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The Impact of Environmental Changes and the Damage to the Structure of Beach Buildings in the Southeast Jazirah of Saparua Island, Central Maluku District

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Abstract— *The coastal border is a certain area along the coast that has important benefits for maintaining the sustainability of coastal functions. The criterion for a coastal boundary is land along the edge whose width is in accordance with the shape and physical condition of the beach, at least 100 m from the highest tide point towards the mainland. Shoreline change is a series of coastal processes caused by external factors (currents, waves, winds and tides) and internal (characteristics and types of sediments and the base layer where the sediments are located). Shoreline changes will refer to sedimentary activity and deposition, namely the deposition of rock material that has been transported by hydropower or wind that occurs on the coast. The purpose of this paper is to determine environmental changes to coastal damage in the Southeastern Peninsula of Saparua Island and to analyze the damage to coastal structures that occurred in the Southeastern Peninsula of Saparua Island. The entire coastal building that was damaged by abrasion was the seawall. The benchmark for damage to the coastal environment from settlements and public facilities is with a weight of 200% and priority. While the agricultural area is with a weight of 100 and is less prioritized. Evaluation of the damage assessment of the coast of the Southeastern Peninsula which consists of 4 villages, namely Ouw Village, Ulath Village, Siri Sori Islam Village, and Siri Sori Serani Village with an importance weight coefficient of 1.00. The review was carried out based on the damage to the building that occurred, namely from STA 00+500 (with a building condition index of 3.4; Needs repair), STA 00+1500 (with a building condition index of 4; Heavily Damaged), STA 00+2000 (with a building condition index 3; Needs Repair), STA 00+3200 (with a building condition index of 3; Needs Repair), and STA 00+3600 (with a building condition index of 4; Heavily Damaged).*

I. INTRODUCTION

Coastal protection or protection structures are a type of building in the field of Civil Engineering designed to protect and secure beaches from erosion/abrasion and coastal/rob flooding, maintain estuary stability to support navigation traffic, and revitalize coastal areas. Some coastal protection structures often suffer damage, both minor damage and major or severe damage. Apart from natural factors, the damage also occurs due to failure of the lower structure (settlement occurs) due to the building's own weight/structure, concrete quality, and structural stability. Besides the two types of damage to the protective structure above, structural damage can also occur due to design errors or building layout.

One of the environmental problems that exist in coastal areas is the change in coastline caused by abrasion. Abrasion is a process of eroding the beach by the destructive power of waves and ocean currents. That way, abrasion can threaten damage to aquaculture, rice fields, settlements and buildings bordering sea water. Coastal abrasion is one of the main problems in the Southeastern Peninsula on Saparua Island. The Southeastern Peninsula itself is located at the eastern tip of Saparua Island and consists of several countries/villages, including Siri Sori Serani Country, Siri Sori Islam Country, Ulath Country, and Ouw Country; as an example are some damaged seawall buildings.

Given the important role of coastal protection structures in the Southeastern Peninsula area, and very little study on the problem of damage to coastal protection structures in this area, it is necessary to carry out an inventory of existing coastal protection structures in the Southeastern Peninsula region, on the level of damage that occurs so that countermeasures can be carried out. .

Based on the description and problems above, the author tries to raise the research title Impact of Environmental Change and Damage to Beach Building Structures in the Southeastern Peninsula Region of Saparua Island, Central Maluku Regency.

II. LITERATURE REVIEWS

2.1. Beach

There are two coastal terms in Indonesian which are often confused in their use, namely the coast and the beach. An explanation of the beach can be seen in Figure 1.

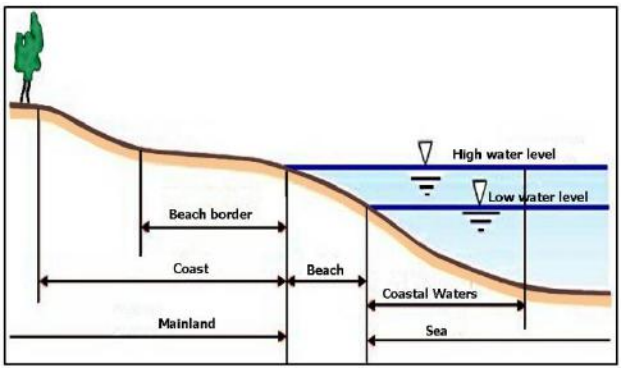


Fig 1. Coastal definitions and boundaries

coastis a land area on the edge of the sea that is still affected by the sea such as tides, sea breeze, and seepage of sea water. While the beach is an area on the water's edge that is affected by the highest tides and lowest tides.

Mainlandis the area located above and below the land surface starting from the highest tide line. The ocean is the area that lies above and below sea level starting from the sea side at the lowest ebb line, including the seabed and parts of the earth beneath it. The coastline is the boundary line between land and sea water, where the position is not fixed and can move according to the tides and beach erosion that occurs.

The coastal border is a certain area along the coast that has important benefits for maintaining the sustainability of coastal functions. The criterion for a coastal boundary is land along the edge whose width is in accordance with the shape and physical condition of the beach, at least 100 m from the highest tide point towards the mainland.

Shoreline change is a series of coastal processes caused by external factors (currents, waves, winds and tides) and internal (characteristics and types of sediments and the base layer where the sediments are located). Changes in the shoreline will refer to sediment activity and deposition, namely the deposition of rock material that has been transported by hydropower or wind that occurs on the beach (Triatmojo, Bambang. 1999. Coastal Engineering. Yogyakarta: Beta Offset).

2.2. Beach Erosion

Coastal erosion is one of the problems in coastal areas that must get attention because coastal erosion can cause enormous losses by destroying residential areas and existing facilities in the area. To tackle coastal erosion, the cause must first be sought, so a solution can be found. One solution to erosion is to build coastal protection structures, these buildings are used to protect the coast from waves and currents.

2.3. Factors Causing Beach Erosion

According to the Coastal Protection Structure, coastal erosion can occur for various reasons, in general the causes of erosion can be grouped into two things, namely natural causes and man-made causes (caused by humans). (Pratikto, WA et al. 1996. Planning for Beach and Sea Facilities).

1. Natural causes of coastal erosion include:
   a. Rising sea level
   b. Changes in sediment supply
   c. Storm Wave
   d. Overwash
   e. Longshore transportation
   f. Transport by wind
2. The artificial causes of coastal erosion include:
   a. Land subsidence
   b. Sand digging
   c. Interruption of longshore transport
   d. Reduced sediment supply towards the coast
   e. The concentration of wave energy on the beach

2.4. Coast Guard Building

The types of coastal protection structures managed by the Ministry of Public Works consist of:

a. Revetmen
b. Seawall
c. Breakwater
d. groins
e. Jetty
f. Sea Wall
g. Sand Filling

2.5. Beach Damage

There are three types of coastal damage criteria, namely: coastal environmental damage criteria, erosion and building damage criteria and sedimentation criteria. (Ministry of Public Works Circular Letter 08, 2010. Assessment of Coastal Damage and Prioritization of Handling.)

a. Criteria for damage to the coastal environment

The criteria for coastal environmental damage used in this guide cover the types of coastal damage caused by the following:

1). Settlements and public facilities that are too close to the coastline.
2). The agricultural area is too close to the shoreline.
3). Sand mining in coastal areas/sand dunes.
4). Environmental pollution in coastal waters.
5). Sea water intrusion.
6). Logging of mangrove forests/plants to make ponds.
7). Taking/destroying coral reefs.
8). Flood due to tidal rob.

b. Criteria for erosion/abrasion and damage to buildings

The criteria for erosion and abrasion referred to here are erosion/abrasion that occurs due to natural factors or as a result of human activities. Some of the causal factors that often result in beach erosion/abrasion include:

- human factor

1). The influence of the presence of coastal buildings jutting into the sea.
2). Mining of beach and river materials.
3). Pollution of coastal waters that can kill corals and mangroves.
4). The influence of the water structure in the river, which has a tendency to cause an imbalance in sediment transport.
5). Coastal cultivation
6). Excessive groundwater withdrawal

- Natural factors : Destruction by natural disasters such as storm surges, tsunamis and earthquakes.

c. Sedimentation criteria

The sedimentation criteria referred to here are sedimentation that causes estuary flooding or disturbance to shipping that utilizes river mouths. There are two types of sedimentation problems in estuaries, namely closure and siltation of estuaries.

- Closing of river mouths occurs right at the mouth of river mouths on sandy or muddy beaches which can result in the formation of sills (bars) or sand spit (sand spit) in the estuary.
- The process of siltation of river mouths is caused by the deposition of sediments, especially those from the upper reaches of the river. This can happen because the river flow is not able to transport the sediment to the sea.

2.6. Coastal Damage Assessment Process

To assess coastal damage and determine priorities for handling, the following steps are used. (Ministry of Public Works Circular Letter 08, 2010. Assessment of Coastal Damage and Prioritization of Handling.)

a. Preparation
b. Assessed beach location
c. Location Description
d. Coastal Damage Assessment
e. Description of Coastal Damage
f. Coastal Damage Rating
g. Determination of Interest Level
h. Treatment Priority
i. Handling Priority Sequence

2.7. Benchmark of Coastal Damage

In assessing coastal damage, there are 3 (three) approaches used, namely:

1. damage to the coastal environment,
2. Erosion or abrasion, and damage to buildings, as well
3. Problems that arise due to sedimentation.

In assessing environmental damage, environmental damage caused by:

a. The existence of settlements and public facilities that are too close to the coastline, so that these settlements/facilities are easily reached by the waves.
b. Agricultural areas (rice fields, plantations and aquaculture) that are too close to the shoreline so that the agricultural areas are easily reached by the waves.
c. The existence of sand mining in coastal areas can have an impact on the loss of natural protection of coastal areas.
d. Pollution of coastal waters.
e. Seawater intrusion into groundwater or rivers can disrupt sources of clean water (drinking water) for coastal communities and industries.
f. Logging of mangrove forests in coastal areas can have an impact on the loss of natural protection of coastal areas.
g. Mining or damage to coral reefs in coastal areas can have an impact on the loss of natural protection of coastal areas.
h. Sea level rise (sea level rise) and land subsidence which can cause tidal flooding.

2.8. Benchmark for Coastal Environmental Damage

a. Settlements and public facilities

Settlements and public facilities that are too close to the coast (located in the coastal area) will cause buildings to be hit by waves so that buildings can be damaged and disrupt community activities.

The following is a benchmark for coastal damage for settlements (the area under review is one hamlet).

Light :1 house to 5 houses are on the beach, not reached by storm waves.

Currently :6 to 10 houses are on the beach, not accessible

storm surge.

Heavy :1 house to 5 houses are on the beach border in storm surge range.

Very Heavy :6 to 10 houses are on the beach within reach of the storm surge.

Very Very Severe: >10 houses are on the beach within reach of the storm surge.

Meanwhile, when viewed from the size of the general facility, the benchmarks for damage are:

1). Small, equivalent to 1 house to 5 houses, local service area.
2). Medium, equivalent to 6 houses to 10 houses, medium scale service areas.
3). Large, equivalent to > 10 houses, wide service area.

b. Agricultural area (plantations, rice fields and aquaculture)

Agricultural areas that are too close to the coast (located in the coastal border area) can be threatened due to wave overtopping. The benchmarks for assessing damage to the coastal environment due to the location of agricultural areas are their presence on the coastal border and the vulnerability of the coast to erosion.

The following are benchmarks for assessing coastal damage for agricultural areas:

Light :The agricultural area is on a beach that is not easily eroded, a location of 0 m to 100 m.

Currently :The agricultural area is on a beach that is easily eroded, a location of 0 m to 100 m.

Heavy :The agricultural area suffered minor damage due to the waves.

Very Heavy :Agricultural areas suffered moderate damage due to the waves.

Very Very Heavy: AreaAgriculture suffered heavy damage due to the waves.

c. Sand dune area

The benchmark for damage to the coastal environment due to sand mining in coastal areas is the location of the sand mining location relative to the coastline and the equipment used for mining. The following is a benchmark for coastal damage for sand mining in coastal areas.

Light :The mining location is at a distance of 200 m to 500 m from the coastline, carried out by heavy equipment (mechanical).

Currently : Locationmining at a distance of 100 m to 200 m from the shoreline, is done with traditional tools.

Heavy : Mining locationat a distance of 100 m to 200 m from the shoreline, carried out with heavy equipment (mechanics).

Very Heavy : Pen locationthreshold at a distance of less than 100 m ofcoastline, with traditional tools.

Very Very Heavy:Mining location at a distance of less than 100 m from the shoreline, with heavy equipment (mechanical).

d. Coastal waters

The benchmark for assessing damage to the coastal environment due to urban waste and oil pollution is seen from the level of waste content indicated by the color, waste content and odor of the waste. The following is a benchmark for assessing coastal damage for environmental pollution of coastal waters:

Light :Beach waters look cloudy, a little trash, and no smell.

Currently : Waters visible cloudy,medium waste/oil content, and odorless.

Heavy :Waters beach which looks brown, contains waste / oil currently, and smell but not yet disturbing.

Very Heavy :The coastal waters look black, the trash/oil content is moderate and smellquite annoying.

Very Very Heavy : The coastal waters look pitch black, lots of trash/oil and has a strong odor.

e. Groundwater

The benchmark for assessing damage to the coastal environment due to seawater intrusion into groundwater is the amount of salt content in community wells and sources of raw water outside the coastal border. How to determine the salt content contained in well water is carried out in accordance with SNI 06-2412-1991, concerning the method of taking samples for testing water quality. The following are benchmarks for assessing coastal damage for seawater intrusion:

Light :Salt content of 0.5 g/l to 2.5 g/l was detected in 1 well to 5 wells.

Currently :Salt content of 0.5 g/l to 2.5 g/l was detected in 6 or more wells.

Heavy :Salt content of 2.5 g/l to 5 g/l was detected in 1 well up to 5 wells.

Very Heavy :Salt content of 2.5 g/l to 5 g/l was detected in 6 or more wells.

Very Very Severe: Salinity > 5 g/l detected in 6 or more wells.

f. Mangrove forest (plant).

The benchmark for assessing coastal environmental damage due to logging is the thickness and density of the remaining mangrove forest. The following is a benchmark for assessing coastal damage for mangrove forests:

Light :The thickness of the mangrove forest (plants) is still 30 m to 50 m with sparse plant conditions.

Currently :The thickness of the mangrove forest (plants) is 10 m to 30 m, the condition of the plants is dense.

Heavy :The thickness of the mangrove forest (plants) is 10 m to 30 m, the condition of the plants is rare.

Very Heavy :The thickness of the mangrove forest (plants) is <10 m, the condition of the plants is dense.

Very Very Severe: The thickness of the mangrove forest (plants) is <10 m, the condition of the plants is sparse.

g. Coral reefs

The benchmark for assessing damage to the coastal environment due to damage to coral reefs is the area of coral reefs damaged by mining. The following are benchmarks for assessing coastal damage for coral reefs:

Light :Damage due to mining under 10% of the area.

Currently :Damage due to miningrange between 10% untilwith 20% widearea.

Heavy :Damage from mining ranges from 20%until with30% area.

Very Heavy :Damage consequenceMining ranges from 30%up to you 40% area.

Very Very Heavy : Damage > 40% area.

h. Rob - coastal area

The benchmarks for assessing damage to the coastal environment due to rob are the height of the inundation and the area of the inundated area. The following is a benchmark for coastal damage assessment for coastal area rob:

Light : The local drainage canal is full when it occursrob.

Currently :Local drainage channels overflow in certain places when a rob occurs.

Heavy :The height of inundation on the road is between 0 cm and 20 cm on a moderate

scale (at least one lane of the main road is inundated).

Very Heavy :The height of the inundation on the road is between 0 cm and 20 cm on a broad scale (at least two main road lanes are inundated).

Very Very Heavy: Inundated height > 20 cm on a broad scale.

2.9. Building Damage

The benchmark for assessing coastal damage due to scouring and building damage can be seen from the appearance of the building itself such as building collapse, building abrasion, building tilt, and building function. The following is a benchmark assessment of coastal damage for scour and damage to buildings. (Ministry of Public Works Circular Letter 08, 2010. Assessment of Coastal Damage and Prioritization of Handling.)

Light :The building can still function properly above 75%

Currently : Building Still working 50% up to 75%.

Heavy : The building functions only 25% to 50% but does not endanger the environment.

Very Heavy : Building only function 25% left to function 50% And harm the environment.

Very Very Severe : The building is badly damaged and andangers the environment

2.10. Benchmark of Coastal Interests

The importance level weighting is presented in a table in the form of importance level weighting coefficients, as shown in Table 1. (Ministry of Public Works Circular Letter 08, 2010. Assessment of Coastal Damage and Priority for Handling it.)

Table. 1.Coefficient Interest Level Weight

No.		Importance scale	Weight coefficient importance level (f)
1	World heritage conservation (such as Tanah Lot temple)	International	2.0
2	Tourism that brings in foreign exchange, places of worship, places of business, industry, defense and security facilities, urban areas, state roads, airports, ports, outer islands	State Interests	1.75
3	Domestic tourism, places of worship, places of business, industry, defense and security facilities, urban areas, provincial roads, airports, seaports	Provincial interests	1.50
4	Domestic tourism, places of worship, places of business, industry, defense and security facilities, urban areas, county roads, airports, ports	Regency/City Interests	1.25
5	Settlements, village markets, village roads, places of worship	Local interests are related to residents and activities economy	1.00
6	Agricultural land (plantations, rice fields and aquaculture) of the people	Interest locally related to agriculture	0.75
7	Land is not utilized and has no economic impact	There is no particular interest and no impact	0.50

Source: Appendix to Circular of the Minister of Public Works NO 8/SE/M/201

2.11. Weighting and Prioritization Procedures

a. Weighting procedure

The weighting of the level of coastal damage is carried out on a scale of 50 to 250 with details as shown in the Minister of Public Works Circular Letter 08, 2010. Assessment of Coastal Damage and Prioritization of Handling.

Table. 2.Coastal damage level weight scale

No.	Damage rate	Damage type		
		Environment	Erosion/abrasion and building damage	Sedimentation
1	Light (R)	50	50	50
2	Medium (S)	100	100	100
3	Weight (B)	150	150	150
4	Very Heavy (AB)	200	200	200
5	Very Very Severe (ASB)	250	250	250

Source: Appendix to Circular of the Minister of Public Works NO 8/SE/M/2010

The following is a coastal damage assessment procedure:

1. Coastal damage assessment is carried out at the location (area) of the damage.
2. Damage assessment at one location is carried out separately from other locations. If several types of damage occur in one location, the assessment is carried out on the heaviest coastal damage cases that occurred at that location.
3. Especially for environmental damage assessment, it must be done very carefully, especially related to the existence of buildings or facilities on the beach, because people's perceptions are very diverse (for example: places of worship are on the beach, hotels are on the beach, recreational locations are on the beach).
4. Assessment of damage to a fairly large coastal area can be carried out by dividing the area into several locations as needed.

b. Determination of priority order

Based on data from field observations and sensitivity analysis, the priorities for beach management can be grouped into: (Ministry of Public Works Circular Letter 08, 2010. Assessment of Coastal Damage and Prioritization of Handling.)

Priority A : Weight > 300 (highly preferred - emergency)

Priority B : Weight 226 to 300 (highly preferred)

Priority C :Weights 151 to 225(preferred)

Priority D : Weight 75 to 150 (less preferred)

Priority E : Weight < 75 (not preferred)

III. METHODOLOGY

3.1. Location / Research Object

The research was carried out at the Southeast Jazirah Coastal Location, East Saparua District, Central Maluku Regency, calculated from the Initial Coordinates: 3º35'13"S 128º41'37"E to the Final Coordinates: 3º36'27"S 128º43'10"E.

Fig 2. Research sites

3.2. Research variable

The research variable is an attribute of a group of objects that have variations from one object to another. The research variables in this study consisted of two kinds. The first variable is the independent variable which is given the notation X and the second variable is the dependent variable which is given the notation Y.

The independent variable (X) determines changes in the dependent variable (Y), but regardless of the influence of the dependent variable. While the dependent variable (Y) is a variable that is influenced by the independent variable (X). In this study it was determined that the independent variable (X) was changes in the coastal environment and coastal damage, and the dependent variable (Y) was damage to coastal structures.

$\int (Y) = X1 + X2 + \cdots + Xn$

Where :

Y = Damage to coastal buildings

$X1$ = Changes in the coastal environment

$X2$ = Coastal damage

3.3. Types and Sources of Research Data

There are two data used in this study, namely:

1. Primary data, namely through field surveys in the form of shoreline coordinates and measurements of damage to coastal building structures, as well as photo documentation.
2. Secondary data is in the form of location maps and topographic maps.

3.4. Flowchart

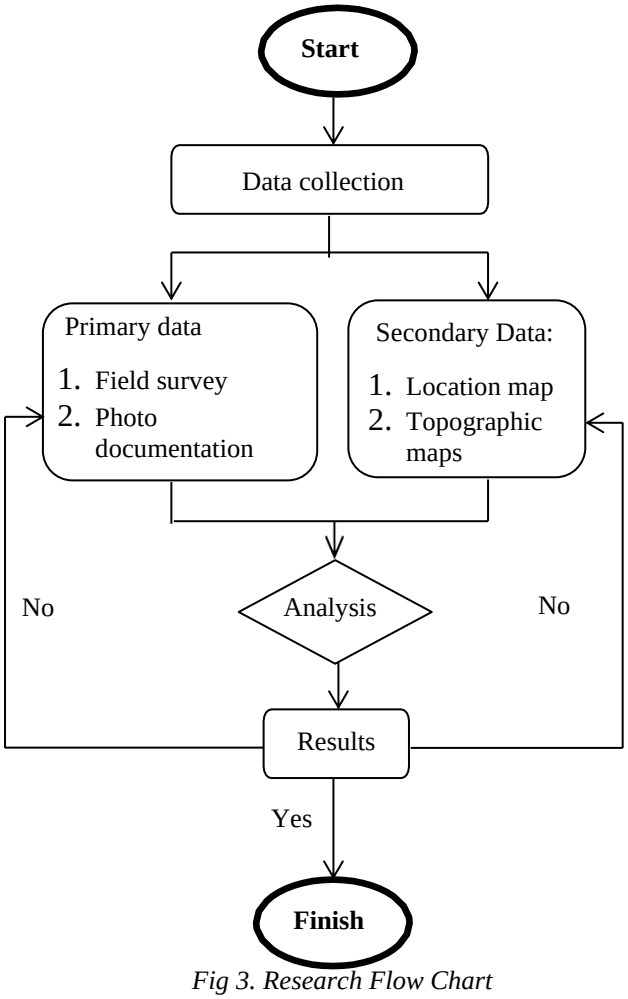


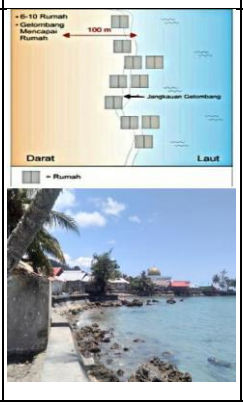
Fig 3. Research Flow Chart

IV. ANALYSIS AND DISCUSSION

4.1. Benchmark for Coastal Environmental Damage

1. Settlements and public facilities

Table. 3. Settlements and public facilities

No	Sketches & Photos	Damage Description	Weight	Priority
1.		6 to 10 houses are on the beach within reach of the storm surge	200	C (Preferred)

Source: Processed Products According to Appendix NO 8/SE/M/2010

2. Agricultural area

Table. 4. Agricultural Area

No	Sketches & Photos	Damage Description	Weight	Priority
1.		The agricultural area is on a beach that is easily eroded, a location of 0 m to 100 m	100	D (Less preferred)
2.		The agricultural area is on a beach that is easily eroded, a location of 0 m to 100 m	100	D (Less preferred)

4.2. Damage to the Coast Guard Building`

Table. 5. Damage to coastal protection structures

No	Sketches & Photos	Damage Description	Weight	Priority
1.		The building is still functioning 50% until with 75%.	100	D (Less preferred)
2.		Buildingdamaged and harmful to the environment.	250	B (Highly preferred)

3		The building functions only 25% to 50% but does not endanger the environment.	150	D (Less preferred)
4		The building is still functioning 50% until with 75%.	100	D (Less preferred)
5		Buildings only function 25% to 50% and are harmful to the environment.	200	C (Preferred)

Source: Processed Products According to Appendix NO 8/SE/M/2010

4.3. Coastal Damage Assessment Evaluation

Table. 6.Evaluation Assessment of damage to the coast of the Southeastern Peninsula

Location	Damage rate												Level Weight Coefficient Interest
	Environment									Erosion/abrasion and building damage		Sedimentation	
	L1	L2	L3	L4	L5	L6	L7	L8	EA1	EA2	SP1	SP2	
Ouw Village Beach	-	-	-	-	-	-	-	-	-	100	-	-	1.00
Ulath Village Beach	-	-	-	-	-	-	-	-	-	-	-	-	-
Islamic Siri-Sori Village Beach	200	100	-	-	-	-	-	-	-	250	-	-	1.00
Siri Sori Village Beach Serani	-	100	-	-	-	-	-	-	-	200	-	-	1.00

Source: Processed Products According to Appendix NO 8/SE/M/2010

Information :

L1 :Damage to settlements and public facilities

L2 :Damage to agricultural areas

L3 :Damage to coastal areas due to sand mining

L4 :Decreased quality of coastal waters due to pollution

L5 :Deterioration of groundwater quality due to seawater intrusion

L6 : The decline in the quality of mangrove forests

L7 : The decline in the quality of coral reefs

L8 : Rob on the coast

EA1 : Shoreline change

EA2 : Scouring and damage to buildings

SP1 :Sedimentation of river mouths, estuaries are not for shipping

SP2 :Sedimentation of river mouths, estuaries for shipping

4.4. Evaluation of Coastal Buildings

Building Type : Sea wall

ID :TL JT

Location : Central Maluku Regency
Maluku Province

Monitoring Officer : Maiyaji Saimima

Watch Date : September 18, 2019

1. Seawall STA 00+500

➢ Physical Code

Physical Condition of the Building Seawall						
Peak	Body		foundation		Material	
	Outside	In	Outside	In	Armor	Concrete/ Wall
1	4		4			4
Physical Component Index (Fill according to assessment	**4** *(Average value)*		**4** *(Average value)*		**4** *(Average value)*	
Physical Component Weights	A **20**	B **10**	C **30**	D **40**		
Component	**20**	**40**	**120**	**160**		

Component Value = Physical component index x physical component weight

Condition Index	**3,4**
Building	**Need Improvement**

Component Value = S (component value) / S (component weight)

➢ Function Performance

Based on observations of notes, sketches, and photographs related to beach conditions around buildings and protected objects, it is concluded that the results of building evaluations show the performance of building functions (Good/Poor):

Building Function Performance	Good

➢ Conclusion

Building	Seawall	**ID**	TL JT
Action Suggestions	**Rehabilitation**		

2. Seawall STA 00+1500

➢ Physical Code

Physical Condition of the Building Seawall						
Peak	Body		foundation		Material	
	Outside	In	Outside	In	Armor	Concrete/ Wall
4	4		4			4
Physical Component Index (Fill according to assessment	**4** *(Average value)*		**4** *(Average value)*		**4** *(Average value)*	
Physical Component Weights	A **20**	B **10**	C **30**	D **40**		
Component	**80**	**40**	**120**	**160**		

Component Value = Physical component index x physical component weight

Condition Index Building	**4**
	Heavily Damaged

Component Value = S (component value) / S (component weight)

➢ Function Performance

Based on observations of notes, sketches, and photographs related to beach conditions around buildings and protected objects, it is concluded that the results of building evaluations show the performance of building functions (Good/Poor):

Building Function Performance	Good

➢ Conclusion

Building	Seawall	**ID**	TL JT
Action Suggestions	**Rehabilitation**		

3. Seawall STA 00+2000

➢ Physical Code

Physical Condition of the Building Seawall						
Peak	Body		foundation		Material	
	Outside	In	Outside	In	Armor	Concrete/ Wall
Physical Component Index (Fill according to assessment	4		4			3
1	**4** *(Average value)*		**4** *(Average value)*		**3** *(Average value)*	
Physical Component Weights	A **20**		B **10**		C **30**	D **40**
Component	**80**		**40**		**120**	**120**

Component Value = Physical component index x physical component weight

Condition Index	**3**
Building	**Need Improvement**

Component Value = S (component value) / S (component weight)

➢ Function Performance

Based on observations of notes, sketches, and photographs related to beach conditions around buildings and protected objects, it is concluded that the results of building evaluations show the performance of building functions (Good/Poor):

Building Function Performance	Good

➢ Conclusion

Building	Seawall	**ID**	TL JT
Action Suggestions	**Rehabilitation**		

4. Seawall STA 00+3200

➢ Physical Code

Physical Condition of the BuildingSeawall						
Peak	Body		foundation		Material	
	Outside	In	Outside	In	Armor	Concrete/ Wall
Physical Component Index (Fill according to assessment	2		4			3
2	**2** *(Average value)*		**4** *(Average value)*		**3** *(Average value)*	
Physical Component Weights	A **20**		B **10**		C **30**	D **40**
Component	**40**		**20**		**120**	**120**

Component Value = Physical component index x physical component weight

Condition Index	**3**
Building	**Need Improvement**

Component Value = S (component value) / S (component weight)

➢ Function Performance

Based on observations of notes, sketches, and photographs related to beach conditions around buildings and protected objects, it is concluded that the results of building evaluations show the performance of building functions (Good/Poor):

Building Function Performance	Good

➢ Conclusion

Building	Seawall	**ID**	TL JT
Action Suggestions	**Rehabilitation**		

5. Seawall STA 00+3600

➢ Physical Code

	Physical Condition of the Building Seawall						
	Peak	Body		foundation		Material	
		Outside	In	Outside	In	Armor	Concrete/ Wall
		4		4			4
Physical Component Index (Fill according to assessment	4	4 *(Average value)*		4 *(Average value)*		4 *(Average value)*	
Physical Component Weights		A		B		C	D
		20		10		30	40
Component		80		40		120	160

Component Value = Physical component index x physical component weight

Condition Index	**4**
Building	**Heavily Damaged**

Component Value = S (component value) / S (component weight)

➢ Function Performance

Based on observations of notes, sketches, and photographs related to beach conditions around buildings and protected objects, it is concluded that the results of building evaluations show the performance of building functions (Good/Poor):

Building Function Performance	Good

➢ Conclusion

Building	Seawall	**ID**	TL JT
Action Suggestions	**Rehabilitation**		

V. CONCLUSION

The entire coastal building that was damaged by abrasion was the seawall. The benchmark for damage to the coastal environment from settlements and public facilities is with a weight of 200 and priority. While the agricultural area is with a weight of 100 and is less prioritized.

Evaluation of the damage assessment of the coast of the Southeastern Peninsula which consists of 4 villages, namely Ouw Village, Ulath Village, Siri Sori Islam Village, and Siri Sori Serani Village with an importance weight coefficient of 1.00. The review was carried out based on the damage to the building that occurred, namely from STA 00+500 (with a building condition index of 3.4; Needs repair), STA 00+1500 (with a building condition index of 4; Heavily Damaged), STA 00+2000 (with a building condition index 3; Needs Repair), STA 00+3200 (with a building condition index of 3; Needs Repair), and STA 00+3600 (with a building condition index of 4; Heavily Damaged). So the recommended action for damage to coastal protection structures in the Southeastern Peninsula of Saparua Island is rehabilitation with the required rehabilitation budget of Rp. 204,040,000,-.

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