Effectiveness of Adaptive Strategy

by Iwan Rudiarto

The Effectiveness of Strategy Adaptations on Tidal Flood in The Coastal Areas of Sayung, Demak, Central Java, Indonesia

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Abstract. Sayung is one of sub-district of Demak Regency which located in the northside of the coastal area. For the last few decades, the coastal area has become a tidal flood cause of climate change, and human activities that have had an impact on social, economic and environmental aspects. The various adaptation efforts had been done to confronting the tidal flood phenomena. The purpose of this study to identify the effectivity of adaptation's strategy which related to the tidal flood phenomena. The required data includes the adaptation's activities, the financial adaptation's activities, the socio-cultural adaptation's activities that have obtained more than 100 household samples. Those samples have distributed in the four villages namely as Sriwulan, Bedono, Timbulsloko and Surodadi villages in the northside of Sayung sub-district coastal area. The data are obtained by scoring method through the questionnaires. This study can be provided as the effectivity level description of the completed adaptation efforts to decreasing the tidal flood risks or impacts. So that, the results of the efforts were landfill, floor elevations, household-furniture raising, highly effective. But, Sriwulan local people argued that the household-furniture raising was ineffectively being the solution, if it cannot be balanced with the others adaptations for solving the tidal flood phenomena.

1. Introduction

The coastal area is an area which has pressure on natural activity caused by climate change. Besides, the coastal area has had an impact on human activities of which those activities are effected on the land subsidence. One of the ongoing effects includes tidal flood that has become a threat to coastal towns throughout the world. Therefore, it was being issued in society, particularly limited resources in developing countries. Exceedingly, this phenomena also has a significant impact on the financial and social aspects of local people's living.

People have done various adaptation efforts to confront the tidal flood phenomena for the last decades in certain countries [1]. Due in part of Indonesia, which is an archipelago country with more than 81000 km of coastline [2]. It can be said that Indonesia has quite long enough coastal areas, with several disaster problems. One of them being the tidal flood, which is getting envolve in Indonesia. Hence, people are trying to do some adaptation efforts. The adaptation's strategy, which was already done by the local

coastal people, was influenced by the social background and the local government's obligations. The adaptation's approach on each coastal area is inequality. The tidal flood phenomena have a consequence on climate change in Indonesia, along the northside of the Java Island coast in particular. It gives several infrastructure damages, one of those damage's effect in Sriwulan village, which located in Sayung. Besides, Bedono, Timbulsloko, and Surodadi villages are included. Those fourth villages are located in northside of Sayung. They are direct borders of the Java Island and have relatively typographical declivous by the geomorphological condition in form of sandy beaches. Also, they have 13 meter level of enortions per year with 0.6 meter tides level.

Based on Suryanti and Marfai research in 2016 related to the sea surface estimation in Sayung coastal area for about 0,6 - 1,15 meters per year, where are the rates included in the high risk category. By the tidal flood phenomena happened in Sayung coastal areas, they raise the various problems in infrastructure settlement physical conditions. So, people have to do some efforts to decrease the tidal flood risks and impacts, as minimal as they could do. As the development of the Sayung coastal area's people in the global society and local strategy are more involved. Thus, there is a research question: "*Have the people's adaptation strategy already effective toward the tidal flood confrontation phenomena?*"

2. Methodology

2.1 Research study area
North-side Sayung sub-district in Demak which was a direct border on the Java Sea particularly in Sriwulan, Timbulsloko and Surodadi villages. Those fourth villages is impacted directly by the tidal flood phenomena caused by climate change. The tidal flood intensity highly happens, as puddles were deeper, the more time longer were receded. It could spend 6-8 hours, and it will get worse every day. The more areas and land have affected the more dykes will be deep inside of the land. By the changing of the areas and land into the dikes, northside of the Sayung will be impact through the abrasion in the seashore.
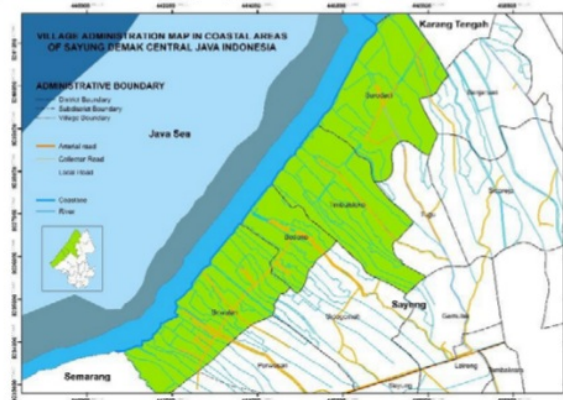

Figure 1. Administration map of Sayung

2.2 The data required
The data required are the data series which are required in the researches. Where the data are needed and those will be submitted during the field survey process. Data presentation is listed, which has the necessary information, source, and types of data. (tabel 1)

Table 1. Data requirement table

No.	Information	Source	Data
1.	Spatial Data: • Landsat picture (1995 & 2015) Administration, Road Network, Topography, Land Use.	Agency for Regional Development (BAPPEDA) Demak Regency , Department of Public Works (Dinas PU) Kab. Demak	Secondary data
2.	Non-spatial Data: • The people's amount • The people's adaptations The tidal flood's height, How long the tidal flood's paddle, the tidal flood's controlling efforts.	Statistic Center Agency Household Survey	Primary Secondary data

2.3 Methodology

Sampling method will be used in research methodology survey techniques. The use of questionnaires has become the primary data suitable for the research population. Besides, the data have obtained by secondary data. Based on the available research data, this study is using quantitative-descriptive approach analysis. So, it represented the next data which will be proposed by the research necessary.

2.3.1   Sampling technique. The research sample expropriation is based on random sampling technique where the whole population can be created a sample by paying attention to the population varieties that determined the exact research population [3]. The sampling population is based on the amount of each population in villages. According to Indonesia Central Agency of Statistics in Sayung on 2018, Sriwulan 3.794, Bedono 914, Timbulsloko 883, Surodadi 804. Those are the result and the amount of the villages that have been doing the population sampling. In the determination of sample population, on each village is using Slovin formula dan have produced the amount of each sample villages population that were being the respondents. (table 2)

Table 2. Samples for respondents in Each Village.

No	Villages	Household Population	Respondents
1.	Sriwulan	3.794	58
2.	Bedono	914	14
3.	Timbulsloko	883	14
4.	Surodadi	804	14

2.3.2   The data analysis technique. The technical analysis that has been done by the research is qualitative-descriptive analysis. It is used to qualify the adaptation effectively, which has been done by Sayung local people through the estimation based on each of the exact indicators. This technique is envolving the respondents to estimate due to its arrangement. The measurement scores are using, 1-4. Where the first score (1) is indicating the ineffective, the second score (2) is indicating the less effective, the third score (3) effective, the fourth score (4) the very effective. Each of the indicators which are

estimated and suited with the criteria indicator of research. These are the following each of the indicator scores (table 3)

Table 3. Indicators and parameters of community adaptation's variables.

Indicators	Criterias	Scores	Informations
Back Road Filling	0,5 m	1	*Ineffective*
	1 m	2	*Less effective*
	1,5 m	3	*Effective*
	2 m	4	*Highly effective*
Village's Embankment	1 m	1	*Ineffective*
	2 m	2	*Less effective*
	3 m	3	*Effective*
	4 m	4	*Highly effective*
Floor Elevations	0,5 m	1	*Ineffective*
	1 m	2	*Less effective*
	1,5 m	3	*Effective*
	2 m	4	*Highly effective*
The raising of household-furniture	10 cm	1	*Ineffective*
	25 cm	2	*Less effective*
	50 cm	3	*Effective*
	100 cm	4	*Highly effective*

Sources: [4,5]

After the local people's assessments are listed toward each criteria. It can be known that each of the score indicators is identified as ineffective, less effective, effective and very effective.

3. Results

This research's located on the Sayung northside coastal area that has focused on the Sriwulan, Bedono, Timbulsloko and Surodadi villages. Those fourth villages are included as the effects of tidal floods phenomena. The data collection have gotten by the questionnaires also the completed data processing. These are the following results:

3.1 The coastal area characteristic
Sriwulan, Bedono, Timbulsloko, and Surodadiare geographically located in the northside of Sayung coastal area. Those are directly bordered by The Java Island, the westside border is on Semarang, the eastside border is on Karangtengah and Mranggen is on the southside. Those fourth villages are 21,12 km^2 in total by the topographical percentages for about 0-2 % above the sea level (MASL). Based on the observation of the village infrastructure condition in the Sayung coastal area, the roads consist of concretes, asphalts, pavings, a layer of soils, while some of the large houses are permanently being ceramics flooring. Besides, some of the houses are permanently soil flooring, the semi-permanently ceramics flooring and soils flooring houses. The villages water purification have already flowed in most of the largely local people. Besides, most of the other local people are using artetion aquifers, and some of them are buying natural water for cooking and drink.

3.2 *The people's structural adaptation toward the tidal flood*

Sriwulan, Bedono, Timbulsloko and Surodadi local people's responds toward the tidal flood phenomena that uncertainly happen in 2-5 hours per day. Furthermore, the puddle's height has been a threat to mental safety and wealthiness. So, it motivated the local people for doing various activities. For instance, water purification management, waste management, also adaptations. Those examples were being the local people backgrounds who are still to stay at their own houses. The reasons are the cheaper low prices, also they are used to familiar with the tidal flood phenomena. The adaptation is a human strategy to responding all of the good change of social and its society in self-adaptation [6]. Some of the example activities which have been done by the local people's coastal area: landfills, embankment buildings, floor elevations, the raising of household-furnitures in the adjustment implementation [7]. Most of the fund resources have gotten by the community self- reliance and the village fund utilization, also the relevant agencies supports. There are some various local adaptation problems. For examples, a lack of civil servants unity and local people who are determined the road construction priority of each orchard.

Based on the adaptation that has been done by the local people is a necessity to be known which is the most effective adaptation by the local people's opinions. It is used to respond to the tidal flood phenomena through the adaptation effectively in terms of local people's views (table 4.). So, it has following results:

Table 4. Adaptation Effectiveness

No	Indicators	Village			
		Sriwulan	Bedono	Timbulsloko	Surodadi
1.	Back Road Filling	Highly Effective	Effective	Highly Effective	Highly Effective
2.	Village's Embankment	Highly Effective	Highly Effective	Effective	Highly Effective
3.	Floor Elevation	Effective	Highly Effective	Effective	Highly Effective
4.	The Rasing of The Household-Furniture	Ineffective	Effective	Highly Effective	Effective

It can be seen that the effectivity table indicator could be known as the most effective adaptation based on the local people's opinions in each village. By doing the people's adaptations divided into two types, those are group adaptation and individual adaptation [8]. The group adaptation has several indicators, such as landfill, where the Sriwulan, Timbulsloko, and Surodadi local people are highly effective and Bedono local people are effective. The other example of group adjustment is embankment buildings which are effectively being the solution for Bedono local people to solving the tidal flood phenomena. By doing the adaptations activities, the Sayung local people are not only using village fund, but also the civil servants and the relevant agencies support.

Figure 2. Back road filling

Figure 3. Village's embankment

The individual adaptation has several indicators that are the floor elevations which highly effectively being the solution for Bedono and Surodadi local people. Besides, the Sriwulan and Timbulsloko local people are argued that floor elevations are not effective to solving the tidal flood phenomena, the another individual adaptation example is the raising of the household-furniture which has been highly effective by the Bendono, Timbulsloko and Surodadi local people. It could decrease and solve the paddle problems that get into the houses. According to Sriwulan, local people argued that the household-furniture raising was ineffectively being the solution, if it cannot be balanced with the others adaptations for solving the tidal flood phenomena.

Figure 4. Floor elevations

Figure 5.The raising of the household-furniture

In spatial, those adaptations on each village can be seen on (figure 6.), where the figure is effectively indicating the adjustment strategies on Sriwulan, Bedono, Timbulsloko villages.
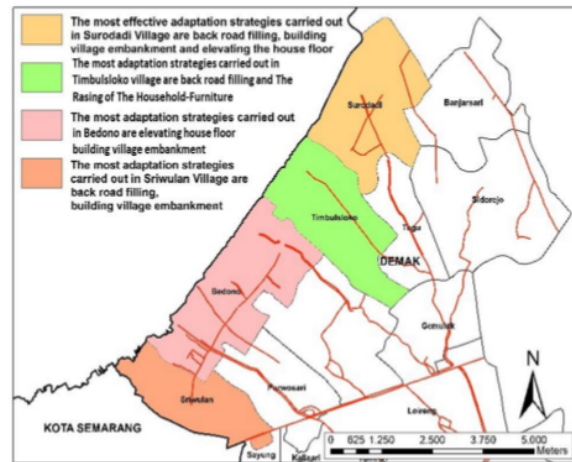
Figure 6. Sayung adaptation strategies map

4. Conclusion

According to the purpose of this study which is explained upon on the discussion. Those can be seen that the previous tidal flood phenomenas on Sriwulan, Bedono, Timbulsloko, and Surodadi have impacts on the houses, roads, bridges, and household-furnitures damages. So, those people are motivated to do the adaptations, whether in a group or individual adjustments. Moreover, it can be seen from the effective estimation of adaptations which have been done by the local people, most of the large adaptations argued in the highly effective until the effective scores. For examples, the landfill, embankment buildings, floor elevations, household-furnitures. But based on Sriwulan local people argued that the household-furniture raising was ineffectively being the solution if it cannot be balanced with the others adaptations for solving the tidal flood phenomena. The adaptation implementation is the use of fund resources have gotten by the community self- reliance and the village fund utilization, also the relevant agencies support. Besides, there are some various local adaptation problems, a lack of civil servants unity and local people who are determined the road construction priority of each orchard. So, there must be a collaboration related to the building priority scales of each sub-district roads.

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