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Research Article

Perception of Flood Waste Management Among Stakeholders in Kelantan

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Abstract

Objective: The purpose of this study is to determine the perception of stakeholder regarding the post-flood waste management system among the stakeholder authority. **Methodology:** This is a qualitative study and using in-depth interview. **Results:** The participants are officers involved in post flood from district council, SWCorp and Alam Flora. Among the criteria taken into consideration during the selection of respondents is having experience in flood waste management and involve in managing problematic areas. **Conclusion:** Researcher determined theme on severity of flood, waste collection, factors of failures and suggestion for improvement.

Key words: Flood, disaster, waste management, stakeholder

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Disaster gives many bad effects to the lives of citizens and the state. Some examples of disasters are earthquakes, tsunamis, hurricanes, volcanic eruptions, floods, fires and terrorism. Over the past decade, a number of major disasters have destroyed the social infrastructure around the world, for examples of earthquake in Sumatra in 2004, Hurricane Katrina in 2005, Sichuan earthquake in 2008 and the earthquake in New Zealand and Turkey in 2011 as well as severe flooding in Thailand¹ in 2011.

Many problems occur affected by the disaster and one of them is the waste problem. The type of waste is categorized by the causes of the disaster, the types of industries in the area, building density and so on. Some aspects of the strategy should be emphasized by those who involved in waste disposal such as including aspects of the capacity of waste, waste handling, trash collection truck, recycling, environmental risks and waste management^{1,2}. In addition, there are some aspects of disaster waste treatment applied by some countries. They dispose the waste by putting it at temporary placement of waste, recycling, waste-to-energy, open burning and land reclamation. Furthermore, the authority should practice the environment aspect of waste management such as considering a large landfill to handle the waste from disaster³⁻⁵.

In Malaysia, flooding considered as one of the worst disasters that could lead to the destroyable of life. Kelantan was affected by the flood disaster in 2014. Previous severe flooding happen about 1927 and 1967, but the flood in 2014 regarded as the worst disaster in the history of Kelantan⁶. According to Chan and Parker⁷ flood on year 1967 had a major impact on the people of Kelantan and an estimated 70% of the places in Kelantan or almost half of the population was affected. In Kuala Krai Kelantan the solid waste⁸ was 30,000 t. Then, unexpected flood happen on year 2014, which destroy almost valuable properties of people and as a result the damaging assets led to the waste. The wastes are from the destroyable house, furniture, electrical goods, cars, mattresses, sofas, uprooted trees, home appliances, clothes, plastic, paper and so on. Besides, the waste mix with the mud, therefore waste management became worst and immediately will give the bad effects in terms of health and comfortable environment^{7,9}.

Based on the study of Guerrero *et al.*¹⁰ flood waste management is a management problem to the authorities that handle waste especially in developing countries due to increasing of waste, high cost of handling waste especially

hiring staff and landfill space and lack of awareness from the public. Various government agencies and NGOs involved in the cleaning process in Kelantan. Among them is the District Council of Tumpat (MDT), Kelantan, Alam Flora and SWCorp Kelantan who has been responsible for solving the issue of waste management. Weng¹¹ suggested that all stakeholders to have collaboration with government and private sector towards the river management for drought and flood preparation.

The NGOs considered as important roles to help the government to tackle the issue of flood waste. The roles of District Council of Tumpat are to establish strategic plan to develop the city, reducing traffic and pollution of the environment council. Whereas, SWCorp also recommend policy, planning and strategy of solid waste management services and public cleansing to the Department of National Solid Waste Management, also they implement, encourage participation and enhance public awareness of solid waste management services and public cleansing. Then, Alam Flora serves as a concession that provides comprehensive waste management services to a number of concessions in certain areas in Peninsular Malaysia, Federal Territory of Kuala Lumpur, Putrajaya and Pahang. Examples of service are waste collection and public cleansing services^{11,12}.

There are many effects from the waste disaster and it should be disposed immediately to prevent environment and people from the bad things. Therefore, study on waste management is essential to avoid all the consequences resulting from the flood. Flood in Kelantan on year 2014 is a disaster and the worst in history of flood in Kelantan. The cause of flood was heavy rainfall and the changes in land use¹³. Another study by Douglas *et al.*¹⁴ stated that the causes of flood can be due to poor drainage system, small river or streams and coastal flooding. An unexpected flood on year 2014 in Kelantan led to the chaos situation in term of waste management, which is the government did not apply their policies before, during and after the flood because of the role of government agencies was disable at that time to help people. As a result, feedback or suggestion from the study will help the government to improve or to have better policies related to the waste management in the future. The objective of this study was to determine the perception of stakeholders on effectiveness, failure factors and suggestions for government policies improvement on flood waste management. The significance of this as it can be used as a suggestion to the policy making by stakeholder. It is hoped that the study will meet the needs of various parties such as District Council of Tumpat Kelantan, Alam Flora, the

Table 1: Severity of flooding

Theme	Sub-theme
Severity of flooding	- Situation during flood R2, Male, Group 1: Flood water last for 3 days and 3 nights. About 80% of Tumpat was submerged R1, Male, Group 2: Flood year 2014 were the worst in Kelantan. My house is like an island and this is not a normal flood - Thickness of mud R2, Male, Group 1: Thickness of mud around a half of feet on the road. Mud is difficult to remove R1, Male, Group 1: The stench of mud caused a problem and take time to clean it R1, Male, Group 2: The flood not only carry water but also mud and dirt

Table 2: Type of waste

Theme	Sub-theme
Waste collection	- Type of waste R1, Male, Group 1: Most of the waste is bulky waste such as furniture, mattresses. It is estimated up to 80% compared to other waste R2, Male, Group 1: Most of the home appliances were damage R1, Male, Group 2: The majority of the waste is bulky waste such as wardrobes, beds and mattresses R1, Male, Group 3: During the flood, bulky waste is too excessive compared to the other waste, so we use open trucks to settle bulky waste - Total of waste R1, Male, Group 1: The average waste collected around 2,900 t and less than 3,000 t and the frequency of garbage collection increase 3 times comparing to usual collection especially after the flooding R1, Male, Group 1: Waste collection is about 120 t for a day for 1 loory that requires 2 times collection R1, Male, Group 2: A total of 60 thousand tons of flood waste have been collected R1, Male, Group 3: Approximately 10-15 thousand tons of waste are collected in Kelantan during the 3 months after the flood

corporation of solid waste and public cleansing management (PPSPPA), SWCorp and JPSPN. This study will help the government to identify main factors that become a problem of flood disaster in the future.

MATERIALS AND METHODS

Target group: A total of 7 respondents are selected based on some criteria. Among the criteria is respondents have the experience in flood waste management and involve in managing problematic areas. Respondents are selected from District Council of Tumpat, SWCorp and Alam Flora.

In-depth interview: In-depth interview session held among the officers of District Council of Tumpat, SWCorp and Alam Flora. The discussion carried out by researchers as moderator. All respondents were briefed concerning the study and the purpose of the research. Respondents were informed that all the information from the discussion will be recorded for the purposes of the study and will not exposed to the public. Questions asked to the subject have been confirmed by the experts group.

Research instruments: The questions of in-depth interview was the structured format of questions, which created by the expert researchers in the related field. Then, the sound recorder used to record for each conversation between the moderator and respondents.

RESULTS

This study involves seven officer from that involve in the waste management of post flood in Kelantan. Their experience in waste management ranging from 4-22 years. The theme of the discussion consist of severity of flooding, waste collection, factor of failures and suggestion for improvement.

Severity of flooding: The water level of flood is very high and destroys almost all the provinces of Kelantan. This severity is treated differently in comparison with the floods in the previous year. Flood severity conditions cause difficulty for authorities to solve remaining wastes after the flood (Table 1).

Waste collection: According to Table 2, bulky waste is mostly collected by local authorities compared the food waste, kitchen waste, clothing, paper, plastic and others. An example of bulky waste is household furniture. The increasing of water level caused the people do not enough time to keep their stuffs. Besides, the total of waste collection increase immediately compared to the previous flood. The flood waste in Kelantan was estimated up to 60,000 t.

Factors of failure: According to Table 3, respondents admit that there should be improvement in stakeholder policies due to lack of transportation for waste materials, inadequate financial provision and no early preparation to face the flood. In addition, the authorities face a few barriers of people's

Table 3: Factors of failures of waste management

Theme	Sub-theme
Factors of failure	- Lack of facilities R1, Male, Group 2: The number of bins and the trucks is not enough R1, Male, Group 1: We only have 4 garbage truck routes. Total garbage truck to collect flood waste we only have 6. In my opinion this shows the lack of transport facilities - Financial problem R1, Male, Group 2: PBT already has a waste management planning....but the execution of planning is very limited and also they have not enough money to execute the plan R1, Male, Group 1: Therefore, I suggest the stakeholder to give the adequate funds for local authorities PBT, to help us in making preparations for landfill space, the funds was not enough to settle the flood waste on time - Unexpected flood R1, Male, Group 2: There is lack of preparation had been done to face the unexpected flooding R1, Male, Group 1: The situation became chaotic because there are no guidelines and no coordination among local authorities, such as SOP - Resident's attitude R1, Male, Group 2: The first group of flood victim that has enter their home has decided the waste that they want to dispose. However, the 2nd group they are not really sure if they still want to use their home appliance that has ruin. Therefore, we have to collect the waste twice on the same area. People do not throw garbage at once and this led the authorities to make collection of waste twice at the same place R1, Male, Group 1: We do the collection within a week and told residents to put their garbage at street, but when it was over the people contacted us again to come and take their waste R3, Male, Group 3: Half of the residents move to their siblings. After 2 weeks we want to collect other area, the residents come back. The last day on waste collection usually I will check again if there is bulky waste before we move on to other area. However there was still new bulky waste. Meaning that the resident remove their waste gradually and that's our challenge to collect it

Table 4: Suggestion for improvement in waste management

Theme	Sub-theme
Suggestions	- Standard Operating Procedures (SOP) R1, Male, Group 2: We will determine the preparation before flood, the preparation in terms of before, during and after flood. We will draw up the guidelines or SOP based on the experience of last year's flood R1, Male, Group 1: We proposed that the higher authorities issued a guideline/SOP for coordination and preparation for the preparation of flood in the future R2, Male, Group 3: We need preparation. As before we get immediate orders and don't have enough time to prepare. Based on our experience need to make early preparation to face the next flood such as logistic department and manpower in order to avoid the chaotic occurred - Allocations of funds R1, Male, Group 1: We would like to propose the stakeholder to allocate a fund to the local authorities to provide adequate funding for the provision of our work - Facilities improvement R2, Male, Group 2: We want to help solving the waste problem especially in Kelantan due to flood. Our suggestion, landfill space should be upgraded R1, Male, Group 1: The local authorities need improvement in terms of adequate transport - Recycling society R1, Male, Group 2: We propose to establish a recycling society. Because our recycle rate is only 10%. We want to achieve 20-30%. It is because everybody produce their own waste. Each person should be responsible for their waste. The waste that can be recycle should be put in special plastic bag

attitude who give less cooperation, while collecting the waste. These led to the failure in helping people to manage the waste.

Suggestions: According to Table 4, some suggestions were mentioned by the authorities such as the District Council, SWCorp and Alam Flora who engaged in flood waste management as a preparation for the flood. The suggestion is to create proper guidelines (SOP) to coordinate all the duties of the officers who involved and upgrade the flow chart in organization. In addition, the provision of adequate funding and facility improvement is also proposed. The stakeholders suggested to establish a recycling society among citizens in Kelantan.

DISCUSSION

To achieve stability in waste management, the role and involvement of some organization is important. Cooperation and coordination between stakeholders such as District Councils, government, non-governmental organizations (NGOs), community involvement and the private sector will further enhance the sustainability of the waste management system¹⁵, According to study of Nakayama *et al.*¹⁶ the authorities recognize the validity of Bangkok flood increase the amount of waste in the aftermath of the flooding in Bangkok, 2011. The parties have estimated the amount of waste generated is in excess of 100,000 t in the affected areas. Bulky waste such as wood furniture accounted for 80% of the rest of floods and other waste by 20%.

In Kelantan, the authorities involved were district council, SWCorp and Alam Flora's managed and collected the waste after the flood. Studies show that the majority of waste collected by local authorities is bulky waste and household furniture. The waste collection after flood arises 2-3 times higher than the daily garbage collection⁸. This resulted difficulties among the authorities to collect waste in a short period. In addition, the broadness of flood area caused the authorities taking a long time to manage the waste. Almost all the areas in Pasir Mas, Tumpat and Kuala Krai flooded and this situation give difficulties to the authorities in order to give full support to all areas. For example, they taking a few months to disposed the waste in Kuala Krai, because of the severity of flood in Kuala Krai compared to other areas.

According to a study by Asiah *et al.*¹⁷, relating to the flood in Perlis on year 2010, the government did provide a program related to the flood to agencies by teaching them to make flood management in more systematic and coordinated. Therefore, the management of flood in Perlis, which began in 2011 considered more systematic than before 2011. Unlike in Kelantan, the study shows that the unexpected flood occurred in year 2014 and this led to the lack of preparation made by the authorities. So, they unable to provide programs or courses related to make preparation for the floods and also campaign of healthcare after the flood. Its show that the need to change the existing policy for the better waste management in the future¹⁸.

Douglas *et al.*¹⁴ in the study of the relationship between climate change, flooding and the urban poor in Africa noted that most local authorities in Africa are lacking of manpower and finance to solve the problem in the flood area. They may be able to create collaboration with NGOs, but they still need to be supported by the state and local authorities to manage flood risk areas. In Kelantan, the lack of transportation of waste materials and manpower by authorities is the delay factor in managing the waste. Besides, a lot of wastes placed at the road and it cause the vehicle of authorities such as the district council difficult to get to the flood areas collect waste. Furthermore waste, which mixed with the thick mud became more difficult and require more time to clear the waste.

Visvanathan and Glawe¹⁵ study on South Asian countries and said that the importance of awareness and public participation are a key step in the implementation of effective waste management system. Therefore, the cooperation of the citizens is an important aspect in the waste management in a city¹⁹. Habits and attitudes of the residents and environmental

education should be given in the early stages of developing public awareness and practice regarding a correct waste management. In Kelantan, there is misunderstanding or miscommunication between residents and the authorities. Some residents give less cooperation to deliver and collect their waste after get the order from authorities. This became more difficult for the government to do the job smoothly. For instance, the authorities need to carry out garbage collection for many times in the same region because residents produced the waste gradually.

The government authorities have some suggestion or planning to deal with flood disaster in the future. Based on study of Zawawi *et al.*²⁰ noted that the need to emphasize some criteria for waste management planning to be included in the Guidelines for Disaster Management in Malaysia. There are several important criteria that should be considered in order to have a better disaster management in Malaysia, which are establishing the good organization and authorization, a way of recycling or disposal of waste and emphasize the technical aspects. In Kelantan, the authorities will upgrade a better planning based on the experience of previous floods, which is increase employment guidelines (SOP) and carry out improvements in terms of increasing the number of manpower and transport.

CONCLUSION

Flood in year 2014 was the worst flood occurred in Kelantan compared to the previous flood disaster. The effect of the flood bring the chaos and challeges to the residents because there are many waste arise and people have to clear the waste gradually according to the schedule by stakeholders. This study wants to assess the perception of the authorities who involved in the flood waste management. The results of this study found that the main cause of flood waste management problems is the ineffectiveness of stakeholder roles such as lacking of facilities, transportation, manpower and financial. Besides, the severity of flood with the thick mud also contributes to the ineffectiveness of management. The authorities need to take a long time to clean the mud, to deal with resident's attitude and clean the waste according to the broadness of flood area. Thus, the stakeholder authorities need to have an procedure to hndle waste for a disaster in the future. They need to upgrade the policies such as implement a new Standard Operating Procedures (SOP), upgrade the facilities, transportation of waste materials and provide an adequate funding provision to change and improve the existence policies.

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