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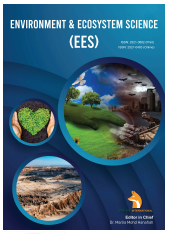

RESEARCH ARTICLE

THE TIDAL FLOOD-AFFECTED COMMUNITY'S PERCEPTION OF ENVIRONMENTAL QUALITY IN PASIRKRATONKRAMAT SUB-DISTRICT PEKALONGAN

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ABSTRACT

Pekalongan City, particularly North Pekalongan District, lies adjacently to the Java Sea. This situation shapes the vulnerability of the District to tidal floods, which have been occurring since 2005. Tidal floods negatively affect the community, as well as the inundated environment. Since 2016, the flooding has reached the areas in Pekalongan Barat District, especially Pasirkratonkramat Sub-District. It affected 1,435 households distributed in 13 Community Units. This research analyzed the community perception of the quality of the environment inundated by tidal floods, including the biophysical and the socio-economic environments. It used questionnaire and performed interviews with 93 heads of household as the respondents, as well as field observation that produced qualitative data of environmental quality. The results of this research presented the tidal flood-affected community's perception of environmental quality, which was determined by education, income, and length of residence in tidal flood-prone locations. Furthermore, the results of community's perception of environmental quality analyses using measuring instruments and statistical tests, i.e., chi-square test and binary logistic regression, supported the research analysis.

KEYWORDS

Community perception, Environmental quality, Tidal flood, Pekalongan, Indonesia.

1. INTRODUCTION

Environmental science can be defined as a study about the physical, non-living and living, surrounding of a society with which it has a reciprocal relationship (Boersema and Reijnders 2009). The environment within the ecosystem and ecological framework is a dynamic space with a variety of interactions and a series of processes that take place inside. Environmental dynamics can be interpreted in terms of positive dynamics such as conservation and biodiversity sustainability and in terms of negative dynamics such as damage, environmental degradation and natural disasters. From an ecological and environmental perspective, environmental degradation is characterized by a decrease in the quality and quantity of the conditions of land, water, air, soil and other physical aspects that can cause crisis, environmental problems and decreasing the quality of the environment from time to time (Marfai and King 2008, Marfai 2013).

Global warming which followed by climate change has become a new disaster in the world. Global warming is moving slowly but clearly and has permanent impact. Global warming has caused the melting of polar ice caps. Increasing sea water temperature causes sea water to expand that the volume of sea water become higher (Marfai 2003, IPCC 2007, Diposaptono et al. 2009, Marfai 2011, Rif'an et al. 2012).

Climate change has impacts in countries in the world, especially in developing countries which has low latitudes will be on the frontline (Mendelsohn 2006). One of them is Indonesia. Indonesia is an archipelago country which is one of the largest archipelago countries in the world which is second in ranks with a coastline length of 81,000 km (KKP, 2017). In Indonesia there are many cities which is located in coastal areas (*coastal cities*). This has become a problem in Indonesia because the impacts of climate change make coastal areas vulnerable to tidal flooding due to rising sea levels and lack of mitigation preparedness to overcome that problem, both structural mitigation and nonstructural mitigation.

Perception is a term from Psychology. The term has various meanings from simple to complex. In etymological studies, perception comes from Latin, from *percipere*, which has the meaning of receiving or taking. In a narrow sense, perception as vision or how a person sees something. Whereas in the broadest sense is a view or understanding, how someone views or interprets something (Sobur 2003). According to Pieter and Lubis (2010) perception is a process of organizing or interpreting something which also give meaning to their lives. Accepting a positive impression will lead to the process of forming behavior.

Perception is a process that is preceded by a sensing process, which is the process of receiving a stimulus by an individual through a sense or also called a sensory process. But the process does not stop, the stimulus continues and the next process is a process of perception (Walgito 2004). Psychologists divide the perception process generally into two general phases namely sensation and perception. Sensation is the process of detecting the presence of stimuli. Perception is a higher process of integrating, recognizing, and interpreting complete patterns of sensation (Pinel 2015).

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The impact of climate change in Indonesia is sea level rise. The consequence is the areas in the north of Java Island is vulnerable to tidal flooding which is caused by sea level rise and coastal erosion (Marfai 2011). Declining environmental quality due to inundation by tidal floods has caused people who live in that location must adapt to the conditions. The adaptation made by the community in Pekalongan City is a manifestation of their desire to remain settled with all their activities despite the economic has decreased due to many rice fields and ponds unable to be used for increasing their economy. Even the condition of the settlement is always inundated with sea water (Sitanggang and Sunarti 2013, Hardoyo et al. 2014, Wulandari 2017, Artiningsih 2018).

Rob is a flood due to the tidal process of inundating the land/coastal area which is lower than the average sea level (*mean sea level*). Tidal process is a vertical movement of sea level due to the influence of force. Intensity of fluctuates according to the position of the moon, sun and earth. Because of the gravitational force, the water will flow to low places and fill the entire space in the lower part (Suryanti and Marfai 2008, Sunarto et al. 2014). Tide enters and inundates the land through coastlines, river channels and drainage (Marfai 2006). The impacts caused by floods are vary, for instance infrastructure damage, cessation of economic activities, transportation, damage to pond fisheries, agricultural land and even damage to water resources (Marfai et al. 2009, Ward et al. 2010).

Pekalongan City has an area that is directly facing Java Sea, namely in the District of North Pekalongan. This has an impact on the vulnerability of the area to tidal flooding (Sitanggang and Sunarti 2013, Hardoyo et al. 2014, Wulandari 2017, Artiningsih 2018). Tidal floods in Pekalongan City have occurred since 2005. Tidal floods have a negative impact on the community and the environment is inundated by tidal floods. Since 2016, tidal floods have reached the District of Pekalongan Barat. Pekalongan Barat District has seven Sub-Districts namely Medono Sub-District, Podosugih Sub-District, Tirto Sub-District, Pringrejo Sub-District, Sapurokebulen Sub-District, Bendankregon Sub-District and Pasirkratonkramat Sub-District. This study examines the perception of people affected by tidal floods in the District of Pekalongan Barat namely in the Pasirkratonkramat Sub-District. This research aims to:

a. Know people's perceptions about the quality of the environment in the area affected by the tidal flood in Pasirkratonkramat Sub-District.

b. Analyze the influence of public perceptions about environmental quality on the decision to remain in the affected area of the tidal flood in Pasirkratonkramat Sub-District.

2. Methodology

This research is a research that used descriptive type survey method to find out how the perception of people affected by tidal floods in Pasirkratonkramat Sub-District, related to the quality of the biophysical environment and the quality of the socio-economic environment and their influence to remain in areas affected by the tidal flood. Figure 1 illustrates the location of Pasirkratonkramat Sub-District that geographically lies between 109^{0}38’50” E to 109^{0}40’13” E Longitude and 6^{0}52’39”S to 6^{0}53’41”S Latitude.

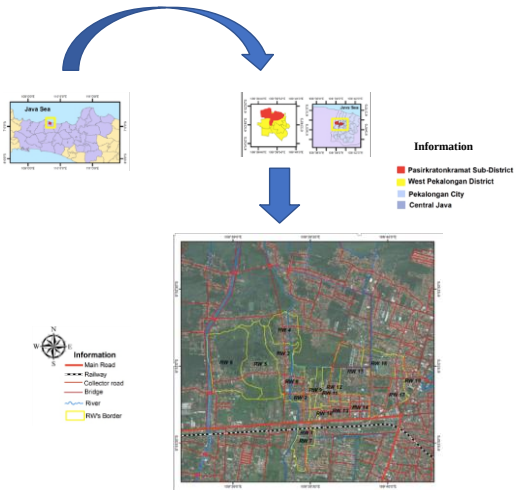

Figure 1: Map of research location (Primary Data, 2018)

Pasirkratonkramat Sub-District was chosen as research location because it was affected by tidal flood since 2016. There were no victims, but the impact could be seen physically and many people moved to safer places to survive. The details of the conditions affected by the tidal flood are presented in Table 1.

Table 1: Details of Conditions Affected by Tidal Flood in Pasirkratonkramat Sub-District 2017

Sub-District	People was Affected	Water level (cm)
Pasirkratonkramat	1435	30-50

Source: Pasirkratonkramat government, 2017

Figure 2: Areas in Pasirkratonkramat SubDistrict which were inundated by tidal floods 21 July 2018

Many houses inundate by tidal flood, 1435 households were identified. Figure 2 illustrates that many houses built very close to river. When the river overflow, it can inundate the houses and reduce sanitation quality in that area. Sea water made the river overflow to the settlements and caused about 30 cm-50cm height of inundation inside the houses.

This research was conducted by questionnaires, books and stationery, cameras and recording devices, avenza software, computer devices and software. The material of this study consisted of satellite imagery, administration map, Pasirkratonkramat Sub-District monograph, profile of Pasirkraton-kramat Sub-District, and Pekalongan city in numbers.

3. Data and Collecting Data

Research was conducted by using descriptive survey method to get answers to the research objectives that have been compiled. A descriptive survey method was used to answer the "How" question. In this study primary data and secondary data were used to obtain data in accordance with the research.

Primary data obtained by the researcher directly, primary data collection was done through 1) questionnaire, 2) semi-structured interviews and 3) field observations. Questionnaires and semi-structured interviews were conducted on 93 respondents who were samples from several RWs in Pasirkratonkramat Sub-District. Field observations were carried out by systematically recording the results of field observations on the condition of environmental quality in the Pasirkratonkramat Sub-District.

Secondary data was obtained by the researcher from existing sources. Secondary data collection included data on the profile of Pekalongan City, Pekalongan City in Figures, Regional Long Term Development Plans (RPJPD) for 2005-2025, Regional Medium Term Development Plans (RPJMD) 2016-2021, Local Government Work Plans (RKPD) 2018, Pasirkratonkramat Sub-District profile and Monography of Pasirkratonkramat Sub-District.

4. Population and Sample

Based on population existence, research methods was included in the sampling research method. How to determine the sample was done using the formula formulated by Yamane (1967) in Sukandarrumidi (2012) are as follow:

$$N = \frac{N}{Nd.d+1} \quad (1)$$

Description :

n = number of samples

N = number of population

d = precision

The population in this study was the number of families affected by tidal floods in Pasirkratonkramat Sub-District as many as 1435 people with a precision of 10%, a confidence level of 90% thus a sample of 93 people could be taken from the calculation as follow:

Table 2: Samples from every RWs

Sub-District	RW	Number of Households	Formula	Sample
Pasirkratonkramat	I	77	77/1435x93=5	5
	II	73	73/1435x93=5	4
	III	70	70/1435x93= 4	4
	IV	201	201/1435x93=13	13
	V	181	181/1435x93=12	12
	VI	290	290/1435x93=18	18
	VIII	119	119/1435x93=8	8
	IX	38	38/1435x93=2	3
	XI	124	124/1435x93=8	8
	XII	193	193/1435x93=12	12
	XIII	17	17/1435x93=1	2
	XIV	39	39/1435x93=2	2
	XV	13	13/1435x93=1	2
Total			**93**	**93**

Source: Primary Data, 2018

Table 2 demonstrates that every RWs in Pasirkratonkamat Sub-District was affected by tidal flood except RW VII, RW X, RW XVI, RW XVII and RW XVIII. The proportion of respondents is described on Table 2. The sample in this research used a random sampling technique. Random sampling is random or indiscriminate sampling. Random sampling is based on solid mathematical principles because it has been tested in practice. In random sampling, all individuals in the population either individually or together are given the same opportunity to be selected as sample members (Hadi 2004). The procedure used for random sampling is randomization from a table of random numbers.

5. Analyze Data

The perception's questionnaire consists of questions that have 5 alternative answers (Table 3). Questionnaires based on the Likert scale scoring system. The perception questionnaire consists of questions that have 5 alternative answers. Each answer has the following values: strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). Likert scale is used to measure attitudes, opinions and perceptions of a person or group about social events or symptoms. In this research, social phenomena have been specifically determined by the researcher. By using a likert scale, the variables to be measured were translated into dimensions, the dimensions are translated into sub-variables and then the sub-variables are translated into indicators that can be measured. Finally, these measurable indicators can be used as starting points for making instrument items in the form of questions or statements that need to be answered by the respondent. each answer was associated with a form of statement or attitude support expressed in the following words:

Table 3: Likert Scale

Positive Statement	Score	Negative statement	Score
Strongly agree	5	Strongly agree	1
Agree	4	Agree	2
Neutral	3	Neutral	3
Disagree	2	Disagree	4
Strongly disagree	1	Strongly disagree	5

Source : Riduwan 2013

Determination of categories using the calculation of class intervals as follows:

$$Int = \frac{Xn-X1}{K} \quad (2)$$

Description:

Int = interval

Xn = Maximum grade observation

X1 = Minimum grade observation

K = Class

Thus, the class intervals in each category are as follow:

Table 4: Interval class each category

Number of Question	Maximum score	Minimum score	Class	Description
49	245	49	2	Bad (49-196) Good (197-245)

Table 4 shows that the questionnaire has 49 questions. Every question has score based on table 3. The maximum score is 245 and the minimum score is 49. This research was classified into 2 categories of community perception namely bad and good. The intervals were divided into two classes namely bad (49-196) and good (197-245).

Quantitative data that has been obtained from the questionnaire was then processed by statistical tests performed using chi square statistical analysis and binary logistic regression statistical test. The purpose of the use of Chi Square was to know the relationship between observed variables as well as to test the hypothesis. The data used nominal scale (Danandjaja 2012). Logistic regression analysis was to see the influence of a number of independent variables (x) on the dependent variable (y) in the form of categorical variables. Binary Logistic Regression is a logistic regression in which the dependent variable is a dichotomous variable or binary variable (Uyanto 2009). This statistic is used to state whether or not there is a relationship between variable X and variable Y as well as to state the amount of contribution of one variable to another expressed in percent. In this study which was the dependent variable (Y) was the result of public perception of the biophysical or socio-economic environmental quality while the independent variable (X) was the decision to remain in the location affected by tidal flood.

6. Result and Discussion

This study examined the perception of the community affected by tidal floods in Pasirkratonkramat Sub-District, Pekalongan Barat District, Pekalongan City. Questionnaires and semi-open interviews were conducted by the researcher on 93 respondents. Questionnaires that have been tested to the community, then tested the validity by using SPSS (Table 5). The total were 54 items, there were items whose value less than r-Table value of 0,204 (N = 93) at 5% significance, thus as many as 5 items were removed from the test because it was invalid. Thus there were 49 valid questionnaire questions.

Table 5: Validity Questionnaires

Number of Questionnaires	Respondents	Description
49	93	Valid

Then the questionnaire items were tested for reliability (Table 6).

Table 6: Reliability Questionnaires

Case Processing Summary			
	N	%	
Cases	Valid	93	100
	Excluded[a]	0	0
	Total	93	100
Reliability Statistics			
Cronbach's Alpha	N of Items		
.918	49		

Based table 6 the Cronbach's Alpha value is 0.918 greater than the Cronbach's Alpha minimum value of 0.60 so that it can be concluded that the instrument used is reliable. The following presents the results of quantitative descriptions from the study.

a. Community perception regarding environmental quality

Table 7: Community perceptions regarding environmental quality

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Good	8	8.6	8.6	8.6
	Bad	85	91.4	91.4	100.0
	Total	93	100.0	100.0	

Table 7 demonstrates the community perceptions regarding environmental quality which included the biophysical environmental quality and the quality of the socio-economic environment. The results show that as many as 91.4% of respondents stated that the environmental quality in Pasirkratonkramat Sub-District which was affected by tidal flood was bad, while 8.6% of respondents stated that the quality of the environment quality was good. The following is a bar diagram of people's perceptions of environmental quality (Figure 3).

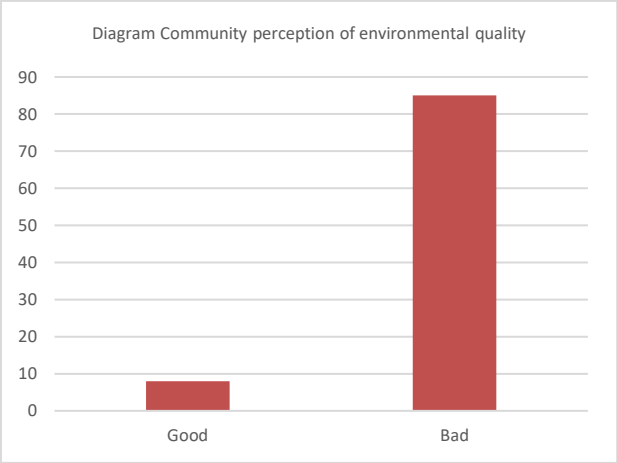

Figure 3: Diagram Community perception of environmental by respondents

b. Community perceptions regarding the quality of the biophysical environment and the quality of the socio-economic environment

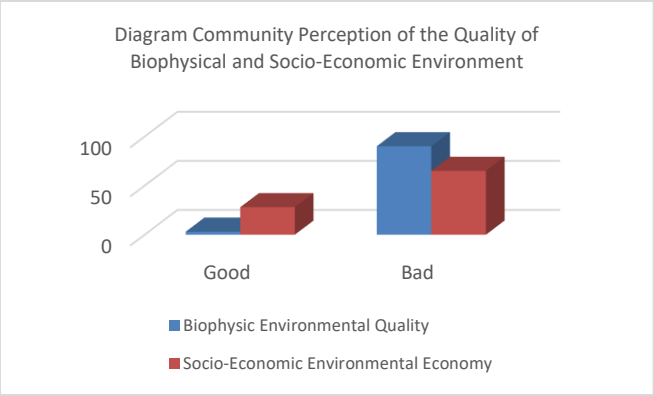

Figure 4: Diagram of community perception regarding biophysical environmental quality and quality of socio-economic environment

Figure 4 shows that the community's perception of the biophysical environmental quality as much as 96.8% of respondents stated that it was bad and 3.2% of respondents said it was good. The biophysical environmental quality which studied were water quality, air quality, soil quality, sanitation conditions, physical quality of the house and infrastructure. In addition, as much as 69.9% of respondents stated that the socio-economic environmental quality was bad, while as much as 30.1% stated that socio-economic conditions was good. Questions regarding socio-economic conditions proposed to respondents included education, health, income conditions, conditions of expenditure, security, social security, services and access and natural carrying capacity.

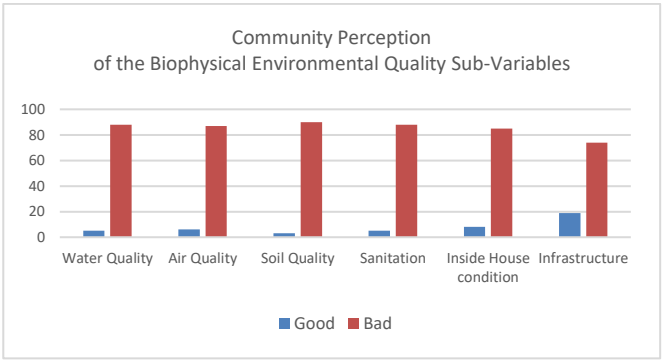

Figure 5: Community perception of the biophysical environmental quality sub-variables

Figure 5 shows that community perceptions of water quality showed that 94.6% of respondents said that water quality was bad while 5.4% stated that water quality was good. Questions regarding the quality of water tested to respondents included physical characteristics and biological characteristics (possibly contaminated with E. coli bacteria). In addition, as much as 93.5% of respondents stated that air quality was bad, while 6.5% of respondents stated that air quality was good. Questions regarding air quality submitted to respondents included temperature, odor and humidity.

Figure 5 shows that as much as 96.8% of respondents stated that the quality of the soil was bad, while as much as 3.2% stated that the quality of the soil was good. Questions regarding the quality of the land submitted to respondents included soil fertility. In addition, as much as 94.6% of respondents stated that the sanitation conditions at the study site were bad, while as much as 5.4% stated that sanitation conditions was good. Questions regarding sanitation conditions submitted to respondents included MCK, household waste, and water channels.

Figure 5 shows that as much as 91.4% of respondents stated that the condition of the house at the study site was bad, while as much as 8.6% stated that the condition of the house was good. Questions regarding the condition of the house submitted to the respondent included the condition of the physical building of houses affected by tidal floods in Pasirkratonkramat Sub-District. In addition, as much as 79.6% of respondents stated that the condition of the infrastructure was bad, while as much as 20.4% stated that the condition of the infrastructure was good. Questions regarding the infrastructure condition submitted to respondents included road conditions and public facilities affected by tidal flood.

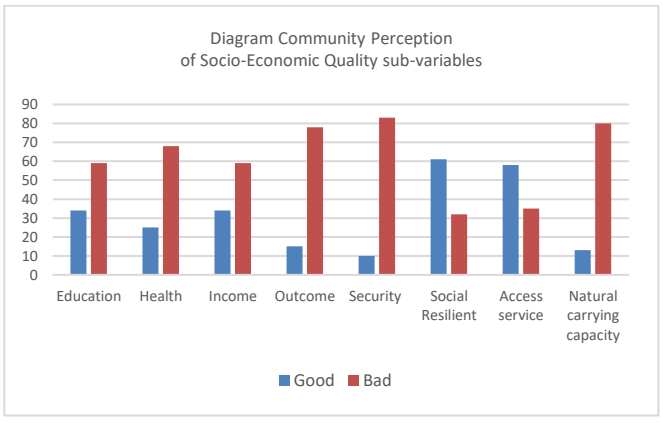

Figure 6: Community Perception of Socio-Economic Environmental Quality sub-variables

Figure 6 shows that as much as 63.4% of respondents stated that the condition of education at the location was bad, while as much as 36.6% stated that the condition of education was good. In addition, as much as 73.1% of respondents stated that health conditions at the study site was bad, while as much as 26.9% stated that health conditions was good. Figure 6 shows that as much as 63.4% of respondents stated that the income condition of the people in the research location was bad, while as

much as 36.6% stated that the income condition was good. In addition, as much as 83.9% of respondents stated that the conditions of public expenditure at the study site was bad, while as much as 16.1% stated that the condition of public expenditure was good. Figure 6 shows that as much as 89.2% of respondents stated that the security conditions at the location was bad, while as much as 10.8% stated that the security conditions was good. In addition, as much as 34.4% of respondents stated that the condition of social resilience at the study site was bad, while as much as 65.6% stated that the condition of social security was good. Figure 6 shows that as much as 37.6% of respondents stated that access service conditions at the study site was bad, while 62.4% stated that access service conditions was good. The table above shows that as much as 86% of respondents stated that the condition of natural carrying capacity at the study site was bad, while as much as 14% stated that the condition of natural carrying capacity was good.

Tested with the Chi Square Test method to determine the relationship between people's perceptions and the decision to remain resident. The following hypothesis then made:

H_o: There is no significant relationship between perception and decision to settle

H_1: There is a significant relationship between perception and decision to settle

Table 9: Statistics between Perceptions and Decisions to Stay

		Decision		
		Stay	Move	Total
Perception	Good	7	1	8
	Bad	75	10	85
	Total	82	11	93

Table 10: Statistic *chi square*

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.004[a]	1	.951		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.004	1	.951		
Fisher's Exact Test				1.000	.650
Linear-by-Linear Association	.004	1	.951		
N of Valid Cases	93				

Significant value of 0.951> 0.05. H_o was accepted, meaning that there was no significant relationship between perception and decision to settle (Table 10). Then performed a binary logistic regression statistical test, namely the independent variable (X) used in the binary logistic regression test, namely the length of stay, education, age and income to the dependent variable, namely perception (Y).

Table 11: Logistics Regression

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	93	100.00
	Missing Cases	0	.0
	Total	93	100.00
Unselected Cases		0	.0
Total		93	100.00

Table 11 shows that the total of 93 samples were observed as much as 100%, no missing samples.

Table 12: Statistic Binary Logistic Regression

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	51.155[a]	.036	.081

R Square Negelkerke shows a value of 8.1% (Table 12) thus it can be interpreted that with four variables, namely income, education, age and duration of residence, perceptions can be explained by 8.1%.

Table 13: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	8.468	8	.389

Table 13 demonstrates the result of Hosmer and Lemeshow Test. The hypothesis of the Hosmer and Lemeshow Test are:

H_o: The model has explained enough data (Goodness of fit)

H_1: The model doesn't explain the data enough

The result of chi square test had a p-significance value of 0.389 (> 0.05) (Table 13) so H_o was accepted. This showed that the model explained enough data (Goodness of fit).

Table 14: Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp (B)
Step 1[a]	length of stay	-.047	.031	2.270	1	.132	.954
	education	-.314	.401	.614	1	.433	.731
	age	.005	.044	.012	1	.911	1.005
	income	-.835	.843	.981	1	.322	.434
	Constant	4.810	2.559	3.535	1	.060	122.749

Hypothesis:

H_o: there is no significant effect between the independent variable and the dependent variable

H_1: there is a significant effect between the independent variable and the dependent variable

Table 14 is the main table of test result using binary logistic regression. The p-value of the significance of length of stay variable is 0.132 (> 0.05), p-value of the significance of the education variable was 0.433 (> 0.05), p-value of the significance of the age variable was 0.911 (> 0.05) and p-value of the significance of the income variable was 0.322 (> 0.05) then it can be concluded that the independent variables namely length of stay, education, age and income did not have significant effect on public perception (H_1 was rejected). Based on the Chi Square test results stated that there was no significant relationship between perception and decision to settle. In addition, using the binary logistic regression test showed that the independent variables consisted of length of stay, education, age and income did not have significant effect on public perception.

The perception of the community in Pasirkratonkramat Sub-District on environmental quality was bad (91.4%). This is in line with Wulandari (2017) which stated that the community of North Pekalongan Sub-District has a perception that tidal flooding has an adverse impact and threaten the community. In spite of that, the Pekalongan Utara Sub-District community has a perception that they are ready to face the risk of tidal flooding. As much as 88% of respondents said they did not want to move from the location of their residence (table 9) which was inhabited even though they were always affected by the tidal flood. Artiningsih (2018) studied the decision making of the community to remain in coastal landscapes containing vulnerabilities to tidal flood determined by the ability to retain assets, through residential investment, and network development as a transactional process between comfort and survival, adaptation and short-term resilience. In addition, Sitanggang and Sunarti (2013) studied in Bandengan Sub-District, Pekalongan Utara District, that tidal flood is common for the community so they are familiar with the conditions that occur.

Based on the results of interviews with respondents, it was stated that the main factor that made them to stay in the location was the socio-cultural factors, namely the sense of mutual benefit felt by the community in Pasirkratonkramat Sub-District. This is in line with the research conducted by Ahmad that one of the capital to form a resilient society in the face of tidal flooding is social capital (Ahmad, 2014). The culture they have run in their hometown, was not easy for them to live in new place, adapt to the new conditions. For them, tidal flood is not something that

makes them forget the spirit of togetherness, precisely because of tidal flood they are more eager to work together repair damaged infrastructure, while carrying out social activities even though they perceive the environmental quality in their place is bad.

The people of Pekalongan City have a unique philosophy of life, *Brayan Urip*. *Brayan* is derived from the word *bebrayan* which means community or settle down, as well as *urip* which means living in a community or living a household. *Brayan urip* for the people of Pekalongan City means an expression of togetherness in doing something without differentiating class or one's origin. Thus it can maintain the balance and justice between groups and between generations in the future. *Brayan Urip* as a philosophy is the embodiment of the pluralism of Pekalongan City and forms an egalitarian (equal) society's character. In this philosophy there are values namely the value of togetherness, justice, and proportional value. The principle used in this philosophy is transparent, accountable, equality and mutual cooperation.

7. Conclusion

The decision to stay in the area affected by tidal flood is not influenced by people's perceptions of environmental quality. The community remains at the location affected by tidal flood despite the place has bad environmental quality. Socio-cultural factors greatly influence the decision to remain resident. The philosophy which is adopted by the community, *Brayan Urip*, which means togetherness in doing something without differentiating class or the origin of a person, makes them feel the suffering of others affected by tidal flood in Pasirkratonkramat sub-distric thus they make the decision to stay with the conditions.

Acknowledgments

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