INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 7, Issue 10, (2017) E-ISSN: 2222-6990

Flood Disaster Water Supply: A Review of Issues and Challenges in Malaysia

Koh Liew See, Nasir Nayan & Zullyadini A. Rahaman

Department of Geography and Environment, Faculty of Human Sciences, Sultan Idris Education University, 35900 Tanjong Malim, Perak, Malaysia

DOI Link: http://dx.doi.org/10.6007/IJARBSS/v7-i10/3406

Published Date: 02 October 2017

Abstract

Potable water is essential for the survival of flood victims in flood evacuation centers. This paper review water supply issues during flood events. Several water supply issues experienced by flood victims were identified such as contaminated water resource, scarcity of safe drinking water, flood-related disease outbreak and disruption of water treatment facilities. This paper also discusses on the challenges to overcome the water supply problems during flood such as lack of access to potable water, unable to treat water properly, accessibility of potable water, speedy restoration process of water supply and accessibility of health services. Hence, the management of water supply during the flood should be done efficiently and systematically to ensure sufficient and safe water supply for flood victims. In this effort, roles and cooperation's of various agencies are very important in ensuring the affected flood victims obtain clean and continuous water supply despite flooding.

Keywords: Water Supply, Flood, Issues, Challenges, Management

Introduction

Water is vital for all living things. In the context of science, water can exist in three phases; solid, liquid and gas. Clean water plays an important role to humans for drinking, washing and cooking. About 71 percent of earth surface is covered by water or ice (De Blij, Muller, & Williams, 2004). Before water can be used for daily activities, it was treated and then distributed by the water supply agencies and known as treated water. Each state has their own water supply agency to manage the water resources to ensure it is safe for the consumers. Oftenly, the consumers face problems with water supply during floods events, especially in terms of quality and quantity. This paper provides a brief overview on issues of potable water during flood events. This paper also discusses on the challenges to solve the issues in the form of review the literature from different sources, previous studies of other researchers, books, handbooks and journals related to water supply during flood events.

Background Study

Generally, domestic water supply is treated and clean before distributed for human consumption. Every country has their own procedure service to ensure safe water for consumers. According to Spellman (2008); Koh and Hamirdin (2015), water supply services is a process in which raw water (river or groundwater) are collected, treated and distributed for human consumption. It can be used for various purposes such as agricultural, domestic, commercial and public. In particular, clean water must meet several requirements such as palatable, safe, clean, colourless and odourless, neutral and non-corrosive (Gray, 2008). If the water supply is contaminated, it will affect domestic activities and human health. To ensure the quality of water supply, water supply management play a vital role in ensuring water supplies are clean and safe for consumers. Water is the most manageable natural resources as it is capable of diversion, transport, storage, and recycling (Kumar, Singh, & Sharma, 2005). Water supply management consists of production, treatment or water quality control, distribution and consumption.

The hygienic of water supply during flood events is difficult to achieve if there is no systematic management to ensure the clean water is distributed continuously especially in flood evacuation centers. This possibly due to the water need for domestic uses such as washing, bathing, drinking, cooking in flood evacuation centers by the effected victims. Flood disaster not only deteriorate the economy of the flood victims, but it also pose a negative impact on water resources. Some negative effects of the floods are damaging agricultural production, livestocks, infrastructure facilities as roads, bridges, irrigation systems, flood control structures and loss of life (Lawal et al., 2006; Ibrahim, 2007) as well as water supply. According to PAHO (2002), there are five main impact of floods on water supply system namely (i) destruction of the whole or part of the river water intake, (ii) damage to the water pumping station, (iii) blocked components due to sediment deposition, (iv) loss of water intake area due to changes in the flow of rivers and streams, and (v) pollute or reduce the availability of groundwater.

Issues and problem of water supply during flood disaster

Water sources contamination

Contamination of water resources is a main problem in supplying water during floods. It can affect both surface (river) and groundwater. For the surface water resources, increased surface runoff during floods often turned rivers and streams murky due to the presence of sediment and suspended solid. In 2014, Kelantan was shocked by extreme flood events and have cause rivers become murky. This because the rush of water in the high regions flow down and carried along huge quantity of sediment (Wan Nur Tasnim, Nor Hidayati, & Mohammad Nazir, 2015). This flood event called “yellow flood” because of the flood water yellowish brown with high sediment contents. Groundwater quality will also deteriorate due to contaminate flood water which contains heavy metals. According to the studies carried out by Tawari-Fufeyin, Paul, and Godleads, (2015); Mackay and Taylor, (2013); Pardue et al. (2005) on flood water quality assessment study show that most of the flood water were contaminated with heavy metals such as chromium, copper and zinc. This situation will expose flood victims vulnerable to water pollution with high concentration of toxic contaminants. As reported by Nayan et al. (2016), exposure to heavy metals cause serious health effects including disrupting human growth system, cancer, organ damage, nervous system damage, and in extreme cases it can be fatal or death. Generally, the impact of flood on water sources quality are (i) inundation of water resource by contaminated flood water,

(ii) disruption of access to clean water resources and (iii) deteriorated water quality due to pollution and high level of bacteriological contamination (Shimi, Parvin, Biswas, & Shaw, 2010; Speranza, 2010).

Water scarcity

During flood event, most of the clean water sources will submerged and results clean water become scarce (Bariweni, Tawari, & Abowei, 2012). The victims will experience a shortage of clean water during floods. The water supply problem will get worsens when a large and prolonged floods happen because it will led to an increase in the number of victims then resulting in high demand for clean water in flood evacuation centers. This situation causes victims to experience scarcity of clean water to accommodate a large number of flood victims. The longer the flood period, the longer victims are encountering water problems. March (2002) stated that, loss of clean water resources is a worst long-term effects when disaster occurs and will affect domestic activities in flood evacuation centers.

Waterborne diseases outbreak

Due to shortage of water during flood, victims have to use flood water with poor grade quality for domestic activities such as cooking, bathing and drinking. The use of contaminated flood water will affect the victims health and increase the risk of the spreading of water-borne diseases. This is due to the difficulties in obtaining clean drinking water during flood (Bariweni, Tawari, & Abowei, 2012; Shimi et al., 2010). As reported by Shimi et al. (2010), floods in Bangladesh in 2004 have caused 25 percent of the households used the surrounding flood water with or even without any purification and have caused contamination of various water-borne diseases. Water-borne diseases includes malaria, cholera, eye diseases, diarrhoea, typhoid, skin diseases etc.. The flood affected peoples in Bangladesh are highly vulnerable to water-borne disease during flood such as diarrhoea, dysentery, fever, jaundice, eye and skin infection, etc. and there are very common during all previous floods (Shimi et al., 2010). Leptospirosis is an endemic disease in Malaysia as reported by Benacer et al. (2016). It might have serious adverse impacts on the health of all ages group.

Water treatment facilities disruption

Floods might also caused damage on water supply facilities such as water pumps and water treatment equipments (McCluskey, 2001). As discussed by Sharad, Pushpendra and Vijay (2007); Abbas and Routray (2014); Linscott (2007); Shimi et al. (2010); Mahmood (2004), floods not only affect water resources, but also affect the water supply facilities and damage water treatment plant equipment. The damage has led to water supply systems interruption because the system has been flooded. As a result, clean water are not reachable to the flood victims. According to Rahman, Haque, Khan, Salehin and Bala (2005); M. Shah (2008), prolonged flood could also damage the water treatment facilities. If the water supply facilities was severely damaged, maintenance work will take a long time to restore the system.

Table 1 shows the case studies carried out by previous researchers on the water supply issues during floods events. The review shows that every floods event will trigger similar water supply problems to all countries such as water sources contamination, water scarcity, water-borne diseases outbreak and water treatment facilities disruption.

Table 1:
Issues of water supply during floods according to the case studies

Area	Flood event (year)	Issues	Source
Kelantan, Malaysia	2014	• Contaminated water sources – high sediment content in water	Shaharudin, Nik Ab Rahman, Syakir, Tajul Arifin, & Ab. Kadir (2017)
Kota Bharu, Kelantan, Malaysia	2010/2011	• Waterborne diseases outbreak	Mohammad Muqtada, Nor Ashikin, Arham Muchtar, & Md Azizul (2014)
Johor	2006/2007	• Contaminated water bodies with high conductivity and suspended solids	Lee, Salmijah, Liew, & Tangang (2012)
		• Outbreak of Leptospirosis disease	Badrul Hashim, Norli, & Adam Gaeshraj (2010)
Malaysia	2004-2012	• Contaminated water bodies • Damage the water and sanitation networks • Contaminated safe drinking water • Waterborne disease - Leptospirosis outbreak	Benacer et al. (2016)
Bangkok, Thailand	2011	• Waterborne diseases outbreaks • Disruption of water treatment facilities • Contamination of water supply	Molla, Sangsanont, Thayanukul, & Furumai (2016)
Darbhanga District, Bihar State, India	2010	• Contaminated the local water supply • Waterborne diseases outbreak	Kumar, Cheng, & Singh (2016)
Bhuapur, Bangladesh	2007	• Drinking water sources are often contaminated • Damage to water supply infrastructure • Loss of safe water accessibility • Scarcity of portable water	Hossain, Juani, Shams, Rokonujjaman, & Shafiuddin (2014)
Isoko South, Nigeria	2012	• Waterborne diseases outbreak	Ubachukwu & Emeribe (2017)

Challenges to overcome the water supply problem

Lack of clean water during flood is the worst problem that faced by the flood victims, particularly those in flood evacuation centers. Without potable water, it will cause the vistims health are affected seriously and could reduce their ability to carry out daily activities. There are many challenges to overcome the problems during floods. Lack of access to clean water is a major challenge because most of the water sources have been contaminated by flood water and not suitable for domestic uses, especially drinking. In addition, contaminated water resources with high sediment and suspended solid will complicate the water treatment

process because of high turbidity make it impossible to treat water properly. According to Lala and Lala (2006), water which has smell and bad taste is polluted water and contains microorganisms. Hence, appropriate water treatment is needed to remove disease-causing agents before use.

Hossain et al. (2014) stressed that accessibility for potable water also a major challenge during flood due to road damage. Extreme flood events might cause considerable damage on the existing transportation network. According to Othman and Hamid (2014), a disaster climate such as flood causes the road operation and environment to worsen and also affect the road facilities as well as vehicle safety. As a result, flood victims would lost their contact with authorities. Eventually, potable water could not reach the flood victims. The process of restoration of water supply facilities is a challenge to the water suppliers after flood. Due to the extreme flood occurred, will be badly affectted. This situation will cause the repairing water treatment plant will take a long time to resume and delay in providing water to affectted residents after the floods.

In term of health, the insistence water shortage has caused the victims to use water of unknown sanitary status while most water sources are polluted. This condition causes the victim vulnerable to various diseases and will increase the number of patients who need urgent treatment during flood. Yet, floods will reduce access to health service and can cause changes in the demand in health services (Kumar et al., 2016). Besides that, shortage of staff also is another challenge for hospitals if a major flood occurs. As reported by Kamarul Aryffin et al. (2015), there are almost 50 per cent of the staff from Emergency Department were affected by the floods during the floods in 2014 in Kelantan. Besides that, the flood also given a distressing trauma to victims as they had lost their homes, jobs, properties, livestock and cut off contact with the outside world (Shaharudin et al., 2017).

Conclusion

Flood is one of the natural disasters that left many negative impacts on residents who live in flood-prone areas. Other than causing destruction on properties and plant, it also cause disruption on water supply. As a result, people faced the problem of water resources contamination, water scarcity, water-borne disease outbreaks and water facilities discruption. This paper has briefly reviewed water supply issues during flood and challenges to resolve the issues. The intergrated management and planning are needed to ensure continuous water supply reaching the flood victims. Since the flood is unpredictable, the management of water supply during flood is very important to ensure the affected populations will receive clean and safe water for domestic uses. All governments, non-government agencies and the public must concentrate their efforts in improving the efficiency of the water supply management during floods by overcoming the issues and problems.

Corresponding Author
Koh Liew See
Department of Geography & Environment,
Faculty of Human Sciences,
Sultan Idris Education University,
35900 Tanjong Malim, Perak, Malaysia.
E-mail: liew_see89@hotmail.my

References

Abbas, H. B., & Routray, J. K. (2014). Vulnerability to flood-induced public health risks in Sudan. *Disaster Prevention and Management*, *23*(4), 395–419.

Badrul Hashim, A. S., Norli, R., & Adam Gaeshraj, A. (2010). Leptospirosis during the Johor flood disaster. *Johor Health Journal*, *9*(1), 1–5.

Bariweni, P. A., Tawari, C. C., & Abowei, J. F. N. (2012). Some environmental effects of flooding in the Niger Delta Region of Nigeria. *International Journal of Fisheries and Aquatic Sciences*, *1*(1), 35–46.

Benacer, D., Kwai, L. T., Ng, C. M., Khebir, V., Galloway, R. L., Hartskeerl, R. A., … Siti Nursheena, M. Z. (2016). Epidemiology of human leptospirosis in Malaysia, 2004–2012. *Acta Tropica*, *157*, 162–168.

De Blij, H. J., Muller, P. O., & Williams, R. S. (2004). *Physical geography: The global environment* (3rd ed.). New York: Oxford University.

Gray, N. F. (2008). *Drinking water quality: Problems and solutions* (2nd ed.). Cambrige, New York: Cambrige University Press.

Hossain, A., Juani, R. H. M., Shams, S., Rokonujjaman, M., & Shafiuddin, K. (2014). The challenges and alternatives of water supply and sanitation in flood prone area: A case study for Bhuapur in Bangladesh. In *Engineering and Technology (BICET 2014), 5th Brunei International Conference on* (pp. 1–6).

Ibrahim, M. S. (2007). An overview on disasters. *Journal Of Radiation Research*, *16*(5), 687–703.

Kamarul Aryffin, B., Shaik Farid, A. W., Nik Hisamuddin, N. A. R., Nik Arif, N. M., Tuan Hairulnizam, T. K., Abu Yazid, M. N., & Mohd Roslani, A. M. (2015). The record-setting flood of 2014 in Kelantan: Challenges and recommendations from an emergency medicine perspective and why the medical campus stood dry. *Malaysia Journal of Medical Sciences*, *22*(2), 1–7.

Koh, L. S., & Hamirdin, I. (2015). An analysis of consumers' satisfaction with regard to water supply services in Kelantan, Malaysia. In *Proceedings of International Conference on Human Sciences 2015* (pp. 547–552). Tanjong Malim: Sultan Idris Education University.

Kumar, R., Singh, R. D., & Sharma, K. D. (2005). Water resources of India. *Current Science*, *89*, 794–811.

Kumar, V., Cheng, S. Y. C., & Singh, A. K. (2016). Impact of flood on rural population and strategies for mitigation: A case study of Darbhanga District, Bihar State, India. *Contemporary Rural Social Work*, *8*(1), 45–56.

Lala, M. K., & Lala, K. R. (2006). Health after disaster. *Indian Journal of Community Medicine*, *31*(3), 123–128.

Lawal, B., Mansor, S., Ahmad Rodzi, M., & Abdul Halim, G. (2006). Comprehensive planning and the role of SDSS in flood disaster management in Malaysia. *Disaster Prevention and Management*, *15*(2), 233–240.

Lee, Y. H., Salmijah, S., Liew, J., & Tangang, F. T. (2012). Kesan banjir ke atas kualiti air sungai di kawasan Segamat-Batu Pahat, Johor. In *Banjir besar Johor* (pp. 79–88).

Linscott, A. . (2007). Natural disasters - A microbe's paradise. *Clinical Microbiology New Letter*, *29*(8), 57–62.

M. Shah, A. K. (2008). Disaster preparedness for sustainable development in Bangladesh. *Disaster Prevention and Management: An International Journal*, *17*(5), 662–671.

Mackay, A. K., & Taylor, M. P. (2013). Floodwater metal contaminants in an Australian Dryland River: A baseline for assessing change downstream of a major lead-zinc-silver and copper

mine. *Journal of Environmental Quality*, *42*(2), 474–483.

Mahmood, A. (2004). Flood impacts on rural water supply and sanitation and mitigation options. In *Proceedings of the National Workshop on Options for Flood Risk and Damage Reduction in Bangladesh*. Dhaka, India.

March, G. (2002). Natural disasters and the impacts on health. Retrieved April 2, 2016, from http://www.unisdr.org/preventionweb/files/1911_VL206112.pdf

McCluskey, J. (2001). Water supply, health and vulnerability in floods. *Waterlines*, *19*(1), 14–17.

Mohammad Muqtada, A. K., Nor Ashikin, S., Arham Muchtar, A. B., & Md Azizul, B. (2014). Impact of the flood occurrence in Kota Bharu, Kelantan using statistical analysis. *Journal of Applied Sciences*, *14*(17), 1944–1951.

Molla, N. A., Sangsanont, J., Thayanukul, P., & Furumai, H. (2016). Proper dissemination of information to improve people awareness on flood disaster: A case study of 2011 flood in Thailand. *Applied Environmental Research*, *38*(2), 1–12.

Nayan, N., Mohmadisa, H., Yazid, S., Kamarul, I., Hanifah, M., & Koh, L. S. (2016). Tahap kepekatan logam berat dalam tasik rekreasi di Taman Tasik Taiping, Perak. *Jurnal Geografi*, *4*(2), 36–45.

Othman, M. H., & Hamid, A. A. (2014). Impact of Flooding on Traffic Route Choices. In *SHS Web of Conferences* (p. 01002 p1–p9). EDP Sciences.

PAHO (Pan American Health Organization). (2002). *Emergencies and disasters in drinking water supply and sewerage system: Guidelines for effective response*. Washington, D.C: Pan American Health Organization.

Pardue, J. H., Moe, W. M., Mcinnis, D., Thibodeaux, L. J., Valsaraj, K. T., Maciasz, E., … Yuan, Q. Z. (2005). Chemical and microbiological parameters in New Orleans floodwater fllowing Hurricane Katrina. *Environmental Science & Technology*, *39*(22), 8591–8599.

Rahman, M. R., Haque, A., Khan, M. S. A., Salehin, M., & Bala, S. K. (2005). Investigation of hydrological characteristics of flood 2004 with special emphasis on Dhaka City, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology, Dhaka.

Shaharudin, M., Nik Ab Rahman, N., Syakir, M., Tajul Arifin, M., & Ab Kadir, M. (2017). The paradox of perception and knowledge of flood victims towards flood causes. *Preprints*.

Sharad, K. J., Pushpendra, K. A., & Vijay, P. S. (2007). Chapter 18: Problems related to water resources management in India. In *Hydrology and Water Resources of India* (pp. 871–936).

Shimi, A. C., Parvin, G. ., Biswas, C., & Shaw, R. (2010). Impact and adaptation to flood: A focus on water supply, sanitation and health problems of rural community in Bangladesh. *Disaster Prevention and Management: An International Journal*, *19*(3), 298–313.

Spellman, F. R. (2008). *The science of water* (2nd ed.). Boca Raton: CRC Press.

Speranza, C. I. (2010). Flood disaster risk management and humanitarian interventions in the Zambezi River Basin: Implications for adaptation to climate change. *Climate and Development*, *2*(2), 176–190.

Tawari-Fufeyin, P., Paul, M., & Godleads, A. O. (2015). Some aspects of a historic flooding in Nigeria and its effects on some Niger-Delta communities. *American Journal of Water Resources*, *3*(1), 7–16.

Ubachukwu, N. N., & Emeribe, C. N. (2017). The 2012 flooding in selected parts of Isoko South, Delta State: Assessment of socio-economic impacts. *Mediterranean Journal of Social Sciences*, *8*(1), 353–358.

Wan Nur Tasnim, W. H., Nor Hidayati, Z., & Mohammad Nazir, A. (2015). Knowledge sharing and lesson learned from flood disaster: A case in Kelantan. *Journal of Information Systems Research and Innovation*, *9*(2), 1–10.