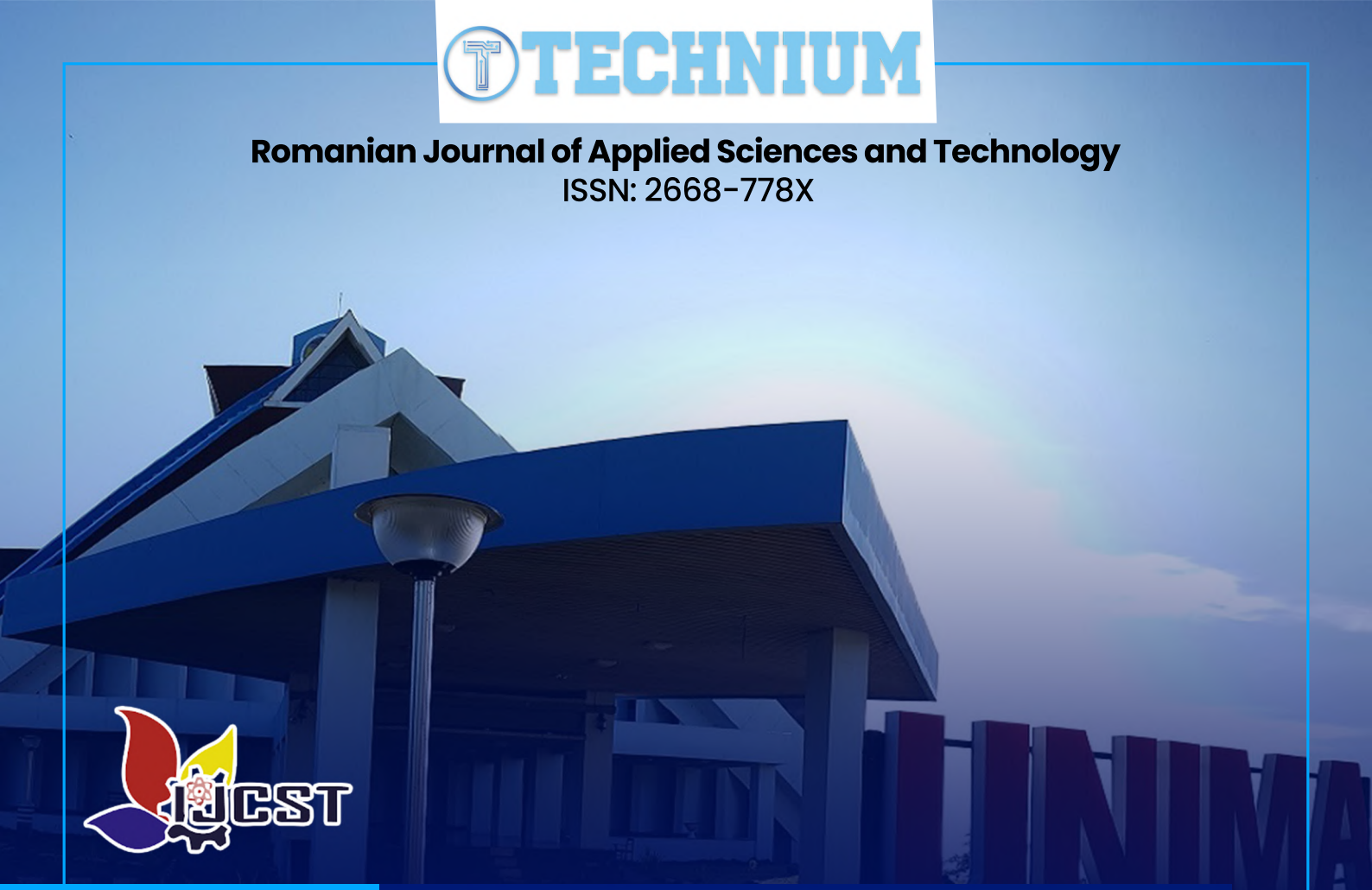
TECHNIUM

Romanian Journal of Applied Sciences and Technology
ISSN: 2668-778X



vol. 17 / 2023

The 7th International Conference on Science Technology

organized by
Faculty of Social Science and
Law Universitas Negeri Manado and
Consortium of International Conference
on Science and Technology

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Technium: Romanian Journal of
Applied Sciences and Technology
Vol. 17, 213-217, November, 2023
ISSN: 2668-778X
www.techniumscience.com

A Study of Abrasion Identification for Coastal Areas at Sidangoli Gam Village.

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Abstract. An abrasion of the coastal areas has occurred at Sidangoli Gam Village, West Halmahera of North Maluku. The original condition was planted mangroves for coastal areas protection. However, it has recently been abraded due to big waves from the Pacific Ocean. Local people and the government constructed a conventional dike using coral stone and wooden piles. Nonetheless, this dike construction is designed without physical meaning. On the other hand, local people cannot be moved to another location because they have fishermen, and this place is very familiar to them. This research aimed to study the identification factor of coastal abrasion area in the field, such as observation in length, abrasion in width, the measured elevation of land, taken coordinates by using GPS (Global Positioning System) for two points and measuring the slope of the land, lithology of the soil layer, land use, and also enquire about how long people have lived in the nearby coastline area. Therefore, the index of susceptibility to abrasion, called IKP, will be presented. The index of susceptibility of abrasion (CVI) results are obtained at 48,99, a moderate vulnerability condition. This value is considered as shoreline change of 4.0, visually observed of 5.0, abrasion in the length of 1.0, abrasion in width of 4.0, green belt width of 4.0, soil lithology of 4.0, land use of 4.0 and slope on land of 5.0. These results may be conducted using coastal dikes to avoid big and high waves from the Pacific Ocean.

Keywords : Absarison, Fisherman ,Sidangoli Gam, Coastal.

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1 Introduction

The smallest province is North Maluku, located in coordinates 3º 40' LS- 3º 0' LU123º 50' - 129º 50' BT. It has a series of islands with a land-to-water ratio of up to 24% and 76%, according to Republic Indonesia Law Number 46 of 1999 and RI Law Number 6 of 2003.

The coastal area is a risk area for human activities such as central government areas, towns, industry, ports, aquaculture, agriculture, fisheries, tourism, etc. The majority of coastal communities and cities are modern and well-developed. For instance, major cities like Jakarta, Surabaya, and Semarang are situated along the shore.

The breakage in a coastal area might impact daily human activities and also impact the management and prevention crucial to the growth of that area. The erosion of coastal cliffs by waves is one of the factors contributing to the degradation of coastal areas.

In the West Halmahera District village of Sidangoli Gam, there was coastal abrasion damage. The abrasion has led to issues for the communities of Sidangoli Gam's village. According to the village headman, concrete housing and mangrove trees were present along Sidangoli Gam's coastline. However, all the concrete houses and mangrove trees were destroyed due to extreme abrasion. Another issue for fishermen in coastal communities reported that they are forced to leave in December because of tidal waves that flood their homes.

Fig 1. Bamboo as the house protection

Following observations and interviews with locals living near the coastal areas, they constructed a simple house protection structure using wooden piers and rocks strategically placed on the beach to fend off the big waves from the sea Figure 1. As a preventative measure and course of action to deal with the damage to the coastal area, it is crucial to carry out anticipation steps to detect damage to the coastal areas of West Halmahera Regency, particularly in Sidangoli Gam Village.

2 Literature Review

The coastline is a region on the ocean's edge, defined as the area where land and water are present between the lowest ebb and highest tide. The coastal regions still experience the effects of land activities (performed in water areas) and marine activities (performed in land areas), leading to the conclusion that the two regions are interdependent or that they have an influence on one another (Triatmodjo 1999; Yuwono, 2005).

The terms "coast" and "beach," which refer to the beach in Indonesian, are sometimes used interchangeably. The coast island adjacent to the ocean experiences some of the ocean's effects, such as tides, sea breezes, and seawater seepage. The widespread understanding that the coast serves as a crossing point between land and water. The highest and lowest tides impact the area near the water's edge, known as the beach.

Previous researchers and scientists have explained how coastal changes cause coastal harm. According to Vreugdenhil (1999), shoreline change occurs continuously due to several processes, including

sediment transport, longshore currents, wave action, and land use (Arif et al., 2011).

The process of eroding a beach by the corrosive force of ocean currents and waves is known as coastal abrasion (Wibowo, 2012). Yuwono (2005) described in Wibowo (2012), there are differences between coastal erosion and coastal abrasion. For example, coastal erosion is defined as receding the coastline from its original position due to an imbalance between supply and sediment transport capacity. In contrast, abrasion, eroding hard objects like walls or rock cliffs into the beach, is defined as being followed by avalanches and material collapse.

The silting or expansion of land caused by sediment deposition carried by seawater is known as accretion or sedimentation. According to Shuhendry (2004), this deposition process may occur naturally due to the sedimentation and freshwater flow processes or may be brought on by human actions on the land, such as deforestation and pollution. In other words, accretion is adding land by deposition to a region near the sea. Because accretion can influence river mouths where ships and boats travel and affect the stability of the shoreline, it can also be harmful to coastal populations. Depending on the sediment that enters and leaves the beach, a beach will erode, accrete, or remain stable.

In this study, the examination of the Coastal Vulnerability Index was used to determine the damage's precise spot. The formula from Boruff (2005) used to calculate the Coastal Vulnerability Index (CVI) is as follows:

$$CVI = \sqrt{\frac{multiplication\ of\ each\ variable\ number}{Number\ of\ variable}} \qquad (1)$$

Where the field verification of data facts is used to establish the variable's weight. The level of coastal vulnerability is taken into account while calculating the CVI using the guidelines in Table 1 below:

Table 1. Value of the vulnerability level provision

Technium: Romanian Journal of Applied Sciences and Technology
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CVI	Level provision			
	0-25	25-50	50-75	75-100
vulnerability	low	moderate	high	very high

2.1 Purpose of this study

This research aimed to use the IKP formula to examine the coastal vulnerability index of Sidangoli Gam Village and to present data in a way that made it easier to grasp and remember by using coherent or narrative language that was coherent or narrative rather than in a table format. Whereby the information used is shown in the form.

3 Research Methods

3.1 Overview of Research Location

This research was carried out in the village of Sidangoli Gam, West Halmahera Regency, by collecting data at two points, as shown in Figure 2.

Fig. 2. Map of research location

3.2 Research Flowchart

A flow chart (flowchart) is a chart (chart) that shows the flow (flow) in a program or system procedure logically. In this study it can be seen in the following figure:

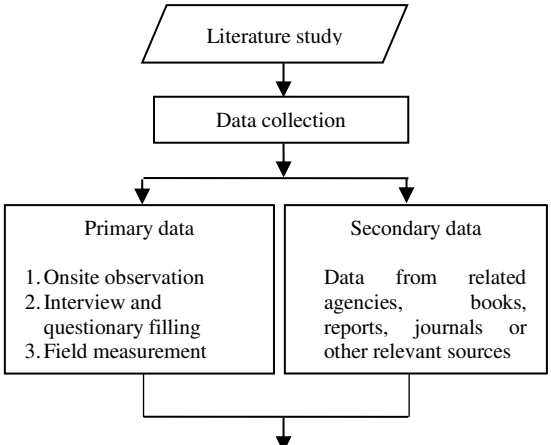

Fig. 4. Research flowchart

3.3 Data Collection Technique

The data collected consists of following data

1. Using a survey method through field observations.
2. Interview residents who live in the area around the coast and fill out a questionnaire.
3. Measurement of coastline geometry data – to land that has experienced abrasion around settlements.
4. Measurement of coastline data - horizontal, which has experienced abrasion around residential areas.
5. Observation of tides on objects - plants around the coast.
6. Measurement of elevation using GPS
7. Measurement of the slope of the beach.
8. Observation of lithology of soil and rock materials around the coast.
9. Discuss with the village head the history of Sidangoli Gam village.
10. Documentation of Coastal Damage.

Fig. 4. Photograph of interview and filling out the questionnaires with the residents around the coastal area.

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Fig. 5. Photograph of the discussion section with the members of the village headman regarding the history of the

village of Sidangoli Gam

Fig. 6. Photograph of measurement of the abrasion damage

4 Result and discussion

The results of the weighting of the physical variables are done according to the division of the variable level of vulnerability to coastal damage, such as 1) Changes in the coastline, 2) visual observation of damage, 3) length of damage, 4) width of coastal damage, 5) width of green belt location, 6) soil lithology, 7) land use, 8) slope of the coastline.

Based on the results of research in the field to determine the weight value for each variable at each damage location, the weighting provisions are used. Physical variable weighting is done by dividing the variable values into 5 (five) levels, from the lightest to the most severe damage (Gornitz et al., 1997; Boruff et al., 2005 and Wahyudi et al., 2009).

The results of collecting the weights of each variable at point 1 can be seen in Table 2 below.

Table 2. Variable and damage at point 1

Damage point	Variable values
Coastline area line changes	4
Visual observation	5
Length of abrasion	1
Width of abrasion	4
Length of green location	4
Soil Lithology	5
Land used	4
The slope of the coastline	5

Calculating the damage value uses the CVI formula as in formula (2) as follows:

$$CVI = \sqrt{\frac{4\times5\times1\times4\times4\times5\times4\times5}{8}} \quad (2)$$

$$= 63{,}25$$

From the calculation results of point 1, CVI value of 63.25 (high damage susceptibility) was obtained.

Table 3. variable and damage at point 2

Damage point	Variable values
Coastline area line changes	3
Visual observation	5
Length of abrasion	1
Width of abrasion	4
Length of green location	4
Soil Lithology	5
Land used	4
The slope of the coastline	4

$$CVI = \sqrt{\frac{3\times5\times1\times4x4\times5\times4\times4}{8}} \quad (3)$$

$$= 48{,}99$$

From the calculation of point 2, the CVI value is about 48.99 (moderate damage susceptibility).

5 Conclusions

In this study, the authors concluded that:

1. Identification of coastal damage vulnerabilities aims to optimize appropriate handling methods.
2. The results of the calculation of the IKP coastal vulnerability value at point 1 are 63.25 (high vulnerability), and at point 2 are 48.99 (moderate vulnerability)
3. The people of Sidangoli Gam village make a living mostly as fishermen.
4. Residents of the Sidangoli Gam coast want handling from the local government to deal with the problem of abrasion or tidal waves.

References

1. Arif, M., Fuad, Z., Yunita, N., Kasitowati, R. D., Hidayati, N., Sartimbul, A., Studi, P., Kelautan, I., & Perikanan, F. (2019). and US Army Map Service in 1964. Calculation of shoreline changes. *Jurnal Geografi*, *11*(1), 48–61. http://jurnal.unimed.ac.id/2012/index.php/geo

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Vol. 17, 213-217, November, 2023
ISSN: 2668-778X
www.techniumscience.com

2. Boruff, B. J., Emrich, C., & Cutter, S. L. (2005). Erosion hazard vulnerability of US coastal counties. *Journal of Coastal Research*, *21*(5), 932–942. https://doi.org/10.2112/04-0172.1
3. Gornitz, V., Rosenzweig, C., & Hillel, D. (1997). Effects of anthropogenic intervention in the land hydrologic cycle on global sea level rise. In *Global and Planetary Change* (Vol. 14).
3. Shuhendry, (2009). *Numerical Analysis and Design Criteria of Embankments on Floating Piles*.
4. Triatmodjo, Bambang. Perencanaan Bangunan Pantai, Beta Offset, Yogyakarta (1999).
5. Vreugdenhil, C. B. (1999). Transport Problems in Shallow Water Battleneeks and Appropriate Modeling. Twente University, Department of Civil Engineering and Management, Seminar on Sediment Transport Modelling.
6. Wibowo, Y. A. (2012). Dinamika Pantai (Abrasi dan Sedimentasi). *FTIK Universitas Hang Tuah, Surabaya*.
7. Wahyudi, Teguh Hariyanto, Suntoyo. (2009). Analisa Kerentanan Pantai di Wilayah Pesisir Pantai Utara Jawa Timur. Jurusan Teknik Kelautan. ITS Surabaya
8. Yuwono, N. (2005). Draft Pedoman Pengamanan dan Penanganan Pantai. *Jakarta: Departemen Pekerjaan Umum*.