric, the prototype presented in the current work which is called by The Flood Catastrophic System.

In essence, approach new system as early response to decrease the possibility of major flood in Malaysia and also to give benefit to the economic sector which reduces the damage cost of each disaster areas and the cost of recovery area involved in disaster. In additional, this system is in response stage on the process of emergency management which in this stage consists of the immediate response of emergency to minimize loss of life and destruction property and facilities. Furthermore, there are several provides the logical view of our propose prototype. Therefore, new developed system which supported by web-based system and the system will link to National Security Council (NSC) webpage. These systems essentially assist in providing the emergency number of inter-agency in whole Malaysia especially in Peninsular Malaysia and Sabah and Sarawak and divided into State, district and area. Therefore, the inter agency involved in this system which Royal Malaysia Police (POLICE), Fire and Rescue Department (BOMBA), Hospital and Clinic, Malaysia Civil Defence Department (RELA) and The People's Volunteer Corps (RELA), especially in flood disaster event.

Figure-1 show the screen shoots of main display or interface for the website Inter Agency of Flood Disaster in Malaysia. The Malay language has been used to fulfil the language requirement of the government agencies. When the disaster happened in certain area, the user can go through to our webpage and need the contacts number inter-agency for related states, user's need to accessing this display with click on the states button as labelled

above. After that, the state flag is showed by system as shown in Figure-2.

PROTOTYPE APPROACH

The developed system are open sources and sub language. The Figure-1 shows the logical view of our proposed prototype. For example, Perlis area used to display the way of our system working.

Every states in Malaysia is labelled by flag. Find the district of each states through click the flag and it expressed by Figure-3. It shown the sample of the Perlis states which consist of three (3) districts. Every district will show the description of the inter-agency which related to the disaster where every disaster need the difference interagency. When district button clicked, the interagency is mentioned which completed by area, mobile number and fax. More detail of interagency in each district could be seen at Figure-4.

Figure-3 shows district step for founding the interagency in each area of district. Figure-3 shows an example of the district of Perak State which is Arau, Padang Besar Utara, and Kangar.

Interagency of of every district is shown in Figure-4. It consist of various interagency which have the different job in different disaster. The users should know that cluster in order to take a right information for urgent condition.

Figure-4 shows the screen shoot list of contact number of inter-agency in Arau area. For example when users click on the Arau area, the online information about contacts number inter-agency will be displayed. When they have obtained the necessary contact number of inter-agency, then users simply can clicks on the "back" button to return to the homepage. This prototype is easily conducted and friendly user. After build up the system, the researcher also done a few session of structured questionnaire will conducted to local people in the study area with different location according to the state and district in Malaysia. The survey will conducted to the people affected the flood disaster event in whole Malaysia. The people were asked about effectiveness, satisfaction, action and confidence the stakeholder and inter-agency during flood catastrophic event. Then the output will be analysed by Statistical Package Social Sciences (SPSS).

CONCLUSIONS

The web-based of flood management is really essential in providing effective and efficient relief to flood victims. In order to define the different requirements of the key stakeholders involved in emergency response management in Malaysia, flood catastrophic system offers the following features that address the requirements of the community and the National Security Agency. The prototype has been developed. The system can also be developed for integration with the distribution of aid operations if required. The prototype will also be administered at National Security Council of Malaysia.



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REFERENCES

- [1] Vincent R. K. 1997. Fundamentals of geological and environmental remote sensing. Prentice-Hall, Inc., Upper Saddle River, NJ.
- [2] Ali Kan M. M., Shaari N. A., Achmad Bahar, A. M., Baten M. A. and Nazaruddin D. A. 2014. Flood Impact Assessment in Kota Bharu: A Statistical Analysis, Faculty of Earth Science, University Malaysia Kelantan. World Applied Sciences Journal. 32(4): 626-634.
- [3] Abdul Ghani S., Zakaria N. A., Abustan, I., Abdullah R., Mohd Sidek L. and Ahamed M. S. 1999. The Development of HEC-Series Programmes to Predict Sediment Movement for River in Malaysia. Bengkel Pencapaian Penyelidikan IRPA-RM 7. 31 Ogos 1999-4 September 1999, Kedah.
- [4] Mansourian A., Rajabifard A., Valadan Zoeja M. J. and Williamson I. 2006. Using SDI and web-based system to facilitate disaster management. Computers & Geosciences. 32: 303–315
- [5] National Security Council. 2014. Majlis Keselamatan Negara, Pusat Pentadbiran Kerajaan Persekutuan Putrajaya, Malaysia.
- [6] O'Arbayah D. A. R., Surinah A., Noorhaida U., Shaharom N. and Rahim A. 2009. Public Health Preparedness And Response To Flood Disaster In Johore, Malaysia: Challenges And Lessons Learned. Malaysian Journal of Community Health. 15 (S), 126-131.
- [7] Hadiguna R. A., Kamil I., Delati A. and Reed R. 2014. Implementing a web-based decision support system for disaster logistics: A case study of an evacuation location assessment for Indonesia. International Journal of Disaster Risk Reduction. 9: 38–47.
- [8] Haghani A. M. A. 2009. Supply chain management in disaster response. Mid-Atlantic Universities Transportation Center, Department of Civil & Environmental Engineering. University of Maryland; (Final Project Report Grant DTRT07-G-0003).
- [9] Turoff M., Chumer M., Walle B. V. D. and Yao X. 2004. The design of a dynamic emergency response management information system (DERMIS). Journal of Information Technology Theory and Application. 5(4): 1-35.
- [10] Preece G., Shaw D. and Hayashi H. 2013. Using the Viable System Model (VSM) to structure information processing complexity in disaster response, Disaster Prevention Research Institute (DPRI), Kyoto University, Gokasho, Uji, Kyoto 611-0011. Japan European Journal of Operational Research. 224:209–218.