

Semarang City's Flood Risk: A Threat to Human Security

Hermini Susiatiningsih¹, Nadia Farabi¹, Satwika Paramasatya¹

¹Department of International Relations, Universitas Diponegoro

Abstract. Flood is a natural hazard because it has the potential of natural disasters. Floods threaten human security, as in the socio-political, economic, and environmental aspects. Natural phenomena in the form of flood that routinely occur in Semarang City during the rainy season, can be considered a disaster if it affects humans and the environment. As a downstream area, Semarang City becomes an abundance of water from the rivers; resulting in flood in the rainy season. The condition is worsened with the characteristics of Semarang City, which makes rainfall in the upstream area to flow downstream rapidly. The community in Semarang City has not been freed from the threat of flood, especially those living in the lower regions. The unique characteristics of Semarang area which consists of highland and lowland and adjacent to the sea, makes Semarang prone to flood. When there is still fear of flood disaster threat around in Semarang, human security still have to be pursued. This study is conducted to find out the cause of high risk of flood disaster in Semarang City, especially from 2013 until 2015. This study also aims to explain how flood as a disaster could damage human security in Semarang City as well and therefore suggest how the government of Semarang City should treat the threat of flood wisely.

Keywords : **flood; disaster; human security; Semarang**

1 Introduction

Semarang City is located in the northern shore of Central Java, Indonesia. The topography of Semarang City consists of hills, lowlands, and coastal area. As it is located in the downstream area, Semarang City becomes an abundance area of water flowing from the river. The condition is exacerbated by the characteristics of the city of Semarang, which makes the rainfall in the fast flowing upstream to downstream. Thus, when the rainy season comes, the water overflows from the river could cause flood mostly in the coastal part of the northern area of Semarang. The increasing level of tidal wave could also become the cause of the coastal flood. The flood and coastal flood happened have a potential to be the source of human insecurity of the Semarang people in social, economic, and environmental aspects.

The government of Semarang City has made numbers of efforts and policies to reduce the risk of flood and coastal flood disasters. The efforts have even been made since the Dutch colonial government, namely by making the channel construction of East Flood Canal and West Flood Canal in the 19th century [1]. Semarang City government also put the flood disaster management as one of the development

priorities in Rencana Pembangunan Jangka Menengah (RPJMD) Semarang 2011-2015. The priority program is called 'Sapta Program' which means seven programs. Sapta Program contains seven points of priority development programs targeted to be completed by 2015. The seven development priority programs are: poverty and unemployment program; rob and flood handling program; public service improvement program; infrastructure improvement program; gender upgrading program; education service improvement program; and health service improvement program [2].

In practice, the Semarang city government targeted a decreasing percentage of the flood inundation area by 50% and increasing percentage of the quality and quantity of drainage system by 50%. The targets is achieved by the implementation of policies focused on: 1) Completion of Package A, B, and C Dam Jatibarang; 2) Normalization of urban drainage channels; 3) Development of polder system and *embung*; 4) Facilitation and development of integrated embankment; and 5) Improvement of institutional capacity of the drainage system. To achieve these targets, the Semarang city government has budgeted about 165.494.670.600 rupiah in the year 2013-2015. The funds are then submitted to the Dinas Pekerjaan Umum Kota Semarang [2].

* Corresponding author: nadia.farabi@live.undip.ac.id

The construction of Jatibarang reservoir was one of the realization of Semarang city government programs in reducing the risk of the flood disaster. This reservoir is located in Kandri Village, Gunungpati District, Semarang City. The construction has been done in cooperation between Indonesia and Japan International Cooperation Agency (JICA). This reservoir began to be initiated after the floods in Semarang City in 1973, 1988, 1990, and 1993 which caused casualties. This reservoir can retain water up to 270 m³ per second. Besides as a tool to control flood, this reservoir also functioned as micro hydro power plant, tourist place, and clean water provider for citizen of Semarang City [3].

Semarang City government also built a drainage system to reduce the risk of flood disaster. The function of the drainage system is to reduce or remove the excessive water and it serves as a water absorber from the surface [4]. The drainage system in Semarang City does not use pure gravity system. The system used is a combination system of gravity drainage system, polder, and sea embankment. This combination system is applied due to the topography type of Semarang [2].

The management of Semarang City drainage system uses the concept of one-watershed-one-plan-one-management. Each drainage system is divided into upstream and downstream areas. The upstream drainage system was developed as a flood canal system to support the lower regions. While the drainage system in the downstream area was developed as a closed drainage system. This system is aimed to prevent the downstream area from receiving excessive water from upstream or coastal flood from the sea. Each subsystem developed with polder drainage system. There are four existing drainage systems: Mangkang, West Semarang, Central Semarang and East Semarang drainage system [5].

The government of Semarang City has also made efforts to normalize the river to prevent the overflow of water in the river when receiving high water debit. In 2010, the Government of Semarang City made efforts to normalize the West Flood Canal and Garang River. In the same year, the City Government of Semarang also normalized the Semarang River by repairing the construction of drainage pumps, floodgates, trash rack, culvert box, ground sill and retention pond [5].

2 Methodology

Rehabilitation of coastal areas has become one of the flood management target mentioned in RKPDP Semarang in 2013 and 2014. The activities of coastal zone management which has been done by the government of Semarang, precisely in Tugu and Genuk District, were the identification of stakeholders, mangrove rehabilitation, development of wave breaker (APO), fish pond diversification and processing business, climate information system development, mangrove forest utilization as ecological function, and education and tourism activities [6].

The social aspect also plays an important role to overcome the flood disaster. In this case, the Semarang city government has made an early flood detection system or Flood Early Warning System (FEWS). This program is a form of Semarang City Government cooperation with the Asian Cities Climate Change Resilient Network (ACCCRN) Indonesia. The construction of FEWS in DAS Bringin is one of the disaster risk reduction measures taken after a great flood disaster happened in 2010. The FEWS was conducted by forming a disaster preparedness group in seven villages in DAS Bringin. The groups then received community-based disaster risk reduction training from the trainers. The FEWS program created a technology-based flood early warning system, the Automatic Water Level Recorder (AWLR) and Automatic Rain Recorder (ARR) in some spots of the area [7].

3 Discussion

A disaster arises as a result of the hazard and the vulnerability of actors facing the potential risks. The flood in the city of Semarang could threaten the human security. The flood itself can be categorized as a natural hazard, although there are certain factors caused by human actions that indirectly lead to the occurrence of such disasters. The flood that occurred in the Semarang City is a water and climatic hazard caused by various natural factors. The hazard potential in nature and will occur if there are trigger events [8]. In this case, the trigger events are land subsidence and sea level increase. The flood as a hazard then can be disastrous for the people of Semarang due to their vulnerability and insufficient adaptation capacity.

The phenomenon of land subsidence in Semarang has occurred in Semarang for more than 100 years. Land subsidence is the cause of the expansion of coastal flood areas, buildings and infrastructure breakdown and increased sea water intrusion. The average rate of land subsidence occurred in 2008-2011 was 6-7 cm per year, while the average rate was 14-19 cm per year. Based on the area, land subsidence were more likely to occur in the northern area of Semarang City [9].

Human activities such as infrastructure development and ground water exploitation became the driving factors of the land subsidence, especially in the North Semarang [10]. The soil structure in this area tends to be sandy so it is very easy to subside [11]. Based on data submitted by Public Works Department of Semarang City, in 2000 there were 670 bore wells used to meet the needs of the industry. Massive groundwater extraction for both domestic consumption and industrial use will reduce the water in the pores of the soil which can subside the soil surface [12].

Sea level rise is the result of climate change. The global warming that occurs causes the melting of glacier at the poles thus increasing the volume of sea water. As an archipelagic country with a coastline reaching 88,000 km, Indonesia is potentially affected by the rise of sea water level, especially in urban

coastal areas such as Jakarta, Semarang, and Surabaya [12] Based on data from the Ministry of Maritime Affairs and Fisheries, the highest sea level rise occurred in 2005-2006 which amounted to 17.8 cm [13].

To determine the vulnerability level of Semarang, the mapping of the actors involved in dealing with such disasters capacity is needed. In this case, the actors are the community of Semarang, Semarang city government and the private sectors. The community's capacity to deal with floods is strongly influenced by the perception of the disaster. Marfai and Hizbaron (2011) in their research have conducted a survey of 40 respondents in the villages Terboyo Wetan and Trimulyo with different educational and occupational background in order to understand the perception of the local community about the tidal flood disaster. The data showed that 32 of the 40 people have already knew that the area where they lived was prone to tidal flood disaster. However, most of them choosed to remain in the area due to economic constraints, better access to downtown, industrial parks and other public facilities, and due to trust and cultural reasons [14]. Therefore, people who chose to stay in the area then made an adaptation of the residence by building a house on stilts, elevating the foundation of the house, raising the yard, and making water reservoir dam [15].

Learning from the Bangkok flood waste, one of the significant issues in semarang flood risk is how to control flood waste [16]. The is not yet a real mitigation plan and method to control flood waste such as infrastructure and logistic preparedness in flood waste management. Moreover, there is not yet found a mapping toward stakeholder coordination for mitigate the risk especially mitigation of flood waste impact. A model for fostering stakeholder intention to promote such as preparedness has been developed by maryono [17], however there is no more literature of experience to fostering the intention especially for anticipating to risk of flood and flood waste in Semarang.

4 Conclusion

Semarang City Government has an important role in the process of community adaptation to coastal flood disaster. The role of government is manifested in the application of physical and non-physical adaptations policies. Physical adaptation is related to infrastructure development and coastal flood control through facilities and infrastructure, while non-physical adaptation is done by providing education and community assistance. Several related agencies such as City Planning and Housing Agency, Public Works Agency, Regional Development Planning Board and Environment Agency plays an important role in this adaptation process (Harwitasari, 2009).

In undertaking the flood disaster mitigation effort, Semarang City Government also cooperates with private parties through Corporate Social Responsibilities (CSR). The of CSR programs have been implemented either independently or integrated

into government programs. The forms of CSR that have been carried out in the field of education, health, social, economic, environmental, and other infrastructure development. Thus, the flood and tidal floods in Semarang City could give an opportunity for companies to engage in community adaptation processes through CSR activities in related fields such as marine and fisheries, public works, housing, transportation and the environment. Nevertheless, the involvement of the private sector in handling the flood disaster in cooperation with the government is still low. Only 16 of 60 development projects have received support from the private sector through CSR (Ma'rif, et al., 2013).

References

1. S. Permatasari, *Strategi Penanganan Kebencanaan di Kota Semarang (Studi Banjir dan Rob)* (Journal of Public Policy and Management Review, 1 (1): **1-10** 2012).
2. Pemerintah Kota Semarang, *Peraturan Daerah Kota Semarang Nomor 12 Tahun 2011 tentang Rencana Pembangunan Jangka Menengah Daerah (RPJMD) Kota Semarang Tahun 2010-2015* (2011).
3. Kementerian Pekerjaan Umum dan Perumahan Rakyat, *Waduk Jatibarang Semarang Di Operasionalka* (2015).
4. D. Wismarini, D. H. U. Ningsih, *Analisis Sistem Drainase Kota Semarang Berbasis Sistem Informasi Geografi dalam Membantu Pengambilan Keputusan bagi Penanganan Banjir" in DINAMIK* (Jurnal Teknologi Informasi 15 (1): **41-51**, 2010).
5. Y. B. Persada, A. Rengga, Maesaroh. *Implementasi Program Pengendalian Banjir Subkomponen C di Kota Semarang* (Journal of Public Policy and Management Review (**1-13**), 2015).
6. R. Yesiana, R. K. Yuniartanti, A. Wulansari, *Pengelolaan Kawasan Pesisir Kota Semarang: Sebuah Potret Berkelanjutan* (Conference on Urban Studies and Development **221-227**, 2015).
7. A. N. Nurromansyah, J. S. Setyono, *Perubahan Kesiapsiagaan Masyarakat DAS Beringin Kota Semarang dalam Menghadapi Ancaman Banjir Bandang* (Jurnal Wilayah & Lingkungan 2 (3): **231-244**, 2014).
8. H. Khan, L. G. Vasilescu, A. Khan, *Disaster Management Cycle - A Theoretical Approach* (Management & Marketing - Craiova (1): **43-50**, 2008).
9. H. Z. Abidin, H. Andreas, I. Gumilar, T. P. Sidiq, Y. Fukuda, *Land Subsidence in Coastal City of Semarang (Indonesia): Characteristics, Impacts, and Causes* (Geomatics, Natural Hazards and Risk 4 (3): **226-240**, 2012).
10. M. A. Marfai, L. King, *Potential Vulnerability Implications of Coastal Inundation Due to Sea*

- Level Rise for the Coastal Zone of Semarang City, Indonesia* (Environ Geol (**1235-1245**): **54**, 2008).
11. D. A. Wibowo. *Spatial Analysis of Anxious Tidal Flood Area at Semarang City* (2006).
 12. M. A. Marfai, L. King, *Tidal Inundation Mapping Under Enhanced Land Subsidence in Semarang, Central Java Indonesia* (Nat Hazards **93-109**: **44**, 2008).
 13. Kementerian Kelautan dan Perikanan Republik Indonesia, *Strategi Adaptasi Dan Mitigasi Bencana Pesisir Akibat Perubahan Iklim Terhadap Pesisir dan Pulau-Pulau Kecil*.
 14. M. A. Marfai, D. R. Hizbaron, *Community's Adaptive Capacity Due to Coastal Flooding in Semarang Coastal City, Indonesia* (Analele Universității din Oradea – Seria Geografie **2**: **209-221**, 2011).
 15. D. Harwitasari, *Adaptation Responses to Tidal Flooding in Semarang, Indonesia* (Thesis, Rotterdam: Institute for Housing and Urban Development Studies, 2009).
 16. Maryono, Nakayama, H., & Shimaoka, T. *Identification of factors affecting stakeholders' intentions to promote preparedness in disaster waste management: A structural equation modeling approach*. *Memoirs of Faculty Engineering Kyushu University*, 74(3), 79-98. (2015).
 17. Nakayama H., Shimaoka, T., Omine Ki., Maryono., Patsaraporn, P., Siriratpiriya, O. *Solid Waste Management in Bangkok at 2011 Thailand Floods*, *Journal of Disaster Research* (8).3, pp.456-464. (2013).