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EVALUATION OF EMERGE LAND FOR MANGROVE CONSERVATION PROGRAM IN KALIWLINGI, BREBES DISTRICT, BREBES REGENCY

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ABSTRACT

Mangrove ecosystems are very important in the balance of ecosystems in coastal areas, because many mangrove functions cannot be replaced by other ecosystems or vegetation from physical, ecological to economic functions. The mangrove ecosystem is decreasing along with the development of coastal areas construction, reclamation, and natural factors including coastal abrasion. This study aims to evaluate emerge land for the mangrove rehabilitation conservation program in Kaliwlingi, Brebes Regency. The imagery used is Landsat satellite imagery and Sentinel in 1999, 2004, 2009, 2014, and 2019. Image processing is done with the support of ER Mapper 7,0, Arc GIS 10,2,2, The method of determining land for mangrove rehabilitation includes the physical conditions of the waters and the analysis of the sediment's grain size. Adjustment area of abrasion in Kaliwlingi, Brebes Regency from 1999 to 2019 were 121,42ha, 109,32ha, 102,98ha and 151,57ha, respectively, Meanwhile, there are 4 points of emerge land found in the research location, With the units of abrasion value in Kaliwlingi, Brebes Regency and emerge land can be used as mangrove rehabilitation area.

Keywords: Abrasion; emerge land; rehabilitation; Kaliwlingi

INTRODUCTION

Mangrove forests are tropical coastal vegetation communities, which are dominated by several species of mangrove trees that can grow and thrive in muddy tidal coastal areas (Harahab, 2009). The vegetation communities generally grow in the intertidal and subtidal considerable get a stream of water, and are protected from large waves and strong tidal currents. Mangrove forests are ecologically serving as a place to find food, shelter, spawning and rearing for many species of fish, shrimp, crustaceans and other marine organisms (Saparinto, 2007). Ecologically, the mangrove ecosystem can act as a coastal protector from the danger of tsunamis, as a barrier to abrasion, nutrient recycling, safeguard of coastal fisheries productivity and biodiversity, reducer of seawater intrusion rate, health buffer and support for other coastal ecosystems (Tuwo, 2011).

The degradation of mangrove forests triggers coastal abrasion and, conversely, coastal abrasion plays an important role in reducing mangrove area which is influenced by ecological, social, economic and cultural factors of the local community, Brebes Regency, Central Java Province has a coastline of 65,48 km, The mangrove vegetation that grew in 1983 was 2,327 ha (Anomimus, 2008), In 2008, the total area of the mangroves was only 257,11 ha, Until 2000, the coastal abrasion in Brebes Regency was 789 ha (Suyono, 2015), Unplanned exploitation of mangrove forests, illegal logging, clearing of mangrove land for aquaculture areas, agriculture, salting and settlements, lack of public awareness and understanding of the benefits of mangroves, as well as community negative perceptions of the existence of mangroves are the causes of damage to the mangrove ecosystem, In addition, there was also a factor of reducing mangrove in this area, namely abrasion, Furthermore, from 2000 to 2008, abrasion Brebes reached 640,45 ha with a length of 27,04 km coastline (Agency of Fisheries and Marine Brebes, 2008).

In Kaliwlingi Brebes, there was emerge land which was commonly referred to as "Pulau Laut" which is used as a conservation area, Emerge land in Kaliwlingi due to accretion in waters which was about 3 km from the coast, Relevant research on emerge land is limited to evaluation and knowledge of the causes of emerge land (Cerlyawati, 2017).

Considering that this research is important to carry out as an effort to conserve mangrove vegetatiton's rehabilitation, this research needs to be carried out as an effort to overcome the above problems, With the emerge land in Brebes, it can be used as conservation efforts for the use of mangrove planting.

RESEARCH METHODS

This research was conducted in the area of Kaliwlingi, Brebes Regency, Central Java in May 2019, The first stage assessment, using GIS technology (Geographic Information System) and remote sensing (satellite imagery) of the emerge land area that will be interpreted, then do field survey and analysis of satellite imagery result. Landsat 8 TM and sentinel 2 satellite imagery data taken in May 2019 and direct field observations were made in May 2019, The observation station was determined purposively based on the amount of visible emerge land. The main aspects studied in determining the land for mangrove rehabilitation include the the water's physical contition, to grain size analysis of emerge land, which then analyzed the sediment samples by using the granulometric method. The equipment used in this study include the sediment corer to collect sediment samples,

GPS to determine coordinates and Water Quality Checker (WQC) to measure water quality.

The method used in this research is the descriptive method, Descriptive method is based on obtaining the facts of the problem and to describing or describing a situation (Hadi, 1984), Measurement of environmental parameters in this research include temperature, pH and salinity, Sediment sampling was carried out using correr sediment with a diameter of 5 cm and a length of 1 m, The equipment is made from modified PVC pipe, so that it can function like a sediment correr which aims to collect sediment samples, Furthermore, the sediment was tested at the Laboratory of Soil Mechanics, Department of Civil Engineering, Faculty of Engineering, Diponegoro University.

Satellite processing

Satellite imagery data used in this research are Landsat 8 TM (Thematic Mapper) and Sentinel 2 imagery obtained from the United State Geological Survey (USGS) via https://earthexplorer,usgs,gov/, Satellite imagery processing consists of Radiometric Correction, Geometric correction, imagery cropping and imagery classification.

Radiometric Correction

Imagery processing begins with pre-processing which consists of radiometric correction, This correction aims to fix the pixel value to match the original color, Radiometric correction is intended to reconstruct the reflection value recorded by sensors that approach or have a pattern such as the actual object's reflection according to the recording wavelength (Parman, 2014).

Geometric Correction

Geometric correction of Landsat imagery is an effort to fix recording errors geometrically so that the resulting imagery has a uniform coordinate and scale system, and is carried out by means of translation, rotation, or scale shift (Parman, 2014), Geometric correction is a process that aims to rectify (rectify) or restore (restoration) an image so that the coordinates of the image match the coordinates of the earth, This can be done by matching (registering) the position of the corrected image with the image and registering the image with a map.

Imagery Cropping

Imagery cropping or cutting is done because the initial imagery obtained has an area that is too large, This process aims to make data processing easier, more effective and efficient because the new imagery coverage area becomes smaller, Imagery cropping is carried out to obtain imagery that only contain the research area (Hidayah and Wiyanto, 2013),

Classification of Citra

Imagery classification is a process of preparing, sorting, or grouping all the pixels into several classes based on criteria or categories of objects (Muttaqin and Aini, 2011), The classification used in this study is an unsupervised classification with the maximum likelihood classification method, The maximum likelihood classification method is the most popular method in classifying remote sensing imagery data (Jia et al,, 2011).

RESULTS AND DISCUSSION

Changes in Coastal Lines and Extensions

Based on the visual observation data of Landsat imagery in Kaliwlingi, Brebes Regency in a multitemporaly, namely in 1999, 2004, 2009, 2014 and 2019, it can be seen that the appearance shows changes in the coastline as in Figure 2, Changes in coastline per five years in a period of 20 years indicate the dynamic nature of the coast in Kaliwlingi (in table 1), The addition of the coastal land of Brebes from 1999 to 2019 in Kaliwlingi shows a significant difference in the shape of the delta on the west side of the mouth of the Pamali River which shows an increase every year, and there is an area of abrasion and accretion on the coast of Kaliwlingi, This data can be seen in Table 2, Geomorphological processes that occur in coastal areas, especially erosion and sedimentation processes, are important factors in the occurrence of shoreline changes (Riasasi, 2019), The continuous process of erosion and sedimentation process is the main triggering factor for shoreline changes as the most dynamic process in coastal areas (Marfai, 2008).

Table 1. Coastline Change Value

The length of the coastline	
Year	Length (km)
1999	12,53
2004	11,88
2009	12,98
2014	14,43
2019	19,29

Table 2. Value of Change in Area of Abrasion and Accretion

Abrasion Area		**Accretion area**	
Period Years	**Area (ha)**	**Period Years**	**Area (ha)**
1999 - 2004	121,42	1999 - 2004	24,48
2004 - 2009	109,32	2004 - 2009	4,20
2009 - 2014	102,98	2009 - 2014	25,76
2014 - 2019	151,57	2014 - 2019	92,11
1999 - 2019	408,42	1999 - 2019	56,36

Seen in the year 1999 with a value line of 12,53 km long coastline, compared with 2004 showed a reduction in shoreline change be 11,88 km, Meanwhile, in 2009 it has a long coastline of 12,98 km, In 2014 began to change coastline length of 14,43 km, And for 2019, it is seen that the coastline is getting longer with a value of 19,29 km, Changes in the

length of the coastline occur due to abrasion and accretion in the coastal area of Kaliwlingi, Significant coastline changes can be seen in 2014 to 2019 which shows changes in the length of the coastline which are getting longer and there is a change in the shape of the coastal area in the Brebes area which is getting wider in the delta in the Brebes area, Where changes in the coastal profile are strongly influenced by waves, currents, sediment properties, size and sediment particles' shape.

It can be seen that the rate of change in the length of the coastline in Kaliwlingi 1999-2004 shows a reduction, where in 1999 was 12,57 km to 11,88 km in 2004, The reduction in the length of the coastline occurred because of The abrasion is quite large in the area, the abrasion value in 1999 - 2004 was 121,42 ha, For changes in the length of the coastline in 2004–2009, the length of the coastline in 2004 also increased by 11,88 km to 12,98 km, Meanwhile, the abrasion value in 2004–2009 was 109,32 ha.

For changes in the length of the coastline in 2009–2014, it shows that the length of the coastline in 2009 was 12,98 km to 14,43 km in 2014, Meanwhile, the abrasion in 2009–2014 decreased from previous years to 102,98 ha, And in 2014–2019 the coastline experienced a significant increase with a value of 14,43 km to 19,29 km, The abrasion value in 2014–2019 was 151,17 ha.

In general, the research location experienced a very large rate of abrasion per 5 years for 20 years from 1999–2019 with a value of 408,42 ha, This is due to the shape of the coastal profile in the eastern part of the Pamali River directly faces the arrival of currents and waves, According to Triadmodjo (1999) the shape of the beach profile is strongly influenced by wave attack, sediment properties such as mass density, particle size and shape, Coastal erosion occurs when the considered area has lost / decreased sediment, meaning that the transported sediment is greater than what was deposited, Abrasion can occur due to weathering of cliffs or due to increased wave energy, or due to reduced cliff resistance by chemical, physical or biological weathering (Bengen, 2001).

Meanwhile, the accretion that occurred in Kaliwlingi was quite low, this shows that the accretion value in 1999–2004 was 24,48 ha, For the following years in 2004–2009, the accretion was quite low when compared to other years with a value of 4,20 ha, During 2009–2014, the accretion valueincreased due to mangrove rehabilitation in the study area, with a value of 25,76 ha, In 2014–2019 there was a very significant increase in the accretion value with a value of 92,11 ha.

The existence of accretion on the coast of Brebes can be seen by the presence of sandbars and a stretch of mud overgrown by mangrove vegetation seedlings as seen at the mouth of the Pemali River, This is reinforced by the statement (Riasasi, 2019) that the mouth of the river which forms a delta causes the coast in Brebes District to be very dynamic, Changes in the coastline indicate the condition of the accretionary coast, in the form of sediment transportation from the sea to the coast is greater than the transportation from the coast to the sea, while the condition of the coast is abrasion if the sediment transport from the sea to the coast is less than the transportation from the coast to the sea.

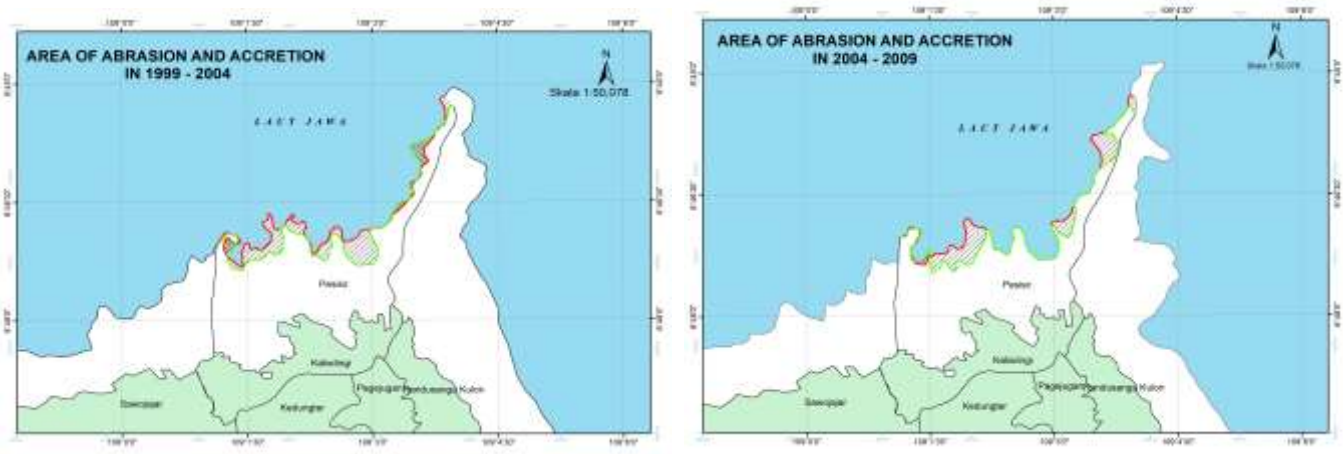
Emerge land

Changes in the shoreline that occur due to abrasion and accretion at the research location have resulted in the presence of emerge land, Previously, emerge land appeared and disappeared with the arrival of the seasons, which appeared during the east wind season and wave conditions were not high and began to disappear during the west wind season or high sea wave conditions (Lestari, 2016).

Emerge land caused by accretion in the research location which is about 3 km from Kaliwlingi beach with a width of about 10 meters extending for about 5 km to the village of Sawojajar Kacamatan Wanasari (Cerlyawati, 2017), The location of emerge land can be seen in Figure 4.

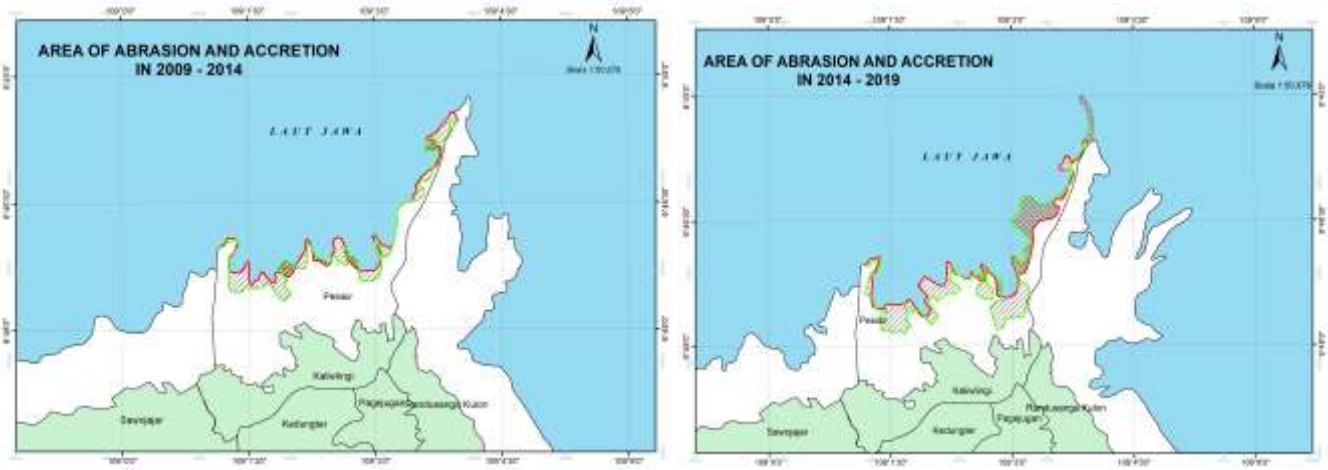
In general, the texture of emerge land in Kaliwlingi, composed of coarse sand, fine sand, muddy sand, followed by a clay swab. The condition of this coastal soil texture is an important factor related to determining the type of mangrove vegetation suitable for planting during mangrove rehabilitation activities in Kaliwlingi.

The sedimentation process at the research location shows that the sediment source comes from the sea, which then deposited a transportation process until it is finally deposited into sediment at each location, The characteristics of the sedimentary deposits that are around the research location point (river mouth) are dominant in size of silt and a mixture of clay minerals and plant residues, this indicates that the influence of land is very dominant, In contrast to the sediments that are offshore and not adjacent to river estuaries, characterized by the composition of marine biota shells, this condition proves that the zone is deposited (Gemilang, 2017).



(a) **(b)**

Figure 1. (a) Map area Abrasion and Accretion 1999 – 2004, (b) Map area Abrasion and Accretion 2004 – 2009



(c) **(d)**

Figure 2. (c) Map area Abrasion and Accretion 2009 – 2014, (d) Map area Abrasion and Accretion 2014 - 2019

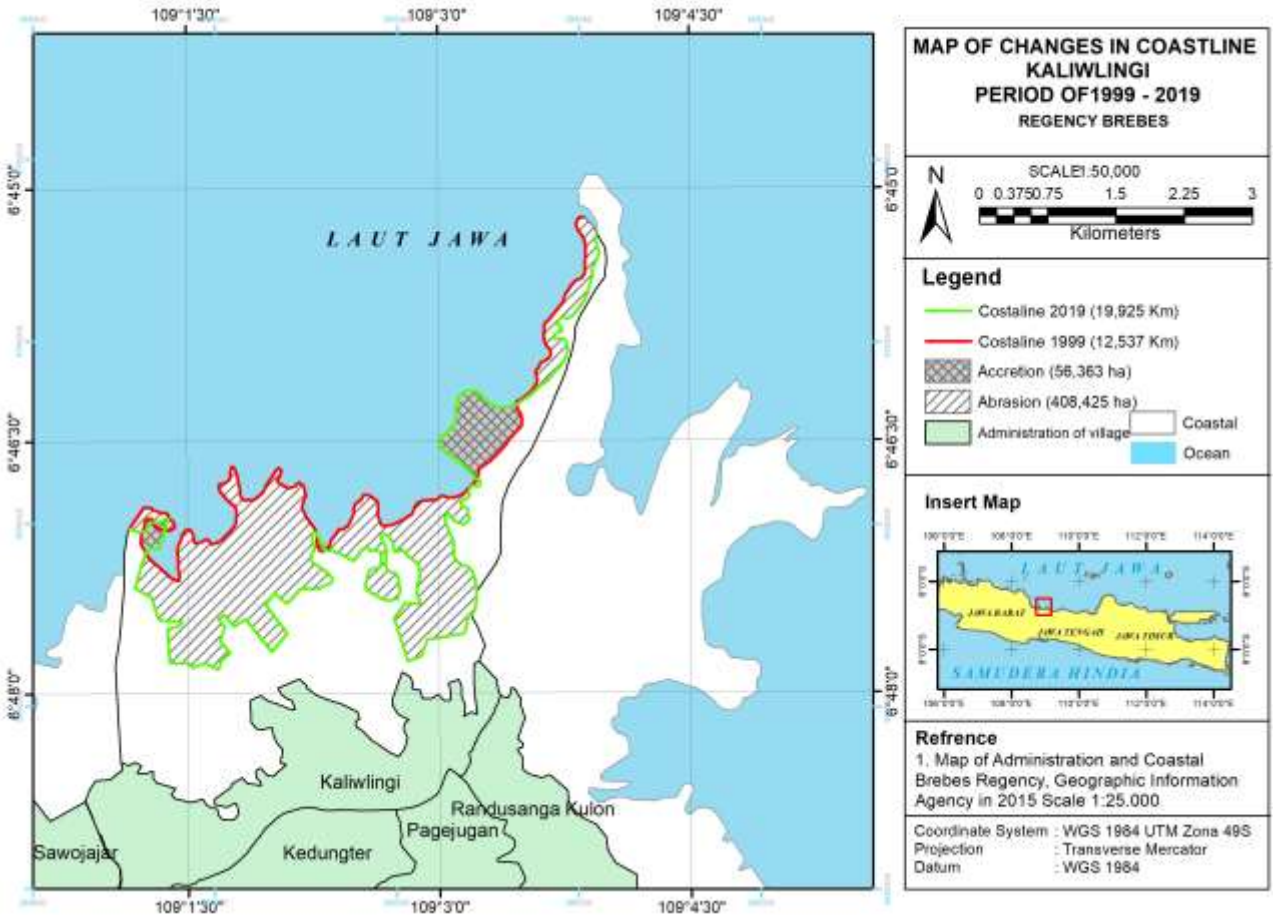
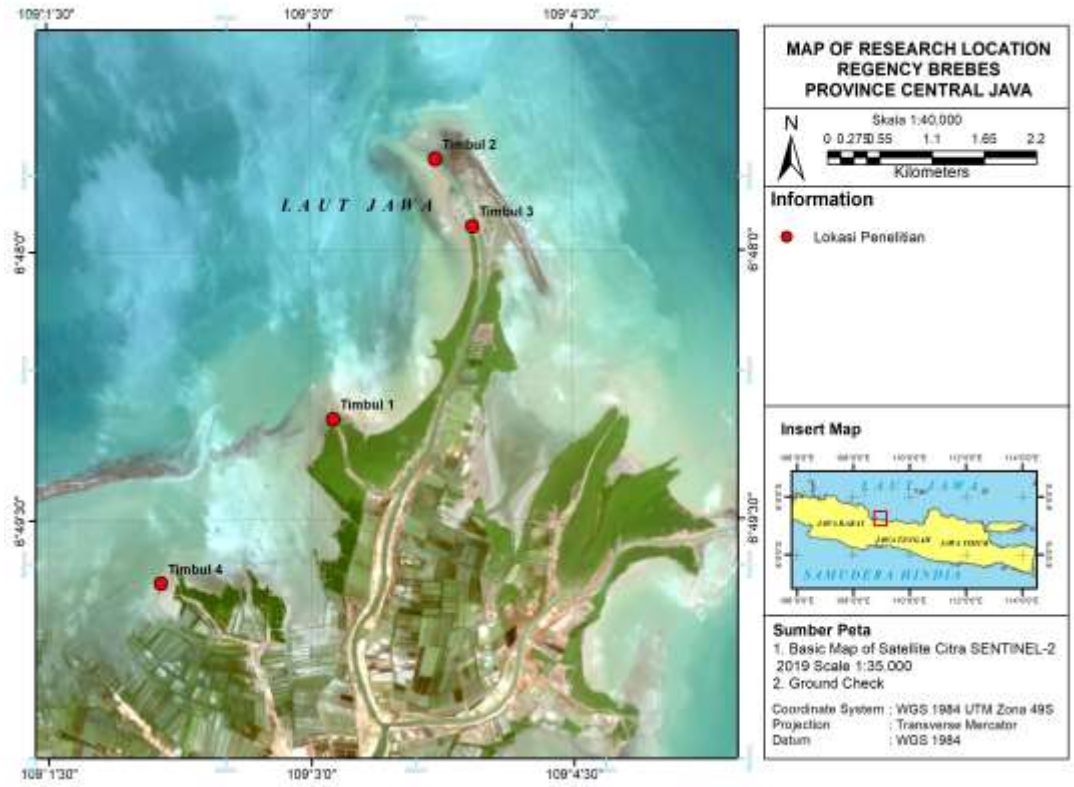
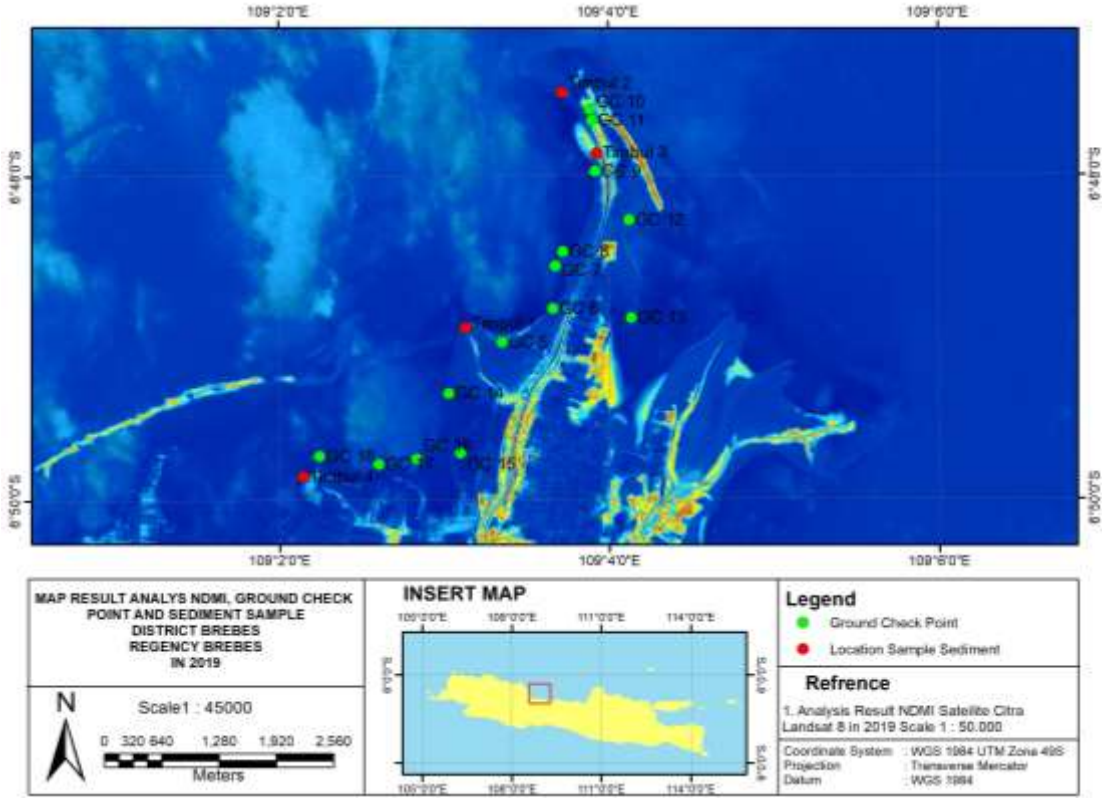


Figure 3. Map of Changes in Coastlines in Kaliwlingi, Brebes Regency, 1999 - 2019



(a)



(b)

Figure 4. Location of Emerge land and Sediment Sampling

At research location points 1, 3, and 4 have a type of silty sandy sediment texture at each station, in contrast to research location point 2 has a type of silty sand sediment, This situation indicates that the location of emerge land can be used as a recommendation for mangrove rehabilitation activities in Brebes.

The results of the research on the location of emerge land tend to be in the mouth of the river, this is because the source of flow from the upstream is the main factor of

sedimentation in the Pamali River Estuary, The factor that affects the value of the sedimentation rate in the estuary is the presence of sediment transport that occurs, what is meant by sediment transport is the process of sediment originating from the upstream of the river which is carried by the river to the sea, while sediment transport originating from the sea is carried by tides to the river channel through estuary, The meeting of the two flows is due to the tides that carry sediment transport which causes sedimentation in the Singai estuary, This is confirmed by Gemilang (2019) river flow from the upstream when the sediment transport tides are deposited in the river channel or river mouth, while the river flow when it recedes, sediment transport is brought back to the sea, However, not all sediment returns to the sea, but some will settle in river channels and river estuaries when the flow weakens, This is why the sedimentation rate in the river channel and river mouth of the study area is quite high.

The sediment transpot mechanism in coastal areas is also greatly influenced by fluctuating environmental and oceanographic factors, If the sediment transpot from the river does not support the eroded area, what will happen is a change in the coastline along the study site and on the coast of Brebes, This is reinforced (Sartohadi, 2009) that currents along the coast are a major factor that has a major role in the transport mechanism of sediment on the Brebes coast which causes the phenomena of abrasion, accretion and changes in the coastline.

The coastal area in the western part is included in the area close to the river mouth, so that the sedimentation process that is formed due to sediment transportation originating from the river mouth is deposited along the coast around the river mouth, Agree in Setiani's research (2017), that the transportation of river mouth sediments can cause coastal silting and sedimentation along the coast.

Based on data in the field, the waters of Kaliwlingi, Brebes Regency are in quite good condition, This condition can be seen from the air temperature in this area ranging from 30,10 - 32,50 ºC, while the water substrate temperature in the research area ranges from 27,70 - 30,30 ° C,

The pH value at the research location ranged from 7,89 to 8,41, This condition can be said that the waters in the research location have high productivity, The pH value reflects the balance between acid and base that will affect mangrove growth.

CONCLUSION

Regency in 1999-2019 was 12,53 km, 11,88 km, 12,98 km, 14,43 km and 19,295 km, respectively, Meanwhile, the abrasion value from 1999-2019 was 408,42 ha and the accretion value in 1999-2019 was 56,36 ha, For mangrove rehabilitation conservation activities in Kaliwlingi, it can be carried out at the emerge land site by paying attention to the criteria for supporting mangrove planting in that location.

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