Flood/Rob Handling Study with Polder System In Port of Tanjung Emas Area Semarang

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*Abstract-*Tanjung Emas Port is located in Semarang City which is the Capital of Central Java Province. Port of Tanjung Emas has a very vital role in supporting the economy of Central Java and surrounding areas as the entrance and exit of goods both regionally and internationally. But the problem of inundation, especially in the port of Tanjung Emas Semarang is a routine problem that can not be resolved and become a scourge for the port service user in the port. The purpose of this research is to know the management of polder system to handle flood disaster in Port of Tanjung Emas Port Semarang both from operational aspect and its maintenance and also evaluate polder system performance as flood / rob disaster management system. This study is a case study, which is to investigate in depth about flood / rob handling system using polder system. The approach method used in this research is descriptive method. Respondents of this research are the parties in the port area that is the manager (PT Pelindo III), port and port hydrological experts both the workers and the harbor. Data collection was done by field observation, questionnaires and interview. Data were analyzed by descriptive analysis.

Keywords: flood / rob handling, polder system, port ofTanjung Emas

1. Introduction

Port of Tanjung Emas has a very vital role in supporting the economy of Central Java and surrounding areas as the entrance and exit of goods both regionally and internationally. The Port of Tanjung Emas has a hinterland area covering Central Java and Yogyakarta. Export commodities from this region are dominant such as furniture, yarns, boards, food and beverages and plantation products such as coffee. However, the port of Tanjung Emas has an environmental degradation affecting the role and service of the port, namely the problem of inundation caused by flooding and tidal sea water, rob.

The problem of inundation, especially at the port of Tanjung Emas Semarang is one of the routine problems that can not be solved. In the event of high tide, the occurrence of rob that closes the pier and even the streets of the harbor. This resulted in disruption of the process of stevedoring (loading and unloading) as well as other port activities.

The cause of the flood / rob disasters resulting from the decrease of soil (land subsidence) and the rising of sea level from year to year. In early February with high rainfall caused flooding which resulted in the activity not being able to run normally, and new water could recede takes a long time. Some solutions to overcome these problems have been done one of them is the polder system.

The objectives of this research is to know the flood / rob management system at Tanjung Emas Port of Semarang using polder system and also for the performance of polder system.

The formulation of problems related to flood / rob disasters is how the performance of flood / rob disaster management system that exist in Tanjung Emas Port of Semarang

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(Polder System)? and also how the management of flood / tidal disaster management system in Tanjung Emas Port Area Semarang (Polder System) both from operational aspect and its maintenance?

2. Literature Review

According to Suripin (2004) flood is a condition where the water is not contained in the drainage channel (time) or the inhibition of water flow in the drainage channel.

While the definition of Rob according to Noson (2000) is a natural phenomenon / phenomenon where the sea water into the territory of the land, at sea surface has tide. The intrusion of sea water can be through river, drainage or underground flow.

The factors causing rob and flood are: (alternative policy of institutionalization of polder system, power point semarang city government slides)

- Rainfall factor,
- Damage factor of Watershed (DAS) retention,
- The error factor of river development planning,
- The factor of shallowness of the river,

The factor of regional mismanagement and construction of facilities and infrastructure,

Community / cultural behavioral factors.

The occurrence of rob in the coastal area of Semarang caused by several causes, namely: first land subsidence / land subsidence and second change of land use coastal area. Flooding in Semarang is caused by overflow of water flowing on channel or river can happen anywhere, in high place and low place.

The problem of flood that hit the port of Tanjung Mas Semarang is still a scourge for the service users of seaport in Tanjung Mas Semarang. Rob floods can occur without knowing the seasons even in the dry season, and in the event of high tide the occurrence of rob that closes the pier and even the roads in the port, this results in disruption of stevedoring process and other port activities. The robust floods caused by the decreasing deletation of soil and seawater also increased in volume and height from year to year. This robot flood problem often creates new problems. One of these mooring vessels is not visible between the dock and the seawater boundary. Flooding in this dock also causes the loading and unloading process pending.

To handle the flood and rob problems, PT Pelindo III created a robot handling program called Polder Sistem. In the construction of polder system in Tanjung Mas Port is divided into 4 (four) clusters, each cluster is made embankment around and installed the pump to remove water that is accommodated in the retention pond. The area of polder system in cluster I is 591,027m2, cluster II of 487,504 m2, cluster III of 544,693 m2 and cluster IV of 292,797 m2.

Polder system is a method of flood handling with completeness of physical facility building, which includes drainage channel, retention pond, water pump, which is controlled as one management unit. With a polder system, flood-prone locations will be clearly defined, so water level elevation, discharge and water volume to be removed from the system can be controlled. Therefore, the polder system is also called a controlled drainage system.

The polder system consists of drainage networks, embankments, retention ponds and pumping bodies. The four elements of the polder system must be planned integrally, so that it can work optimally.

While the definition of the port is a place consisting of land and the surrounding waters with certain limits as a place of government activity and economic activities used

as a place to lean, berthing, up and down passenger and / or loading and unloading of goods equipped with shipping safety facilities and port supporting activities and as a place of intra and inter-wheel transport movement (PP No. 69/2001).

To support the role and function of strategic ports, the availability of port facilities and infrastructure includes:

1) The dock

The jetty is a mooring facility where boats lean to load and drop goods and / or transport and degrade passengers.

2) Warehousing

Warehousing is a facility supporting the marine infrastructure of a port. It is defined as a place to store goods coming from ships or to be loaded onto ships (Sumardi, 2000).

3) Field Stacking

A stacking field is a place that is outside the dock, has the function to pile up items to be loaded onto ships or goods unloaded from the vessel.

While the facilities are located in the port of Tanjung Mas, among others:

a. Wave Breaker

b. Sailing Flow

c. Port Pool

d. Dock

e. Fender

f. Warehouse

g. Terminal area of 3000 m²

3. Research Methods

This study is a case study, which is to investigate in depth about flood / rob handling system using polder system. The approach method in this research is descriptive method. Descriptive method is a method designed to collect various information about the current situation. According to Gay (in Sigit, 2001) defines descriptive research method as an activity that includes data collection in order to answer questions concerning the current state of the course from the subject of a study.

Respondents of this research are the parties in the port area that is the manager (PT Pelindo III), port and port hydrological experts both the workers and the harbor. Selection of respondents mentioned above because in this study the goal is to know the causes, effects and handling of floods and rob that hit the port area. So it takes the respondents who really know and competent in the field of flood and rob in the Port of Tanjung Emas Semarang.

In order to obtain the respondents who are really competent on the final results of this study, the random sampling method used purposively (puposive random samling), that is by determining the sample research based on the considerations of researchers, among others:

- Communities around the port area that has been living for more than 10 years
- Workers working in the port area for more than 10 years
- Hydrologist who has experienced more than 5 years
- Porters with experience of more than 5 years
- Head of PT. Pelindo III

The study sample was determined based on the criteria with the intention:

a) To obtain data or information on flood and rob and impacts that have been caused, including to know the factors causing flood and rob in the Port of Tanjung Emas.

b) To be able to explain academically and scientifically the influence of puddles against the damage of facilities in Tanjung Emas harbor area of Semarang. Also

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known also the existing water system in the city of Semarang in general and Tanjung Emas Port area in particular.
c) To be able to formulate an alternative handling of rob that occurred in the Port of Tanjung Emas Semarang. So that it can solve the rob problem in the port area appropriately.

This study used sample size with Krecjie and Nomogram tables of Harry King specifically for a 10% error rate (Sugiyono, 2002).

$$\text{Sub sampel} = \frac{N_{sub}}{N} \times S$$

Nsub = Sub population
N = Total population
S = sample (provision in Krecjie table)

In this study, the research data is divided into two, namely primary data and secondary data.

(a) Primary data

Data collection in the primary survey is conducted by:
1. Field observation, that is done by observing directly the condition of Tanjung Emas Port area at this time.

The things done in the field include:
Polder System
▪ Identification and evaluation of the drainage network in the research area;
▪ Identification and evaluation of embankment components in the research area;
▪ Identification and evaluation of retention ponds in the study area; and
▪ Identification and evaluation of pump components in the study area.
Supporting Infrastructure Facility
▪ The condition of roads and buildings in the port area such as warehouses, docks and ports of passenger ships;
▪ Port service includes ship service, goods service, terminal service, ground service, water and electricity;
▪ Port area plan drawing;
▪ Puddle conditions such as high puddles, long puddles, puddle frequency and extent of inundated port areas;
▪ Building materials used in each building component;
▪ Evaluate the overall condition of physical existence by visual observation in terms of architecture, structure and utility;
▪ Damage classification;
▪ Identify repair costs incurred in repairing or replacing damages that have occurred;
▪ Identify management efforts in reducing the impact of inundation; and
▪ Noting other important information about environmental conditions.
2. Questionnaires, taking data by using questionnaires done by spreading questionnaires addressed to the respondents who have been determined. Questionnaires are used to obtain extensive data for managers, experts and community and workers in the port area that has been structured question The spread of questionnaires to respondents conducted directly and filled by respondents to avoid the accumulation of data in the population.
3. Interview, in this research interview is used to know information about factors causing the occurrence of rob and its influence on port service, damaged facility and utility

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(b) Secondary Data

   Secondary data is data coming from related institutions. Data collection is done through survey of related institutions. Secondary surveys were conducted to obtain data among others:

- Bappeda Kota Semarang: land subsidence, sea level rise, policy related problems inundation
- Central Bureau of Statistics: hydrological data
- Pelindo III: port conditions, data on inundation behavior patterns, port masterplan, puddle points

The following are the variables used in the impact assessment caused by flood and tidal floods in the Tanjung Emas Port area and how the policy responses undertaken by the manager to address the problem:

Table. 1. Definition of Research Variables

Goals	Goals	Parameters	Data source
Identify the affected port area of rob	High and long puddles that occur	- More than 5 hours / day - More than 3 times / week - More than 30 cm	- Field observation - Interview - Questionnaire
Identify damage to buildings	Condition of warehouse building, dock, port of passenger ship, piling field	- Lightly damaged - Medium damage - Badly damaged	- Field observation - Interview - Questionnaire
Identify infrastructure damage	Condition of road, railway, sanitation and terminal	- Lightly damaged - Medium damage - Badly damaged	- Field observation - Interview - Questionnaire
Port service conditions	Ship service, goods service, terminal service, land servicez	- Do not disturb - Very annoying	- Field observation - Interview - Questionnaire
Penanganan genangan banjir dan rob di kawasan pelabuhan	Solusi, kebijakan dan langkah yang telah dilakukan untuk menangani genangan oleh pihak terkait	- Handling is working and successful - Handling has been running but failed - Not yet handling	- Field observation - Interview

Source: Research Wuryanti, Processed Researcher 2016

   To achieve the goal of knowing the effects of rising sea tide and contribute thoughts to the effort to handle the problem there are several stages of analysis conducted:

1) Analysis of the points on the rob port area affected
2) Analysis of damage to buildings
3) Analysis of infrastructure damage
4) Analysis of port service conditions
5) Analysis of sea tidal handling

 Methods of data analysis of this study include analysis of validity and reliability questionnaire and descriptive analysis.

Descriptive statistical methods used are:

a) Statistical Method Value Percentage, to menyentasekan answers provided by the respondents on each question questionnaire. To calculate the percentage value used the formula (Walpole and Myers, 1986):

$$\text{Value Percentage} = \frac{\text{Data Value}}{\text{Total Data Amount}} \times 100\%$$

$$(1)$$

b) Statistical Method Average Value (Mean), to determine the frequency of each answer given by the respondent. Thus will it be known which of each respondent's answer is more priority situation. To calculate the mean (X), the formula used is (Walpole and Myers, 1986):

$$\bar{X} = \frac{\sum_{i=1}^{n} \bar{x}\,i}{n}$$

$$(2)$$

$\bar{x}i$ = data - i

n = the amount of data

c) Categorization, done by using six criteria, namely:

1 = very low
2 = low
3 = enough
4 = high enough
5 = very high

For more details about the research process from start to finish can be seen in the following research steps. Step research is the steps or steps that must be done during the process of research.
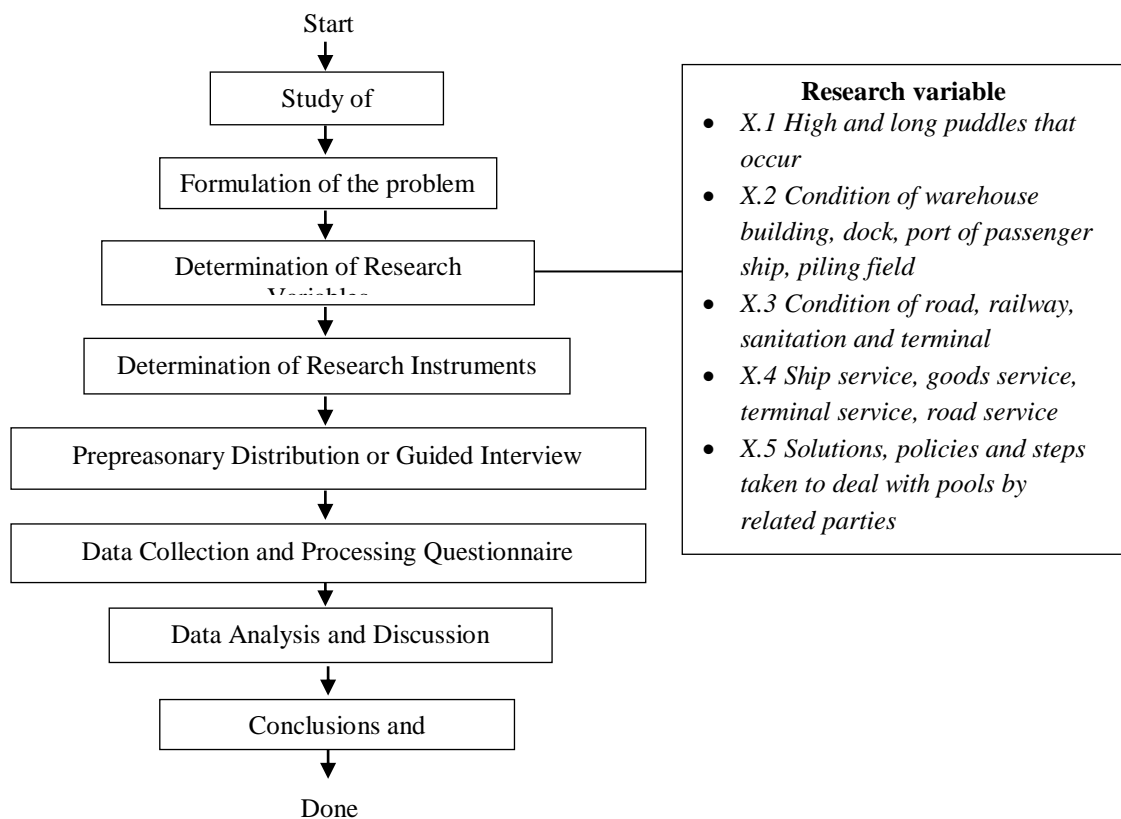

Fig. 1. Flow Chart of Research

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