

## Flood and ROB management in the Pekalongan District

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### Abstract

Tidal floods in the Pekalongan coastal area have been occurring for a long time and are expected to become more widespread. Tidal floods in the Pekalongan area affect various aspects of the Pekalongan coastal area. If there is no significant handling from the Government, both Central, Provincial and Regional Governments, the slum settlements caused by tidal floods in the coastal area of Pekalongan will get bigger and spread to other areas because sea water which rises to land areas every year will cause flooding. rob originating from the shoreline. Rob floods will also cause damage in various sectors and cause losses estimated at than trillions. The aim of handling tidal floods is to increase the carrying capacity of infrastructure and transportation services in the Pekalongan area. This writing uses the method used in writing this paper, namely the literature study writing method. From the results of the analysis that has been carried out, it can be seen that handling tidal floods is a shared responsibility of both the Government and the Community.

**Keywords:** Floods; Tidal floods; Management; Handling; Community; Government

### 1. Introduction

Coastal areas where there is a sea boundary with land areas are lowland areas which have quite high complexity of problems, the northern coastal area of Java Island in urban areas for example is dominated by slum areas resulting from tidal floods which inundate residential areas.

The Pekalongan area, both Pekalongan City and Pekalongan Regency, is no exception, almost all coastal areas experience tidal flooding problems.

The tidal floods that occurred in the Pekalongan coastal area were caused by [11]:

- Sedimentation deposits that reduce the water discharge capacity in rivers;
- Land Subsidence;
- Sea Level Rise and the Effects of Tides;
- Rubbish;
- Damaged condition of flood embankments;

In 2022, the Pekalongan coastal areas affected by tidal flooding were in 5 sub-districts in 20 villages in Pekalongan Regency and 1 sub-district in 7 sub-districts in Pekalongan City [3]. The tidal floods have been going on for the last 5 years and have turned the affected areas into slums because the infrastructure and public facilities are not functioning.

For this reason, serious handling is needed from the government, provincial and district/city governments.

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## 2. Research methods

The writing methodology used in writing this paper is the literature study writing method. The Literature Study writing method is a method of reviewing various reading sources studied from various sources, both print and electronic. Some of the tools used in writing this paper include laptops, internet and printers. The data used is secondary data obtained through the Central Java Province PU SDA TARU Service, Pekalongan Regency Regional Development Planning and Research and Development Agency (BAPPEDA & LITBANG), Pekalongan Regency Public Works and Spatial Planning Service, Pekalongan Regency Regional Disaster Management Agency.

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## 3. Results and discussion

### 3.1. Understanding Rob Flood

Tidal floods are floods where the water comes from sea water. This tidal flood is a flood caused by rising sea water, so that the tidal water inundates the land. Tidal floods are also known as inundation floods. These tidal floods will occur frequently or frequently occur in areas where the surface is lower than sea level. Because it is caused by the overflow of sea water reaching land, the water that is inundated due to tidal floods has a color that tends to be clearer than the water that occurs in normal floods [1].

### 3.2. Characteristics of Rob Floods

If we don't know about floods or don't understand the types of floods. Maybe we would think that cause of flooding what happened was a flood caused by things that commonly cause floods. In fact, if we know, one type of flood and another type of flood have different ways of handling it. Therefore, it would be better if we knew together about the type of flood that occurred [8].

To find out what type of flood is occurring, we can look at the characteristics of the flood that is occurring. All types of floods have their own characteristics. Like this tidal flood. We can see that a flood is said to be a tidal flood from the characteristics or characteristics of the flood itself. Tidal floods themselves have several special characteristics or special characteristics. Some characteristics or characteristics of tidal floods include:

- Occurs when sea water is high tide
- The water color is not too cloudy
- It doesn't always happen when the rainy season arrives
- Usually occurs in areas that have lower land areas than ocean areas.





These are some of the characteristics of tidal floods. So when an area is affected by flooding and has the characteristics as mentioned above, then it is likely that the flood is a type of tidal flood. So, what caused this tidal flood to occur? Anyway, a The flood came because it was triggered by several things. Such is the case with this tidal flood or Rob. Even though we already knew beforehand that tidal floods were caused by high tides, behind the rising sea waters there must be something behind the floods [13].

### 3.3. Factors that Cause Rob Floods

There are several reasons that cause tidal floods. Even though it is not a direct cause, it can also be said that these factors are factors that support the occurrence of tidal floods. Several factors that cause or support the occurrence of tidal floods include [10]:

- Global warming
- Excessive use of ground water
- Clearing of mangrove forests and mangrove forests
- The topographic condition of an area
- Changes in the use of swamp land, lakes, rice fields and so on
- The phenomenon of land subsidence
- Narrowing of river banks
- Throwing rubbish in the river
- Poorly maintained drainage system

Tidal floods are predicted to continue to increase both in frequency and extent in the future. Several images that cause or support the occurrence of tidal floods are as shown in Figure 1.

			
Weeds/Water Hyacinth in the Breml River	Condition of drainage channels that pass through residential areas	Londo Gate downstream of the Pesanggrahan River	Garbage that fills drainage channels

**Figure 1** Various causes of Rob Flood

Several damaged sluice gates and the many small channels that directly connect settlements with rivers are one of the causes of tidal floods. The following is an illustration of the influx of tidal water into residential areas [4].



**Figure 2** Illustration of tidal water entering settlements [7]

### 3.4. Impacts Arising from Rob Floods

All disasters must have a bad impact on anyone who experiences them. Tidal floods are a disaster. Therefore, whether large or small, this tidal flood will certainly have a negative impact on the people who experience it. So, what are the impacts of this tidal flood? Some of the impacts caused by tidal floods include [9]:

- Causing material losses
- Damaging buildings
- Causing the environment to become dirty and muddy
- Spreading germs of disease
- Disrupting traffic
- Scarcity of clean water

### 3.5. Handling Floods and Robs in the Pekalongan Region

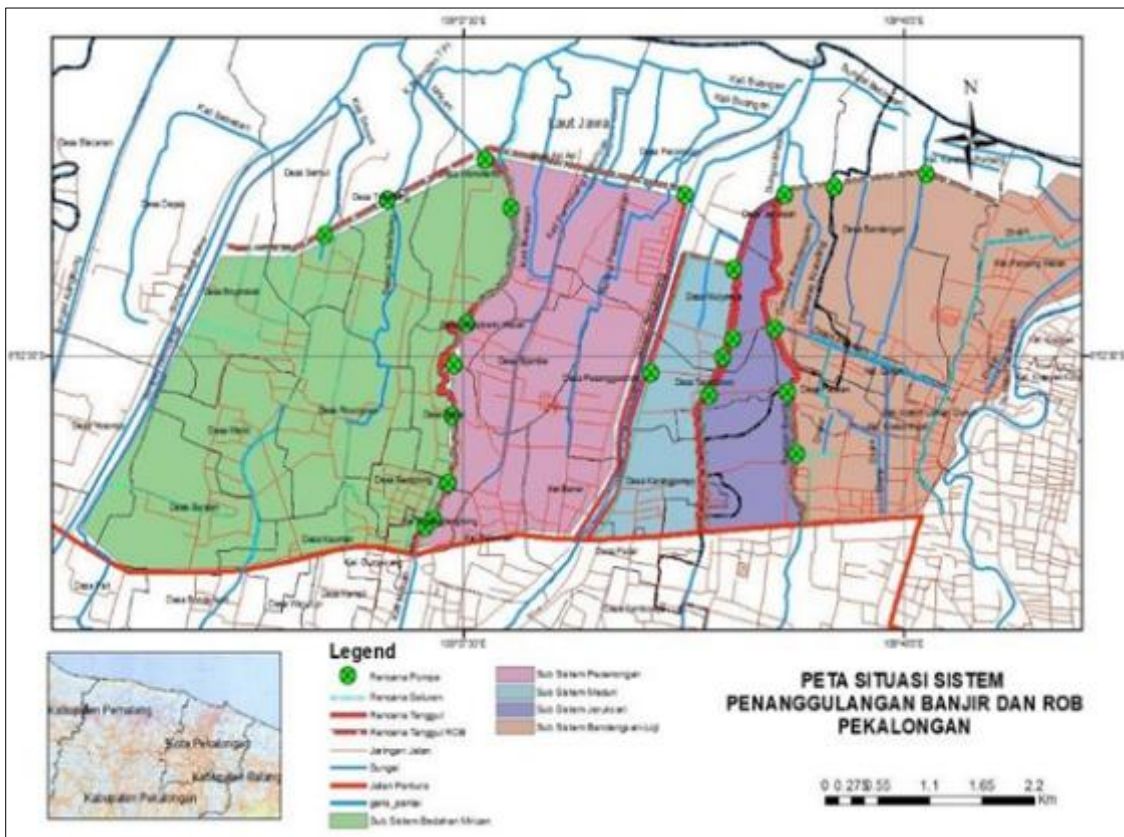
The concept for dealing with tidal floods in the Pekalongan area that will be implemented by the government includes [5]:

- Limiting tidal inflow towards land

- Create a temporary reservoir for water from land that would otherwise be wasted downstream
- Pumping this stored water downstream periodically
- Enlarging the capacity of existing rivers and drainage. Physical development that will be implemented includes:
- Create embankments separating land areas and ponds
- Create a longstorage/carry channel parallel to the embankment separating this ROB
- Procurement of pumps and pump houses to periodically store water in long storage
- Create river embankments and/or raise river parapets that are still not high enough
- Normalizing the Semut, Mrican, Tratebang, Pakuncen, Pesanggarahan, Meduri and Bremit rivers
- Create drain collectors at several locations that require them and provide pumps if necessary so that the water stored in the drain collectors can flow into rivers/sea.

The Rob Embankment has a total length of 7997 km consisting of [6]:

- Section 1 Length 2868 m
- Section 2 Length 2231 m
- Section 3 Length 586 m
- Section 4 Length 2312 m, consists of:
- 1824 m (city) and
- 488 m (district)



**Figure 3** Embankment and Long Storage Construction Plan

Apart from the physical work mentioned above, it is also necessary to normalize rivers that have experienced sedimentation. River normalization in Pekalongan Regency and Pekalongan City is at 13 (thirteen) river locations as described below [2]:

**Table 1** Location of the river that will be normalized

No.	Description	Location Normalization	Watershed area	River Length	River Discharge	
			(km <sup>2</sup> )	(km)	Q2 (m <sup>3</sup> /sec)	Q10 (m <sup>3</sup> /sec)
1.	Location of the river that will be normalized	New Sragi	254.17	60.12	192.41	366
		Silempeng	18.05	8.2	14,16	35.05
		Semut	1.03	1.68	2.02	4.49
		Tratebang	4.61	3.98	6.3	11.95
		Mrican	8.3	14,13	6.68	14.21
		Pakuncen	2.15	3.88	2.64	6.61
		Pesanggrahan	3.03	4.33	5.66	14.76
		Sengkarang	251.39	50.06	289.07	612.18
		TPI		1,307		
		Bebel		1,779		
		Bebel Canal		1,466		
		Bremi	21.56	8.61	19.03	43.69
Meduri	21.13	10.57	14.29	35.61		

- The normalization design was carried out on several rivers and drainage areas in the flood and Rob Pekalongan areas, namely the Semut River, Tratebang River, Mrican River, Pakuncen River, Pesanggrahan River, Bremi River, Meduri River. The need to normalize rivers and drainage channels is to provide sufficient storage capacity when floods come from land [12]. Moreover, the current conditions on the ground are that the river and drainage are in a condition where they are silting up and cannot accommodate the planned flood discharge. The construction of parapets or embankments is needed primarily to anticipate the flow of back water due to closed river dams. Even though it has been channeled into longstorage, this back water flow continues to occur.
- Apart from river normalization activities carried out at several river points located in Pekalongan Regency and Pekalongan City, another activity carried out is the construction of tidal embankments. The purpose of building this tidal embankment is to anticipate the impact of tidal waves which often occur in the Pekalongan coastal area. The locations for constructing tidal embankments in this activity are 4 (four) sections. Then the section specifications made at each location can be seen in table 1 below.
- Apart from that, planning for the construction of this embankment requires protection of the embankment cliffs with the following criteria:
  - The part of the embankment that is affected by tidal fluctuations can be protected by adding rip-rap, while the upstream part can be protected simply by planting grass;
  - The parts of the embankment that are not exposed to water do not require protection
- Making Long Storage. The longstorage is planned to be parallel to the Rob embankment, and is intended as a temporary water storage area. The water stored here is water from land/rivers/drainage in the secured area.
- Flood and Flood Management, Taru PU SDA Department, Central Java Province in 2017
  - Done Activity Repair And Development Infrastructure And Infrastructure Flood Control and Beach Security;
  - Construction of a 150 m long wave barrier;
  - Located in Panjang Wetan Village, North Pekalongan District, Pekalongan City
- Flood and Rob Management Plan for Taru PU SDA Department, Central Java Province for 2019
  - Carrying out activities to repair and build infrastructure and infrastructure for flood control and beach security;
  - Construction was carried out to strengthen the river bank with 350 m Sheet Pile construction;
  - Located in Wonokerto Village, Panjang Wetan Village, North Pekalongan District, Pekalongan City

- Recommendations for preventing the destructive power of water-related disasters
  - Carrying out outreach to change the mindset that water is a part of life which is a blessing from God Almighty that must be grateful for.
  - Make systematic efforts to encourage all stakeholders to be willing to change the paradigm of overcoming flood problems which relies more on structural efforts to become Integrated Flood Management.
  - Conduct performance audits and improvements to all flood control infrastructure and drainage networks that have been built, so that they are more adaptive to the dynamics of flood problems with the support of adequate institutions and resources.
  - Building public awareness so that they can understand that the physical infrastructure that has been built has limited capacity to control floods, as well as preparing public awareness and preparedness to face the possibility of floods of a larger scale and level.
  - Encourage relevant Ministries/Agencies to immediately carry out evaluations regarding the effectiveness of flood problem handling activities within their respective agencies, so that they are not only based on momentary ideas, are reactive, are not coordinated with the activities of other agencies, even ignore standard planning procedures, and the rationality of their feasibility is doubted.
  - Determine more proportional and optimal action options and implement them systematically and consistently in accordance with the strategic directions set out in the National Water Resources Management Policy and its follow-up plans, by prioritizing the implementation of activities including the following:
    - Determining a map of water-related disaster-prone areas as a reference in preparing RTRW and controlling space utilization;
    - Carrying out construction and management of drainage in productive areas, urban areas, roads and rivers into a flood control system;
    - Increasing the adaptive capacity of communities living in flood-prone areas;
    - Initiate the formation of effective cooperation patterns between upstream and downstream areas in flood management;

Determining areas that have flood retention functions, river borders, lakes and reservoirs;

- Increasing the availability of flood control infrastructure to protect public infrastructure, residential areas and productive areas;
- Develop forecasting and early warning systems to reduce the risk of loss due to flooding;
- Increase knowledge, preparedness and ability of the community in dealing with disasters caused by the destructive power of water;
- Improving flood management systems and procedures to improve disaster management performance due to the destructive power of water;
- Establish a budgeting system that is conducive to emergency conditions to realize a quick response in overcoming the destructive power of water;
- Carrying out rehabilitation and reconstruction of damaged infrastructure, as well as restoring environmental functions by allocating sufficient funds in the APBN/APBD, and other funding sources;
- Developing the participation of the community and the business world in coordinated activities for recovery from water damage disasters, by encouraging the formation of disaster preparedness community organizations as the main partners in disaster mitigation efforts;
- Increasing community motivation and the contribution of the business world in implementing water resource conservation activities and controlling the destructive power of water with various forms of incentives to the community.

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#### 4. Conclusion

From the results of the study that has been carried out, several things can be concluded as follows:

- Floods and tidal waves in the Pekalongan area have caused damage to houses, road infrastructure, public facilities such as schools and health services, sanitation, yards, dry fields, rice fields and fish ponds;
- Floods and tidal waves in the Pekalongan area are a shared responsibility of both the Government and community groups, to change lifestyles to instill a culture of clean living.
- To reduce land subsidence, it is necessary to limit and/or stop the use of groundwater through deep wells.
- It is necessary to form institutions that involve the Government and the Community in controlling floods and tidal waves as well as maintaining tidal and tidal control infrastructure.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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