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NORTHERN COASTAL CONDITIONS OF PALANG-TUBAN

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ABSTRACT
The coast is a transition and meeting area between the territory of the land and the ocean in which there is an intensive interaction between the components of the land and the components of the sea. A depiction of the northern coastal Palang-Tuban conditions must be made to know the whereabouts of environmental damage. The depiction of the northern coastal Palang based on this study literature and observation field. The observation was conducted on 22-23 july 2023 by exploring the coastal villages in the cross-border area and documenting the conditions of the coastal and the activities of the coastal communities in the region. North coast conditions indicate a change in coastline and decrease in sea water quality. Changes in the coastline occur due to accretion and land reclamation for community economic activities such as parking tourist vehicles, reclamation for the construction of culinary businesses and shops, as well as the construction of jetties in each village on the north coast of Palang as a place to dock for fishing boats. The quality of sea water in the Palang District area has decreased. The research show that there are several parameters that exceed the quality standard thresholds, such as brightness, salinity, DO and heavy metals

Keywords: north coast, coastline, sea water quality, reclamation, jetty

INTRODUCTION
Tuban Regency is the district located at the northernmost tip of East Java Province. Astronomically, Tuban district is in the coordinates of 111º 30" – 112º 35" BT and 6º 40" – 7º 18" LS. The area is divided into land area of 1,839.94 km2, and sea area of 22,608 km2. The area of Tuban Regency administratively consists of 20 sub-districts and 5 of them are coastal sub-districts with a total of 41 coastal villages. The total length of the Tuban district coastline is 64,164 km. This makes Tuban district known as a coastal area. One of the sub-districts that has a fairly long coastline is Palang sub-district. Palang sub-district has the second longest coastline after Jenu sub-district, namely 11.25 km. This coastline crosses 9 villages, that is Panyuran, Tasikmadu, Kradenan, Gesikharjo, Palang, Glodog, Leran Kulon, Karang Agung and Pliwetan **(Sukandar. et al., 2016; Tuban, 2020).** The area of Palang sub-district, which is mostly a coastal area, means that many of its residents work as fishermen. From 2016 statistical data, the number of fishermen in Palang sub-district was 4733 people. This value exceeds Jenu sub-district, whose coastline is 26.15 km long, 2 times larger than the coastline in Palang sub-district, but the number of fishermen is only 2103 people. Coastal resource processing activities in Palang District are divided into 3, namely capture fisheries, aquaculture, and fishery product processing. There are various types of fishing gear used by coastal communities, including: payang, dogol, gill net, trammel net, fishing rod, purse seine, and trap. Each village per coastal sub-district has different fishing gear and generally the results they catch are anchovies, mackerel fish, tuna fish, donggol shrimp, petek/peperek fish, squid, snapper, stingray, bambangan fish, three face fish and grouper **(Sukandar. et al., 2016)**.

Coastal areas are densely populated areas and centers of economic activity. This is what causes economic growth in the northern coastal area of Palang - Tuban subdistrict to be faster than in the southern area. The factors that make the northern coastal area the center of economic activity in a particular region are a) Population growth in the northern coastal areas is faster than in the southern areas. Population growth in coastal areas is not only caused by high or low numbers of local residents, but population growth can also be caused by immigrants from outside the area. These immigrants were initially for economic activities, such as working, trading, and so on. However, over time they were able to settle and become official residents of the area. The impact of population growth is to expand markets, and market expansion will increase the level of specialization in the economy. As a result of specialization, the level of economic activity will increase. b) The coast as an area that is relatively easy to reach will be a target for the development of human activities. In the northern coastal areas, access to transportation and accommodation for community activities is much

more adequate than in southern areas **(Marfai & King, 2008; Ward et al., 2011)**. In the northern coastal areas, land access has been adequate since the Dutch colonial era, because at that time Indonesian agricultural products exploited by the Dutch were transported by land to the port to be carried by Dutch ships. c) The lifestyle of northern coastal communities is more consumerist. This behavior of coastal communities is what makes economic activities and the circulation of money in coastal areas faster. Moreover, supported by abundant fish catches, the mindset of safe deposit coastal communities is reluctant.

In the era of society 5.0 and current technological advances, high competition in various sectors that are in direct contact with society's needs has led to specialization and division of work among the workforce. The impact of increasing labor productivity and encouraging technological development. On the other hand, population density in the northern coastal areas causes problems with uneven population distribution, which can affect the quality of life of the community. In areas with high density, efforts to improve the quality of the population will be more difficult. This raises socio-economic problems, welfare, security, availability of land, clean water and foods. The biggest impact is environmental damage. All human needs are met from the environment, because the environment is a natural resource that is used to fulfill human needs. These needs include food, shelter, clean water, clean air and other needs (Suleman et al., 2018; Yunianto, 2021). This has resulted in the utilization of the potential of coastal areas experiencing a significant increase. Coastal area management is basically related to ecological, economic and social factors. However, this management often ignores carrying capacity and the principles of optimal and sustainable utilization **(Zamdial et al., 2017)**. The activities of the north coast of Palang-Tuban, both economic and non-economic activities, will have an impact on the coastal ecosystem. The most obvious impact is the degradation of the biophysical conditions of coastal resources north of Palang-Tuban.

In this article, we will describe the condition of the north coast of Palang-Tuban sub-district as an actual condition regarding environmental damage. This article is based on a literature review and the results of field observations conducted in July 2023. It is hoped this article will become a source of information for academic and government circles regarding the condition of the north coast of Palang-Tuban District for carrying out corrective actions and planning spatial planning policies for the north coast of Palang-Tuban District

RESULTS AND DISCUSSION

The coast is a transition zone between terrestrial areas (land) and the ocean in the earth's biosphere layer where there is interaction and mutual influence between the characteristics of the land (ground winds, river estuaries, sediment, etc) and the characteristics of the sea (tides, salinity, sea winds, etc.) **(Sara, 2014; Setyawan et al., 2015; Wibisono, 2011).** Coastal areas are one of the zones of ecosystem diversity and natural resources. The characteristic of coastal areas is the presence of intense interaction between land components and ocean components, for example biogeochemical cycles. Biogeochemistry is the process of transferring chemical elements through living organisms and the abiotic environment (soil and water) **(Crossland et al., 2006)**. The north coast of Palang sub-district is one of the coastal areas with a high potential for enviromental damage. It is based on the high intensity of exploitation of the northern coastal area and the lack of awareness in protection and conservation of this area. The potential for enviromental damage to the north coast of Palang-Tuban District will be even greater if strategic steps are not taken to control natural damage factors. According to **Suleman et al., (2018)** the causes of damage to coastal areas are generally divide into 2:

Human factors

The activities of coastal communities greatly impact the damage of coastal nature because human needs are generally met from natural resources. Economic and non-economic activities of the community will produce polluting materials that can reduce the quality of the northern coastal waters of Palang sub-district. The results of observations showed that data on community and industrial activities on the north coast of Palang sub-district wich have the potential to produce waste and contaminate the sea waters. The observation results are presented in table 1 below. Observations were carried out for 2 days on 22 – 23 July 2023.The results of observations show that many sources of pollution from the economic activities of coastal communities such as fishing activities at ports & TPIs (Fish Auction Places), shrimp and fry cultivation activities, beach tourism, culinary, fish processing industries and others. Meanwhile, the source of pollution from non-economic activities is domestic activity in coastal community settlements. Most of the types of waste produced are domestic waste and plastic waste.

Natural factors

Coastal areas are very sensitive and vulnerable to natural phenomena such as climate variability, climate change, rising sea levels, abrasion, sedimentation, rate of change in coastlines, beach slope, waves, tides and rising sea levels **(Agustin et al., 2016; Joesidawati, 2016; Kaly et al., 2004; Sakka et al., 2014; Zamdial et al., 2017).** These natural factors can slowly change the geomorphology of a coastal area. For example, rising sea levels can cause abrasion, namely the erosion of land in coastal areas caused by

damaging waves and ocean currents. Sedimentation at river mouths results in erosion and accretion in coastal areas. This phenomenon occurs in almost all coastal areas, including on the north coast of Palang sub-district.

Table.1 Types of activities and industries carried out by the northern coastal communities of Palang-Tuban District and the types of waste produced

Types of activities/industries	Location	Types of waste
Fish auction & fishing port	Karangagung village, Njangon village, Glodog village, Palang village, Kradenan village	Domestic waste, waste fuel oil, and plastic waste
Shrimp and fry pond cultivation	Panyuran village	Pond waste water
Fishing village settlement	Karangagung village, Palang village	Domestic waste water, organic waste and plastic waste
Beach tourism	Pantai kelapa : Panyuran village Pantai Klero : Gesikharjo village	Domestic waste and plastic waste
Culinary	Along the coastline of the north coast of Palang-Tuban, from simple stalls to restaurants	Domestic waste water, organic waste and plastic waste
Industry	PT.Bagona Indonesia : freozen seafood factory, EPC 3 project: oil and gas pipeline of pertamina	Industrial waste and domestic waste

Geomorphological conditions of the Palang Northern Coastal

Prabowo & Astjario (2012) explained that the coastal areas of Java Island which have a sloping coastal morphology and small slope angles can cause disasters in vulnerable and even risky areas that experience sea level rise. So also the condition of beaches in northern coastal of Palang sub-district has a beach morphology of 100 % sloping beaches, while a substrate base of sand, delta (clay, sand or gravel) which settles with a covering biota coral reefs and biota ecosystem cover in the form of coral reefs (Figure 1). The slope of the Palang coast is 1,3-7,1 meters with an average slope of 3,8 meters **(Joesidawati, 2016).** The research of **Joesidawati (2016)** related to coastal classification in the Tuban district shows the geomorphological formations in coastal villages in Palang sub-district as follows:

a) The Panyuran village ia an alluvial and gisik
b) The Tasikmadu villages is an beach Alluvial and gisik
c) The Kradenan villages is an little alluvial land, beach Alluvial , and gisik
d) The Gesikharjo villages is entirely alluvial land
e) The Palang villages is an Alluvial land and little of gisik
f) The Glodog villages is an Alluvial beach land and gisik
g) The Karangagung and Pliwetan village is entirely alluvial beach land

The northern coastal area of Palang sub-district is vulnerable to changes in the coastline. Changes in coastlines are caused by changes in land use and human activities, the influence of the wind, tides and sea waves **(Suhardi & R.Saraswati., 2020)**. According to **(Raihansyah et al., 2016)**, accretion due to other anthropogenic processes is land addition due to human activities, such as accretion due to groynes, breakwaters, or beach fill by mechanical tools. Coastline changes also occurred on the north coast of Palang sub-district. That's because almost every coastal village in Palang sub-district has built attached breakwaters and jetties as a place for fishing boats to dock, for example jetties at the port and TPI in Karangagung Village and Kradenan Village (Figure 2). According to **Richard & Sunarto (2015),** coastal damage, especially changes in coastlines, is strongest in coastal areas where human activity is high, and there are coastal protection buildings such as breakwaters and jetties. In addition to the beach reclamations committed by coastal communities to expand their land area as well as abrasion and accretion make coastal areas vulnerable to the coastal environmental damage **(Joesidawati, 2016)**. Changes in the coastline and damage to the northern coastal area in the northern coastal area of Palang sub-district are due to the land covering for economic activities such as Maulana Malik Ibrohim Asmoroqondi religious tourism parking lots, restaurants and other economic activities (Figure 3). Sedimentation at the river mouth is very visible at Klero Gesikharjo beach, where this sedimentation increases the area of the beach so that it is used as beach tourism by local residents.

Research by **Siburian et al., (2017)** stated that changes in the coastline that occurred over ± 50 years in Pliwetan Village were based on the highest Net Shoreline Movement (NSM) value of 804.17 meters

with an End Point Rate (EPR) of 14.16 while the abrasion area was in Karang Village Agung with the lowest Net Shoreline Movement (NSM) value of -60.45 meters with an End Point Rate (EPR) of -1.06. The changes in land cover that occurred were dominated by residential land cover and ponds for ± 50 years and a reduction in empty land and forest cover. The relationship between changes in coastline and land cover is fluctuating. Short-term predictions made for the next 5 years show that Palang District is experiencing accretion due to the construction of coastal protection such as jetties and seawalls.

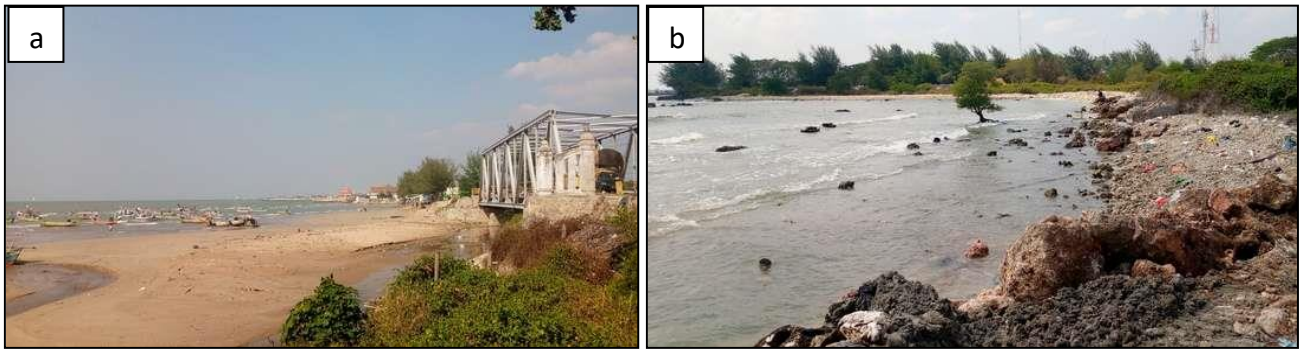

Figure 1. a. Klero Gesikharjo beach is an alluvial beach land, b. Njangon is an alluvial land and gisik. **Source** : Private document

Figure 2. a. Jetty at the port & TPI Karangagung village, b. Jetty & Wavebreaker in Kradenan Village. **Source** : Private document

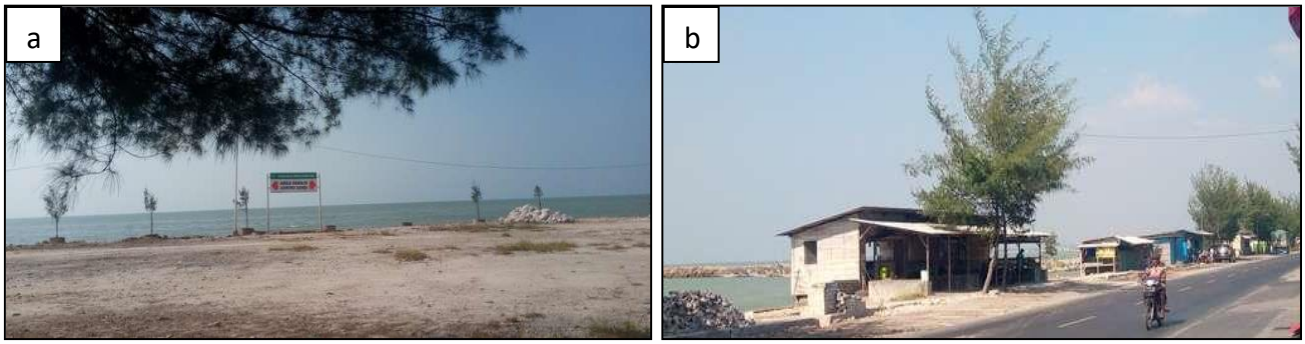

Figure 3. a. Beach accretion for parking of Maulana Ibrohim Asmoroqondi religious tourism, b. Beach accretion for economic activities**. Source** : Private document

Characteristics of the Palang northern coastal

Oceanographic characteristics of sea water of the northern coastal of Palang is not significantly different from the characteristics of the northern coastal sea of Tuban, Lamongan or other northern coastal areas of Java. This is because the morphology of the north coast of Java has a homogeneous structure, which is lowlands with many deltas. The waves in Palang waters are similar to the waves in Tuban waters. In generally, the waves in the northern coastal waters of Palang-Tuban are shallow wave types. **Suhardi & R.Saraswati., (2020)** stated that from the direction and height of the water waves in the Tuban area, generally leads from the southwest direction with significant wave heights ranging from 0 - 0.5 meters, which

is in the calm water category. Research by **Thirtasari & A.Rifai, (2015))** states that the wave characteristics on Boom Tuban beach are transitional sea waves using the SMB (*Sverdrup Munk Bretcheider*) & CMS-Wave (*Coastal Modeling System - Wave*) method. Current speeds in the northern coastal waters of the Tuban region and its surroundings, including the Palang coast, tend to be smaller during the west season. This causes sedimentation to proceed slowly **(Richard & Sunarto, 2015).** Research by **Chotimah (2022**) states that the current speed in Tuban waters is relatively small and the dominant current direction is east and west with an average current speed of 0.0034 and a bottom of 0.0112 m/s. Besides that, the waters north of Palang have characteristics of diurnal tide type where in 24 hours there are pockets of high tide and one low tide **(Spanton & A. Mahardika, 2022)**. The characteristic oceanographic conditions of the north coast of Palang mean that changes in the coastline due to abrasion are very small. However, changes to the coastline of the north coast of Palang due to accretion and reclamation cannot be avoided. Physically and chemically, the sea on the north coast of Palang has a temperature range of 29-31 oC, which is not much different from the temperature of Java Sea waters ranging from 13.06 – 30.33 °C with an average of 25.29 °C. Meanwhile, the salinity of the Palang Sea waters around Asmoroqondi coastal waters (Klero Beach) ranges from 30.30 ± 1.58 ‰ to 32.60 ± 2.08 ‰. The salinity of the Java Sea is more variable because apart from being influenced by river run-off to the west of the three large Indonesian archipelago groups, it is also influenced by the insertion of high salinity water masses from the eastern region so that it has unique water mass properties **(Mudloifah & Tarzan, 2023)**.

The water quality conditions of Palang northern coastal

The quality of sea water on the north coast of Palang-Tuban District has decreased. Research by Joesidawati (2016) states that the water quality in Tuban district using the WQI (*Water Quality Index*) method, overall shows good conditions with the parameters tested being Do, turbidity and total phosphorus, but the coastal waters in Palang District are not suitable for marine cultivation activities. The quality of coastal waters in Tuban district has decreased as evidenced by several heavy metal parameters slightly exceeding the quality standard thresholds permitted for cultivation activities. The latest research conducted by **Mudloifah & Tarzan (2023)** who analyzed the water quality at Asmoroqondi Palang beach using the PCA (Principal Component Analysis) method shows that the water quality in the area is classified as poor with 3 parameters that do not comply with quality standards which is brightness, salinity and DO. The water quality of the northern coastal of Palang sub-district can be predicted to continue to decline due to the high pollution load from community activities, as well as the large number of industrial activities starting to grow in the area.

CONCLUSION

The condition of the north coast of Palang District, Tuban Regency, has a geomorphological form in the form of a sloping beach, with a basic substrate in the form of sand, clay or gravel that settles with coral reef fragments and a biota ecosystem in the form of coral reefs. Changes in the coastline on the north coast of Palang District are caused by accretion and reclamation of coastal areas for community economic activities such as parking for tourist vehicles, reclamation for the construction of culinary businesses and shops, as well as the construction of jetties in each village on the north coast of Palang as a place to dock for fishing boats. The quality of sea water in the Palang District area has decreased. The results show that there are several parameters that exceed the quality standard thresholds, such as brightness, salinity, DO and heavy metals.

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