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Community Perceptions and Adaptation Strategies Toward Floods in Pedurenan Village, Tangerang City

Iman Tresnadi¹⁾* & Muhammad Sani Roychansyah²⁾

1) Magister Perencanaan Wilayah dan Kota, Fakultas Teknik, Universitas Gadjah Mada,
Indonesia

2) Magister Perencanaan Wilayah dan Kota, Fakultas Teknik, Universitas Gadjah Mada,
Indonesia

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*Corresponding Email: iman.tresnadi@mail.ugm.ac.id

Abstract

In Indonesia, many cities located along riverbanks are prone to flood disasters. This study seeks to know the people's perceptions of flood and their strategies to cope with floods in the study area. This study was conducted as a field survey in Tangerang city, a suburban area of Greater Jakarta. A qualitative design using a case study approach was used in this research. The study reveals that floods in a suburban area like Tangerang city can be caused by both natural and human factors. The key findings can be summarized as follows. First, people employ some local-level measures to cope with floods, especially as an effort to minimize the impact. Second, as part of flood management in Tangerang city, integrated flood management should be considered. To maintain sustainable development in a suburban area, it will be crucial to create close public and local community relationships through the strengthening of coordination and social capabilities.

Keywords: *Community Perceptions, Adaptation Strategies, Flood Management*

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INTRODUCTION

Sustainable Development Goal 11 aims to make a sustainable city and communities. Moreover, one of the targets is to reduce the number of people affected and the direct economic losses caused by disasters, including flood, with a focus on protecting vulnerable people living in cities or urban areas (United Nations, 2018).

Floods are considered to be the most problematic natural disaster in the world, and due to climate change, the frequency and the magnitude of floods are increasing (Pilla & Lyons, 2018; Sado-Inamura & Fukushi, 2019). Floods can be caused by both natural and human factors (Tingsanchali, 2012). Heavy rainfall combined with the rapid growth of the human population increases the development activities in floodplains, is considered to be one of the biggest causes to contribute flood risk (Pilla & Lyons, 2018).

Indonesia is located in one of the world's areas highly prone to natural disasters. According to data compiled by the National Disaster Mitigation Agency (Badan Nasional Penanggulangan Bencana [BNPB]), more than 1,800 disasters occurred in Indonesia from 2005 to 2015. Over 78% of the incidents were water-

related disasters, including floods (BNPB, 2016).

Like many cities in the flood-prone areas of Indonesia, flooding is a serious problem for Tangerang City, although various efforts have been made to tackle the issue. The occurrence of a series of floods within a relatively short time, and repeated year after year, requires a greater effort to anticipate the problem so that losses can be minimized, since flood hazards can be a hindrance to a city's development for years (Tingsanchali, 2012).

Tangerang City local government tends to put in considerable effort into combating the floods. The authority has introduced several mitigating measures. Despite these actions, people are still impacted by flood hazards, as mentioned above.

Previous studies on coping with floods show that communities differ in their coping strategies, which vary from place to place (Palmiano-Reganit, 2005; Shaw, 2006; Paul & Routray, 2010). These relate to different stages of flooding as well as the differing impact of floods. In terms of reducing damage, Marfai et al. (2015) have identified several local-scale adaptation measures that have already been employed by the communities in Jakarta to cope with flooding. These

adaptation measures include physical and non-physical strategies.

People's responses and strategies to cope with floods vary among different places and human societies (Yevjevich et al., 1994). Therefore, it is important to find out the responses and strategies adopted for facing floods by people living in a suburban area, in this case in Tangerang City.

Tangerang city is located in Banten province on the island of Java, Indonesia. It is about 25 kilometers west of Jakarta. The city is the third-largest urban center in the greater Jakarta (Jabodetabek) region after Jakarta and Bekasi. It has an area of 164.54 square kilometers and had a population of 1,789,601 as of 2010, increasing to 2,139,831 by 2017 (BPS, 2018). Tangerang city has become a flood-prone area due to its relatively flat topography, and because it is also surrounded by rivers (as shown in Figure 1).

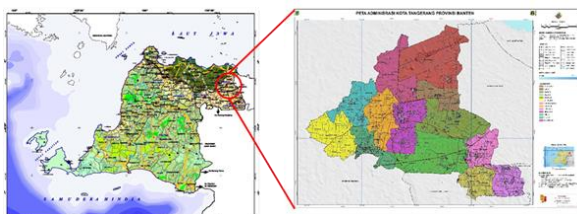


Figure 1. The Location of Study Area
Source: Badan Perencanaan Pembangunan Daerah Provinsi Banten, 2010

Due to time and resource limitations, the household survey of this research was conducted in Pendurenan village in Karang

Tengah district. This study area was chosen intentionally because this is an area in the Angke river basin with severe flooding events. However, the selection of this village was driven by some unique features, as this location is spatially located on the border of the city with Jakarta province about 5 km to the west. In terms of economic activity, most of the labor force work in the non-agricultural sector, mainly in industry and small and micro to medium-large business.

RESEARCH METHODOLOGY

Field survey in Pedurenan village, Tangerang city, was the principal method adopted to collect primary data. A preliminary ground tour was undertaken to look at the current condition of the study area. Field data collection consists of two main techniques, which are questionnaires and interviews. The sample of the respondents for filling the questionnaires was selected by purposive random sampling.

Secondary data were also collected from books, reports, and statistical data bases. Some secondary data like the number of floods, flood-prone areas distribution, and floods impact were taken from local government sources, such as the Regional Planning and Development Agency and the Statistics Agency.

A descriptive approach is used in the study for the data analysis. Original data sets are maintained, to be cross-checked with the tabulated data taken from the survey. In quantitative data analysis, simple quantitative operations using questionnaires are processed. The use of graphs, frequencies, and percentages supports the statistical considerations to describe the socioeconomic factors as well as the responses and adaptive actions in the community.

RESULTS AND DISCUSSION

Socioeconomic characteristics of respondents in Pedurenan Village

Of the 82 respondents surveyed in Pedurenan village, 54% are female, while 46% are male. This shows that the percentage of female respondents is higher than males. This probably happened because the interview during the fieldwork was held in the daytime, when the male as head of the family is mostly out working. The average age of the respondents is 35 years. In addition, the age of the respondents ranges from 22 to 62 years old.

Of the 82 respondents, private employee accounted for the highest percentage in terms of occupation, at 33% of the total, followed by housewife 25%, civil servant 18%, and entrepreneur 17%. The high percentage of respondents being housewives can be

understood since the interview was mostly carried out during daytime when men are working. As regards income, it ranges from <Rp.3,000,000 (20.7%) to above Rp.100,000,000 per month (19.5%), where the highest percentage of respondents is in the income range of Rp.3,000,000–Rp.100,000,000 per month, at 59.6 %.

It is assumed that people living in this study area can be classified as middle-income people, with a stable job and income. Most of the people living in this area can also be considered as a commuter community; they live in Tangerang city but have a job in the neighboring areas such as Jakarta, Bekasi, Tangerang Regency, or South Tangerang.

Variable occupation and income of the respondents are being considered in this study based on the assumption that occupation and income as part of economic characteristics have a close relation with the responses and type of mitigation action to cope with floods.

Community Perceptions and Adaptation Strategies Toward Floods

Tangerang city people living in the Pedurenan village have little awareness of living in a flood-prone area. From the 82 households that have been surveyed, only 47% of respondents realize that they are now living in a flood-prone area, and the remaining

53% do not. Some people perceive floods in their surroundings as a disturbance, but that somehow they can manage living there (73.1%), while others perceive floods as ordinary events (24.3%), and a small number view floods as something that cannot be controlled (2.4%).

flooding, some people usually take part in community works to clean up the environment when the rainy season comes (80%), while others provide mutual help to support the efforts towards preventive actions (20%). People understand that there is a lack of information before floods come to their localities, in terms of an early warning system;

Table 1. People's Perception of Floods

Age	Perception			Total
	Ordinary	Can be controlled	Cannot be controlled	
20-29	3	14	0	17
30-39	17	30	2	49
40-49	0	6	0	6
50-59	0	7	0	7
≥60	0	3	0	3
Total	20	60	2	82

Source: Survey, 2019

The survey reveals that urban flood events can be caused due to natural and human factors. People understand that heavy rainfall in upstream and downstream areas resulting in river overflow is the natural cause (58.4%), and this factor still outweighs the other causes that include human factors contributing to floods, such as bad drainage, garbage, and broken embankments (41.3%). However, the human contributions through urban development also cannot be ignored, as this can cause extreme changes in the natural conditions, and could increase urban flood phenomena in the future.

Preparation for and mitigation of flooding includes action before, during, and after the hazards. For preparation before

only 19% of respondents get early information about likely occurrence of floods.

On a local scale, people have already developed some kind of preparation and mitigative actions for facing floods to minimize the impact. Based on past events and their experience of living in the area, some people have employed some structural measures to their housing in the form of elevating the foundation of the house including the furniture location (48.7%), adding to the floor of the house (3.6%), and making small dikes (2.4%), while others have done nothing to their current house structure.

For mitigation actions during floods, people usually prevent water from coming into the house by using sandbags (12.1%), move items to a higher place inside the house

(31.7%), and some choose to evacuate to another place (3.6%). However, during a flood event, some respondents have no problem and experience no adverse effects at all due to floods; they go about their ordinary life without any mitigation actions.

Even though some people understand that this area is prone to floods and they have experienced much loss due to floods, the desire of people to move is small, with a total of 43%, and people still prefer to stay in the same areas even though they are vulnerable to flooding. Many factors influence people's preference for staying or moving from this area (as shown in Figure 2).



Figure 2. Desire to move and reason to stay
Source: Author Analysis, 2019

Because of fear of losing their assets, people think they do not want to move because it is their own property or something they have got from their parents. This area also has very good access to their workplace and is a strategic location at the border of Jakarta. Others think the land price in this area is more affordable than at other places.

Local Government Flood Management

Flooding in Tangerang city is still a major problem for the government. Many parts of the city, especially areas along the rivers, experience flooding. From the government perspective, this problem is related to an inadequate drainage system, both quantity and quality, and also the rapid growth of urban development and population in the city.

In order to combat floods, the Tangerang city local government still focuses on structural measures. The government approaches flood management focusing on structural works, including building floodwalls, dikes, and embankments, or modifying river channels. Although these measures have achieved some success in managing floods, there is still the possibility that these structures may fail. Failure may happen because floods could occur beyond the design of the protection structures or due to poor maintenance. Also, sophisticated structures need large sums of money, and the cost of the structures may not be feasible in some areas that are prone to floods.

CONCLUSIONS

People in Pedurenan village, Tangerang City, have already employed some local-scale measures to cope with

floods, especially as an effort to minimize the impact. This study found that raising building levels and moving household items have become the main forms of the strategy adopted by the community. Moreover, based on the interviews, it can be inferred that these strategies are not limited to individuals. Several types of coping measures require solid effort from the community. Passive action and lack of concern from the community's members can be a problem for such types of strategies. It is important to support social capital between the people living in flood-prone areas. However, this process requires higher awareness and preparedness of the community.

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