

## IMPORTANT CRITERIA FOR MANAGING DISASTER WASTE IN MALAYSIA

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### Graphical abstract



### Abstract

In Malaysia, disaster impacts have become an impediment to the sustainable development. Limited number of case studies has been carried out on the topic of the Disaster Management Guidelines in Malaysia and the needs of the waste management to be adopted into disaster management guidelines. Thus, the main purpose of this study is to highlights possible entry points for waste management adaption into Disaster Management Guidelines in Malaysia. This study will adopt qualitative research design involving comprising of journal review, previous case study and semi-structured interviews. This paper presented the important criteria relating to the disasters waste management in Malaysia. It is anticipated that this research will generate interests from disaster waste researchers and disaster waste management policy makers, as it will provide fundamental elements towards more rigor disaster waste management policy.

Keywords: Disaster, waste management, Malaysia

### Abstrak

Di Malaysia, kesan-kesan bencana telah menjadi penghalang kepada pembangunan mampan. Beberapa kajian kes terpencil telah dijalankan melibatkan topik garis Panduan Pengurusan Bencana di Malaysia dan keperluan pengurusan sisa yang diterima ke dalam Garis Panduan Pengurusan Bencana. Oleh itu, tujuan utama kajian ini adalah untuk menekankan sebarang kemungkinan bagi pengurusan sisa untuk dimasukkan dalam Garis Panduan Pengurusan Bencana di Malaysia. Kajian ini akan menggunakan kaedah kualitatif yang melibatkan kajian jurnal, kajian kes yang lepas dan temu bual separa berstruktur. Kertas ini menunjukkan kepentingan kriteria yang berkaitan terhadap pengurusan sisa bencana di Malaysia. Adalah dijangkakan bahawa kajian ini akan memupuk minat daripada penyelidik sisa bencana dan penggabul polisi bencana pengurusan sisa kerana ia dapat memberi elemen-elemen asas ke arah yang lebih rapi terhadap polisi pengurusan sisa bencana.

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## 1.0 INTRODUCTION

Since 1980s until to date, human activities are causing global warming and climate change. This situation has made it a major contributor to the increasing occurrence of natural disaster worldwide. Research on current risk management, flood mitigation and early warning systems have been made globally in order to improve the design strategy that connects communities with more

comprehensive flood warning system. Rate of waste volumes from a single event is equivalent to waste production for a year. Unsuccessful disaster management can affect long-term recovery in the affected areas. Effect of management on disaster waste to life and health could be overcome with effective approach at the same time can recover and redevelop the affected areas. Unfortunately, existing disaster waste management practice often involves either no action, in which the waste is left to

accumulate and decompose, or improper action, in which the waste is removed and dumped in an uncontrolled manner. The aim of this research is to highlight possible entry points for waste management adaption into disaster management guidelines in Malaysia. Therefore, the specific objectives of this research were to investigate the extend of disaster waste effect the environment; to provide a basis on which the needs of the waste management could be evaluated in disaster management guidelines; and to propose post disaster waste management strategies adaption into disaster management guidelines in Malaysia. The research output is expected to add in to the existing body of knowledge on the theoretical mechanism to reduce adverse environmental impacts by way of policies and legal instruments since there is still insufficient research been conducted in this area. Qualitative research design by way of case study and supported by quantitative research will be adopted. For the start this paper will present the important criteria that need to be considered for disaster waste management that would be a good source to the authority to manage disasters waste in Malaysia efficiently.

## 2.0 LITERATURE REVIEW

Nowadays, the current issues caused by disaster are well-known in the entire world including in our country. A large of impacts that have faced by the people because of unexpected events namely landslide, the Tsunami and floods but recently it was happened in Peninsular Malaysia, Sabah and Sarawak over the century. The lack of human behavior and did not have sense of responsibility towards of the environment has led to major changes to global warming and climate change to our earth. Thus, whether natural or man-made, there are impacts of disaster and it have both human and environmental dimensions [14]. In Malaysia, due to rapid urbanization, industrialization transition and added by the uncertain event; floods or any disaster occur in our country, it will reflect the escalation of solid generation now and in future. Thus, it is important to managed the waste wisely especially on the issues of the disaster waste management.

Generally, solid waste is a matter undesirable thing produced by human activities. Every day, we produced high amount of garbage which cannot be sustained by our country. On the other hands, waste management and recycling, which as aspects of the 'environment' started to become serious political issues in the early 1970s, could by 80s have been gently fading away. Disaster waste is a well-recognised threat to our health, safety, and environment. Normally, it is well-managed in an ad hoc manner and is consequently a major impediment to post-disaster rescue operations, hampering entire humanitarian relief efforts by blocking access to affect the populations and

urbanization. Accordingly to Flora [7], from the several of involve and affected by flood disaster in Kelantan and Pahang almost 24,000 tons of flood debris are collected by Alam Flora Sdn. Bhd in the post-flood mission. This is amount far exceeded the normal daily waste in Malaysia. Therefore, if these issues of the waste are not properly managed and take a long time to solve this problem, so the serious environmental and economic burdens will fall on the general living conditions, reconstruction and as well as general waste for collection process. Without knowing the amount of potential waste generation, environmental officer of the town correctly cannot ask resources for waste collection and disposal. In fact, it seems there is no way to estimate the appropriate amount of waste generation from flood or other natural disasters [2]. But it is not the task that we have to estimate the amount and quantity of the waste generation. Typically there is a lack of accurate historical data about the amount of wastes generated from each disaster.

### 2.1 Disaster

Disaster can be define as "an event that happens suddenly, complex in nature to cause loss of lives, damages to property and the environment and affecting the daily activities of the local community" [3]. Ver & Ry [15] stated that among the types of disaster incidents which are protected under the Policy Disaster Management of Malaysia Directive 20 are: floods, storms, drought, mud-slides; major industrial accidents such as fire and explosion; collapse of buildings, railway accidents; nuclear accidents, aviation accidents that occur on residential or build-up areas; and extensive haze condition that causes environmental stress and affect public order. There are two types of disaster which are natural disaster and man-made disaster. Both natural or man-made disaster have impact on the environment and human [14] in (Karunasena, G., Amaratunga, D. & Haigh, R. 2012).

This study will emphasize the natural disasters that occurred in Malaysia in December 2014 which is floods. Natural disasters are caused by events that occur naturally. Probably those activities conducted by human causing natural disaster. However, the disasters are mostly occurring naturally. Natural disaster occurred due to biological state, geological, seismic, hydrologic, and meteorological conditions for example cyclones, earthquakes, tsunami, floods, landslides, and volcanic eruptions. Condition of disaster that occurred could result in a huge amount of debris and waste depends on nature and their severity. Rate of waste volumes from a single event is equivalent to waste production for a year. These volumes of waste can overwhelming the existing waste management facilities and staff. Irregular disaster management can affect long-term recovery in the affected areas [6]. Various magnitudes of disasters which consist of biological, structural collapse, fires and explosions, landslides and

meteorological events have been suffered by Malaysia. Level of occurrence disaster was very difficult to be predicted. Hence, it affects the affected areas. A list of notable disasters in Malaysia is shown in Table 1 [15].

**Table 1** List of notable disasters in Malaysia

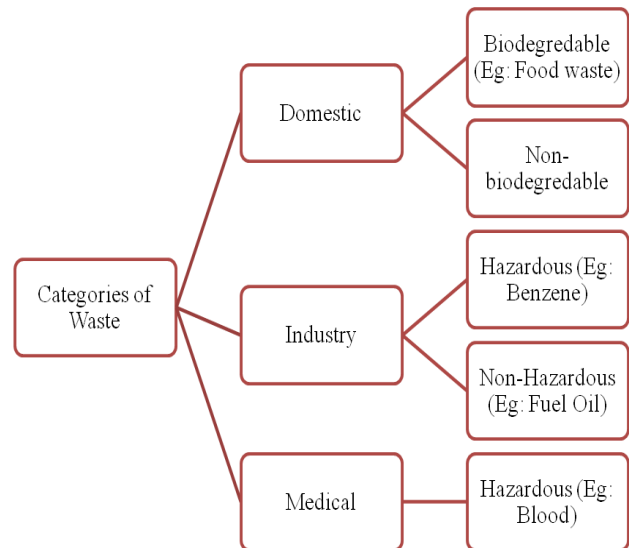
Date	Disaster
19 October 1968	Collapse of 4-Storey Building, K.L
January 1971	Monsoon flood spilled over to West Coast of West Malaysia
31 July 1988	Collapse of Sultan Abdul Halim Jetty, Butterworth, Penang
22 September 1989	Fire at Sek. Agama Rakyat Taufiqiah Khairiah Al-Halimiah Yan, Kedah
7 May 1991, 22	Fire and Explosion of Bright Sparklers
5 April 1992	Fireworks Factory Sg. Buloh, Selangor.
20 Jun 1992	Fire at Sultan Abdul Aziz Shah International Airport, Subang, Selangor.
11 Dec 1993	Choon Hong III Ship, Explosion and Fire, Port Klang, Selangor.
4-7 Dec 1994	Collapse of Highland Towers Condominium, Hulu Klang, Selangor.
30 Jun 1995	Landslides in Cameron Highlands off Genting Highland Road, Pahang.
29 August 1996	Mudslide at the Aborigines' Village in Pos Dipang, Kampar
26 December 1996	Tropical Storm GREG (Typhoon), Keningau, West Coast
24 December 1997	Fire and Explosion, Shell SMDS, Bintulu, Sarawak. 12 Minor Injuries
4 February 1999	Extensive property damage and losses
28 January 2002	Kg. Gelam Landslides Ruan Changkul Simunjan, Sarawak Landslide
26 December 2004	Tsunami ( States of Penang, Kedah & Perlis)
December 2014	Flood (States of Kelantan, Pahang, Perak, Terengganu, Johor, Perlis, Sabah & Sarawak)

**2.2 Waste Management**

According to Did [4], implementation at the local level becomes one of the core factors in succeeding disaster waste management. A resilient disaster management system depends on the involvement and cooperation of all parties including the private sector, NGOs and the public. Cooperation between all agencies to carry out their responsibilities is very important to determine the success and effectiveness of disaster management [9]. Thus, there is a need for a waste management in disaster management guidelines in Malaysia to curb this problem, otherwise the sustainability and environmental problems will not be addressed effectively. As a result, a proposed waste management adaption into disaster management guidelines could be formulated. However, the current body of literature could be explored to identified the guidelines been formulated by the developed countries. Meaning we should learn, adopt and modify from more successful regimes.

Effect of management on disaster waste to life and health could be overcome with effective approach at the same time can recover and redevelop the damage facilities [1]. Unfortunately, current disaster

waste management practice often involves either no action, in which the waste is left to accumulate and decompose, or improper action, in which the waste is removed and dumped in an uncontrolled manner [12]. In the latter case, illegal dumping can create long-term environmental problems that affect the community and create incremental costs when its need the waste to be moved again. This is what happened to the latest flood disasters in Kelantan and Pahang where there are too many waste was dumping along the roadside and no action been taken for a a long period. This condition may lead to other health and environmental problem. These shows that there are gaps need to improve to have an efficient practice of disaster waste management in Malaysia.



**Figure 1** Classification of waste management process [5]

In general, there are three (3) classification of waste management process which are domestic; industry and medical as shown in Figure 1 above. When we know how to classify, then we know how to segregate. The most efficient is segregation method, because it's makes treatment, recycling, and reusing of the waste. Waste can be divided using several categories.

Besides that, Pichtel [13], stated that there are several categories of waste which are Municipal, Hazardous, Industrial, Medical, Universal, Construction and Demolition, Radioactive, Mining and the last one, waste from agricultural. Most of the waste groupings listed above are indeed managed separately, as most are regulated under separate sets of federal and state regulations.

On top of that, it is also very important to know where exactly the source of solid waste in our country. To define the source of municipal waste [8] stated the solid waste in a variety of source which are from residential, commercial centre, institutional, industrial likes from factory and city centre as shown in Table 2.

**Table 2** Sources and types of solid waste

Sources of Solid Waste	Residential (community /house)	Commercial Centre (Small lot shop, office, shopping complex, etc)	Institutional (school, hospital, university, college)	Industrial ( Factory)	City Centre (Road and drainage)
Type of solid waste	Food waste, clothes, newspapers, papers, bottles, can, furniture waste etc.	Vary type of papers and boxes, food container or food waste, bottles, the empty boxes, can etc.	Garden waste, office waste, papers, furniture waste etc.	Office waste, Processing waste, plastic waste, cafeteria waste etc.	Vary type of garden waste, construction and demolition waste, disaster waste likes flood , public waste etc.

### 3.0 METHODOLOGY

#### 3.1 Selecting Case Studies

Observation parameter will be established to observe the current status of disaster waste management in Malaysia. The research will be focussed on selected major post disaster events such as flood in East Malaysia and comparative study will be made based on the parameters identified beforehand. For each case study, qualitative data will be gathered from post-disaster literature (government reports, documents and legislation; practitioner reports etc.)

#### 3.2 Interview

The second phase of data collection will be the interview. Samples will be selected based on professionals involved in disaster waste management. Selected samples should consist of policy makers from government related agencies relevant to disaster waste management. Sampling frame of the target group will be identified before the actual data collections take place. Due to the nature of qualitative research, the data will be collected until saturation point is achieved. It is to mention that this interview result is not discussed in this paper

### 4.0 RESULTS AND DISCUSSION

It is identified that there are few important criteria that need to be considered in order to have a good disasters waste management in Malaysia. There are as follows:

#### a) Organisation and authorisation

It is very important to determine the right contact person responsible to manage disaster wastes. Their roles and responsibilities need to be clear up. Authorities need to establish a Disaster Emergency Authorisation from the public agencies and municipalities by the head of governor. In order to manage disaster waste defiantly it is important to

determine number of trucks and demolition contractors for transportation of rubble.

It is also a need to determine Disaster-Debris Service Providers. Following a disaster, there may be a need to contract with demolition/excavation contractors, debris box haulers, or others to assist in the recovery process.

#### b) Criteria for Waste Recycling / Disposal sites

Location sites should be identified that are accessible to areas particularly susceptible to disasters (e.g. near urban centres, freeway interchanges) - Make a list of possible sites: public and private. -

There are several plan and strategies to develop such as Site Operation Plan and Site Restoration Plan. The chosen sites should be of sufficient size to allow for the storage of disaster debris material and the safe movement of vehicles.

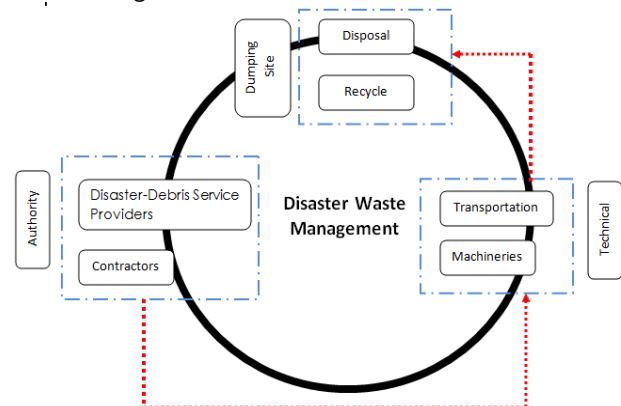
It is very important for the authorities to identify potential sites before a disaster strikes, and to consider permitting and pre-approving the use of identified sites for disaster waste. Everything need to be negotiated before a disaster including of privately or publicly owned land and this can also save valuable time and cost.

#### c) Technical requirements

There are also waste that can be recycle. It is very important to identify the segregation method as this can classifies types of waste to be treated. The following decisions can be made in the pre-disaster mitigation planning:

- Selection of crusher and screening types with address/contacts to supplier and average cost basis.
- Trained personnel at hand to operate the machinery
- Quality control plan for use during the recycling process to ensure recycled material of satisfactory quality.
- Spare parts and service agreements required for the equipment - Diesel and other supplies to be planned for.

With that the solution diagram of disaster waste management containing all criteria is developed. It is shown in Figure 2.



**Figure 2** Disaster waste management important criteria

## 5.0 CONCLUSION

This research will add in to the existing body of knowledge on disaster waste management issues and policies since there are limited resources on the stated area of study. Because of this study is a part of the MOHE (Ministry of Higher Education) under the Fundamental Research Grant Scheme (FRGS) known as Flood Disaster Management Grant. Limited updated primary literature resources are one of the main concerns in preparing this research proposal. The disaster waste management issues are one of the primary concerns in order to ensure the disaster waste is managed wisely. There is a gap in terms of what has been planned and implementation actions in particular disaster waste management. Generally, disaster waste management issues in Malaysia have not been seriously addressed, thus more empirical evidence and research is required to provide information on the current scenario and actions should be taken. From the above, it can be anticipated that this research will generate interests from disaster waste researchers and disaster waste management policy makers, as it will provide fundamental elements towards more rigor disaster waste management policy.

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## References

- [1] Approach, G. 2012. Cabarrus County, North Carolina, (April).
- [2] Chen, J. R., Tsai, H. Y., Hsu, P. C., & Shen, C. C. 2007. Estimation of Waste Generation from Floods. *Waste Management*. 27(12): 1717-1724. <http://doi.org/10.1016/j.wasman.2006.10.015>.
- [3] Council, N. S. (n.d.). National Security Council Putrajaya 1.
- [4] Did. 2009. Government of Malaysia Department of Irrigation Volume 1–Flood Management. 1.
- [5] EnviroNiche-Waste. 2013. Retrieved from <http://www.enviro-niche.com/Waste.html>.
- [6] Engineering, N. R. 2012. Disaster Waste Management : A Systems Approach.
- [7] Flora, A., Bhd, S., Hassan, M. Z., Flora, A., Rangers, E., Flora, A., Zain, M. 2015. Alam Flora Collects 24 , 000 Tons Of Flood Garbage In Kelantan, Pahang, Mohd Zain. (January): 2–3.
- [8] Franklin, Associate. 1999. *Characterization of Municipal Solid Waste In The United State*. Washington: Environmental Protection Agency, EPA.
- [9] Hon Anna Bligh MP. 2010. Disaster Management Strategic Policy Framework. *State Disaster Management Group*. 1: 1-20.
- [10] Karunasena, G., Amaratunga, D. & Haigh, R. 2012. Post Disaster Construction & Demolition Debris Management: A Sri Lanka Case Study. *Journal of Civil Engineering and Management*. 18 (4): 457-468.
- [11] MKN Directive No 20 dated 11th May 1977.
- [12] MSPs. 2009. Draft National Policy for Disaster Management in Kenya. (February): 1-50. Retrieved from <http://www.ifrc.org/docs/idrl/765EN.pdf>.
- [13] Pichtel, J. 2005. Waste Management Practices. In J. Pichtel, Waste Management Practices: Municipal, Hazardous, and Industrial London, New York, Singapore: Taylor & Francis Group. 3-15.
- [14] Shaw, R. 2006. Indian Ocean Tsunami and Aftermath: Need for Environment-Disaster Synergy in the Reconstruction Process. *Disaster Prevention and Management*. 7(1): 5-20.
- [15] Ver, C. O., & Ry, S. T. O. 2007. Disaster Management in Malaysia : Evolution, Development and Future Challenges, (February).