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# CHARACTERISTICS AND SEDIMENT DISTRIBUTION OF COASTAL MAMUJU DISTRICT

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## ABSTRACT

This study aims to determine the basic sedimentary profile and distribution of TSS in the coastal areas of Mamuju Regency. The research method used a case study with data collection using field survey tec hniques and sample testing in the laboratory. The data was then analyzed descriptively using tabulation techniques and making sediment distribution maps. The results showed that sediment at the study site was dominated by coarse sand with a total organic matter content (BOT) of 1.59 mg / L which was still below the quality standard (<10 mg / L) but the TSS concentration at water bodies of 26.80 mg / L have passed the quality standard for coral reef and seagrass ecosystems (20 mg / L).

**Keywords**: characteristics, sediment, TSS, BOT

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## 1. INTRODUCTION

Coastal areas are very vulnerable to environmental changes, both accumulative and extreme change. This is inseparable from the geographical location of the coastal area which is a link between land and sea identities. Therefore changes in environmental conditions, both on land and at sea, will have an impact on coastal areas.

The increase in human population has led to changes in landforms on land due to land clearing for both residential needs and economic and industrial activities . The combination of increasing population and land clearing makes it easy for anthropogenic pollutants to enter the coast through the river.

Coastal environmental pollutants can be grouped into three types, namely pathogenic material (risking to humans), aesthetic (causing uncomfortable environmental changes), and ecomorphic (causing changes in the physical properties of the environment). The presence of environmental pollutants in general causes sedimentation, eutrophication, lack of oxygen, to contamination of *trace elements* in the food chain [1].

Changes in the quality of water in an ecosystem affect the conditions of biota which are networked on the ecosystem. The high rate of pollution on the coast threatens the condition of main ecosystems such as mangroves, seagrasses and coral reefs, thus potentially eliminating the habitats of many marine

biota given the environmental services of the three ecosystems as spawning sites.

Sedimentation is a threat to coastal ecosystems. Sedimentation is the process of deposition of material which is blocked by streams from the upstream due to erosion [2]. Sediments which are delivered in the form of basic load transport (bed load) and suspended load transport. Suspended particles caused turbidity while particles that precipitate will damage the production of fish feed (phytoplankton), fish eggs, and the physical condition of the waters [3,4]

Sediments are dynamic and experience spatial and temporal displacement and deposition [5] depending on the type of sediment. Research [6] in the Spermonde Islands, South Sulawesi showed that sediments were concentrated in the deep zone (near the main land) with higher concentrations in the rainy season than in the dry season.

The content of nutrients and organic matter in sediments can trigger algal growth and in eutrophic conditions which cause *algae bloom* [7]. [8] explained that the direct impact of high TSS concentrations on coral reef ecosystems is a decrease in coral growth rates while the indirect impact is an increase in macro algae growth due to nutrient enrichment carried by sediments.

Coast of Mamuju Regency is very susceptible to sedimentation because on its coast there are several estuaries. The existence of the estuary is an entry point for sediment from upstream to the coast and sea that is experiencing land clearing due to population growth and economic activity in Mamuju Regency as the Capital of West Sulawesi. Therefore, this study aims to examine the condition of sediments on the coast of Mamuju Regency..

## 2. MATERIAL AND METHOD

### Sampling

Sediment samples were taken using two techniques, namely (1) through water sampling to determine the concentration of TSS in water bodies and conditions of temperature, pH, and salinity and (2) *sediment grabs* to determine the sediment profile at the bottom of the water . Water samples were taken at 11 points while sediment samples were taken at 3 (three) points located at the mouth of the Mamuju River, Karama River, and Rimuku River.

### Analysis

The water samples which were collected and measured in an ex-situ TSS at the Hasanuddin University's FIKP Chemical Oceanography Laboratory using the gravimetric method. After TSS concentration is obtained, it is then plotted in the form of TSS concentration distribution maps with the application of ArcGIS 10. Distribution maps in the plot with *spline barrier* technique that mathematically interpolates the data approaching the value of x at f (x) with intervals a <x <b using other functions g (x) [9].

Sediment samples were used to determine the sediment profile which consisted of grain size (mm) and weight (gr). The calculation of grain size and weight were based on the method of Buchanan which sieving and filtering system ( *sieving* ). After the grain size and weight are known then the data is processed using the GradiStat application to determine the type of sediment at each

observation location based on the D50 value obtained.

## 3. RESULT AND DISCUSSION

Mamuju Regency experienced a decrease in land cover of 1.19% per year including a mangrove area which was significantly reduced from 186.47 Ha in 2006 and 44.29 Ha remaining in 2011 [10]. Changes in the function of land in the upstream include for the purposes of expanding the area of oil palm plantations while in the downstream to meet the increasing demand for settlements as the growth of Mamuju Regency as the Capital City of West Sulawesi Province. These conditions increase the potential for sediment transfer from upstream to downstream and from downstream to the coast then to the sea.

### TSS concentration

Total Suspended Solid (TSS) is a fine-grained sediment material that is carried by the flow into the water column. Large amounts of suspended sediment can affect the physical condition of the waters, which increases turbidity thereby reducing the ability of fish and other aquatic organisms to obtain food (Darmono, 2010). The pattern of distribution of TSS concentrations can be noted in Figure 1.

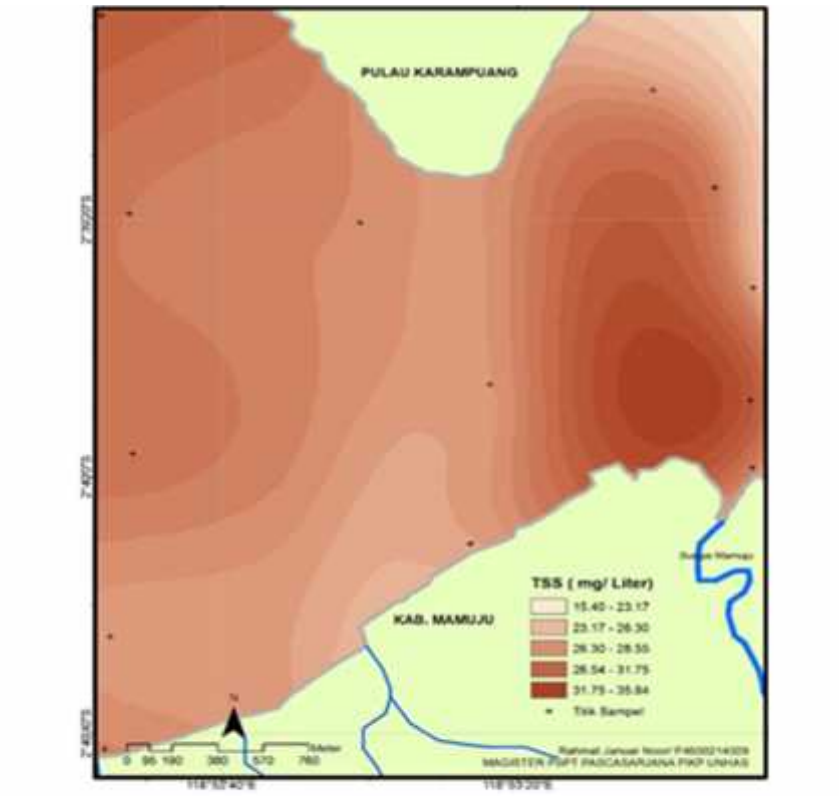


Figure 1. Distribution of TSS

TSS concentrations in the study area ranged from 24.93 mg / L to 31.68 mg / L. The highest TSS concentration values were found around the mouth of the Mamuju River at 31.68 mg / L while in Karama River 31.28 mg / L and Rimuku River 26.41 mg / L.

Suspended solids are one of the parameters to support marine life. The quality standard values of the suspended solids are contained in Ministerial Decree No.51 of 2004. Comparison of TSS concentrations in the field and established quality standards can be considered in Table 1.

Table 1. Table 1. TSS concentrations at the study site

| Location | Measurement results (average) (mg/L) | Quality standard (mg/L) | Status | | |
|---|---|---|---|---|---|
| | | | Coral | Seagrass | Mangrove |
| Mamuju River | 26.95 | Coral 20 mg/L Seagrass 20 mg/L Mangroves 80 mg/L | It is not in accordance with | It is not in accordance with | Corresponding |
| Rimuku River | 25.68 | | It is not in accordance with | It is not in accordance with | Corresponding |
| Karama River | 27.76 | | It is not in accordance with | It is not in accordance with | Corresponding |

The distribution of sediments on the coast of Mamuju Regency shows that the condition of the TSS has exceeded the Quality Standards set for coral reef and seagrass ecosystems, while for mangrove ecosystems it is still considered appropriate.

The High of TSS concentrations in coastal areas threaten the existence of coral reef coastal ecosystems. The existence of TSS around corals can cover coral polyps so that the process of coral growth is inhibited. The long term impact is the occurrence of *algal blooming* due to nutrient content in TSS in water bodies.

Sediment Profile Darmono (2010) outlines that the sediment that settles in the water can damage the substrate production plan k tons, nursery grounds, and cause silting. Therefore, in the study of sediments, it is important to know the physical condition of the sediment. The assessment of sediment conditions in this study was based on grain size and total organic matter content in the basic sediments.

The results of measurement of sediment grains and conclusions of sediment types are described in the following table

Table 2. Results of sediment grain measurements

| **Location** | **D50** | **Type** | **Skewness** | **Sorting** |
|---|---|---|---|---|
| Mamuju River | 0.283 | Medium sand | -0.005 | Pretty good |
| Rimuku River | 0.556 | Rough sands | .136 | Not good |
| Karama River | 0.275 | Medium market | -0.360 | Not good |

Around the estuary of the Mamuju River and the Karama River, moderate sand type sediments are found, while around the Rimuku river coast, coarse sand type sediments are found. The skewness

value on the coast of Mamuju Regency tends to be negative so that the sediment population tends to be coarse grained. In terms of sorting, sediments on the coast of Mamuju Regency are not poorly sorted which means that fine-fraction sediments have settled and are not only in the water column as suspended particles.

The role of surface water flow (run-off) acts as a sediment transt medium from the estuary to the coast. The speed and direction of the current is not too dynamic, considering that Mamuju Regency is a bay, allowing sediment to sette. Therefore, it is feared that more massive sedimentation will occur and disturb the ecological stability [11] depending on the organic content of the sediment.

Organic content in sediments can trigger eutrophication because it increases water fertility and decreases dissolved oxygen content so that it has a negative impact on aquatic organisms [12]. Total organic matter (BOT) on the coast and the sea is sourced from the land, decay of organisms, extracellular metabolic changes by algae, especially phytoplankton, and excretion of zooplankton and other animals [13]. The following graph is the result of calculation of total organic matter at the study site.

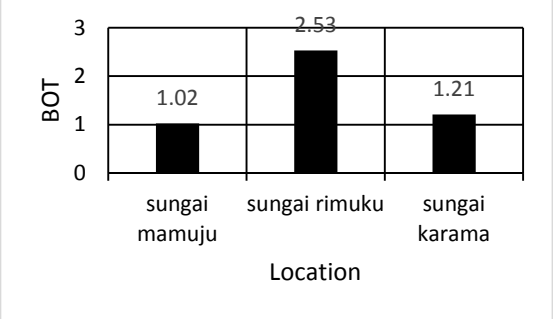


Figure 2. Total Organic Concentration at the study site

BOT content in waters is influenced by the input from anthropogenic factors, the presence of mangrove ecosystems, and substrate or sediment type [13]. [14] The source of BOT in sea water which is the highest BOT value monitored is around the Rimuku River which is 2.53 mg / L. On average the BOT value on the coast of Mamuju Regency is 1.59 mg / L so that based on the LH-LIPI KLH 1993 it is still stated as clean waters (<10 mg / L) [15]. However, the content of organic matter can rapidly change in the event of an algae explosion, zooplankton predation, and freshwater run off from the over land.

## 4. CONCLUSION

Sediments on the coast of Mamuju Regency are dominated by medium sand types with a coarse-grained majority. The total Organic Content (BOT) averages 1.59 mg / L so that it is still classified as a clean water category. The highest distribution of dissolved sediment (TSS) is around the estuary of the Mamuju River with an average TSS concentration on the coast of Mamuju Regency which is 26.80 so it exceeds the quality standard for ideal conditions for marine life in seagrass and coral reef ecosystems.

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