

# *Identification of the Physical Characteristics of Mangrove Ecosystems in the Coastal Area of Pantai Labu Subdistrict, Deli Serdang Regency, North Sumatra*

Eni Yuniastuti, Anik Juli Dwi Astuti, Nahor Simanungkalit  
*Department of Geography Education*  
*Universitas Negeri Medan*  
Medan, Indonesia  
eni.yuniastuti17@gmail.com

**Abstract**— This research was carried out in the Coastal area of Pantai Labu Subdistrict , Deli Serdang Regency, North Sumatra. The purpose this research is to identify the requirements for mangrove growth and development based on aspects of slope, soil, water, sea tide, and climate in Coastal area of Pantai Labu District. The method which used in this research were survey methods, data collection by sampling, and data analysis with qualitative. Data were obtained by field and institutional survey. The data were collected by observation, interview, measurement with tools, and map/ image interpretation. The research variables used in this study are physical factors requirements for the growth and development of mangrove research areas. The results of this study indicate the physical conditions of growth and development of mangroves in the Coastal area of Pantai Labu Subdistrict can be seen from (a) aspects of slope criteria: the study area is included in the sloping category with slope class 0-2%, (b) soil conditions criteria: soil texture is debris clay and the soil pH ranges from 5.60 to 7.00, (c) frequency of water conditions: water pH ranges from 5.35 to 7.36, salt content (ppt) ranges from <0.01 ‰ to 26 ‰, and temperatures range from 29.00 °C to 34.40 °C, (d) tidal criteria: including the class of micropases with tidal range <2 m, inundation height <2.00 m, and inundation frequency 57 - 62 per month, and (e) climatic conditions criteria: annual rainfall of 2,230.80 mm/ year, number of annual rainy days of 203 days, number of wet months 9 and number of dry months 0, average annual temperature of 26.91°C, average air humidity the average per year ranges from 87.91%, and the average solar radiation per year 5.16 hours.

**Keywords**—*mangrove ecosystem, physical characteristics, coastal area*

## I. INTRODUCTION

Indonesia is one of the regions found in the tropics. The tropics generally have many and varied levels of biodiversity. The biodiversity is found in the territorial waters, land and transitional areas of land and waters. One of the natural resources found in the transitional area between land and waters is mangrove. Mangroves and mangrove ecosystems have similarities, but basically the meaning is very different. Mangroves are tree plants or plant communities that live between the sea and land which are affected by the ebb and flow of sea water.

Meanwhile, mangrove ecosystems are complex ecosystems consisting of flora and fauna of coastal areas. Usually these mangrove ecosystems grow and develop in the delta, estuary, shallow bay beaches, and protected coastal areas.

Mangroves are one of the plants that can grow and develop around coastal areas. The growth of the mangrove ecosystem is very dependent on the physical aspects and the social aspects of society. Physical aspects that influence the growth and development of mangroves can be seen from the aspects of slope criteria, aspects of criteria for soil conditions, aspects of criteria for water conditions, aspects of criteria for tidal conditions. Meanwhile, the social aspects that influence the growth and development of mangroves are people / humans.

According to Yuniastuti the problems found in the coastal area of Pantai Labu Subdistrict include the occurrence of abrasion processes in some coastal areas of Pantai Labu, some of which are damaged and dead mangrove ecosystems, and at high tides can cause flooding tidal [1]. Problems that are found in the coastal area must be addressed immediately in order to minimize the impact of the damage and be able to avoid the occurrence of unwanted disasters. One effort to overcome this problem is to conduct a mangrove rehabilitation program so that the ecosystem in the coastal area can be maintained properly. The mangrove rehabilitation program is a process of replanting mangroves. Before conducting mangrove rehabilitation, it is very necessary to do a study of the requirements and growth of the mangrove ecosystem.

The purpose of making this article is to identify the requirements for mangrove growth and development based on (1) aspects of slope criteria, (2) criteria for soil conditions, (3) criteria for water conditions, (4) sea tide criteria, and (5) climate criteria Coastal area of Pantai Labu District. The benefits of knowing the requirements for mangrove growth and development are based on (1) aspects of slope criteria, (2) criteria for soil conditions, (3) criteria for water conditions, (4) sea tide criteria, and (5)

climate criteria in coastal areas of Pantai Labu Subdistrict. The results of this analysis are used to support mangrove rehabilitation programs that are seen from their physical aspects.

## II. METHODOLOGY

The research location is administratively located in Pantai Labu District, Deli Serdang Regency, North Sumatra Province. The Pantai Labu District is geographically located at 3 ° 62 " - 3 ° 69" North Latitude and 98 ° 80 " - 98 ° 93" East Longitude [2]. The research method used is survey, the method of data collection is by sampling, and the method of data analysis is qualitative descriptive. The tools used in this study include: (1) computers/ laptops for data and writing analysis, (2) printers for printing results and reports, (3) *Microsoft Word* 2013 software and *Microsoft Excel* 2013 software for analysis and writing. Tools for research in the field include: GPS (*Global Positioning System*), EC meters, sample bottles, sample plastics, stationery, cameras, boats and motorbikes.

The materials used in this study are as follows: (1) Map of Indonesian Earth in the coastal area of Pantai Labu Subdistrict on a scale of 1: 250,000 in 1986, (2) *Google Earth* imagery in the research area in 2018, (3) requirements for growing mangrove ecosystem aspects of slope criteria, criteria for soil conditions, criteria for water conditions, tide criteria for water, and climate criteria, (4) secondary data from relevant agencies, and (5) supporting data collected through literature studies, both print and electronic to look for references.

Data collection techniques used in this study include: interpretation of satellite images, interpretation of maps, analysis of secondary data, measurement with tools, and field observations. Satellite images obtained from the *Google Earth* application, maps and secondary data obtained from relevant agencies. Field observations aim to verify results interpretation of satellite images, knowing the physical conditions of the conditional parameters of the growth and development of mangrove ecosystems.

The research variables used in this study are physical factors requirements for the growth and development of mangrove research areas. Physical factors used as research variables include aspects of slope criteria, criteria for soil conditions, criteria for water conditions, tide criteria for seawater, and climate criteria. The stage of implementation of this research is divided into 3 main stages, namely the preparation stage, the implementation phase, and the stage of completion.

## III. FINDING AND DISCUSSION

The results achieved in this study were to determine the physical factors that influence the growth and development of mangrove ecosystems. Physical factors used in this study are aspects of slope criteria, criteria for soil conditions, criteria for water conditions, tide criteria

for seawater, and climate criteria. According to Hartono in Johari [3], the conditions for land suitability for mangrove conservation are determined by five influential criteria, namely: (1) criteria for slope (%), (2) criteria for soil conditions, (3) criteria for water conditions, (4) criteria for tidal range (m), and (5) climate criteria. Criteria for soil conditions include: (1) soil texture, (2) organic matter (%), and (3) soil pH. Criteria for water conditions include: (1) pH of water, (2) salinity (ppt), (3) temperature (°C), (4) suspended salt levels (mg / l), and (5) dissolved oxygen levels (ppm). Climate criteria include: (1) annual rainfall (mm), (2) number of wet and dry months, (3) number of annual rainy days (days), and (5) potential area.

Physical factors that influence the growth and development of mangroves are obtained from direct measurements in the field, testing in the laboratory, and secondary data from agencies related to these parameters. Before taking samples in the field, first make and prepare a map of the land units. According to Sitorus, land units are groups of related locations, with certain landforms in the land system and all units of the same land and have the same location association [4]. The land system is an area that has a repetitive pattern of topography, soil and vegetation. Land units are usually used as a unit of analysis in geographic studies.

The land unit map in this study was made by summarizing landform maps, land use maps, and slope maps. Information on the appearance of objects on landform maps and land use is obtained from a visual interpretation of *Google Earth* imagery. This land unit map will be used to measure the physical parameters in the field. The aim is to facilitate the retrieval and measurement of data in the field and so that all objects on the field are represented. Based on the results of data analysis and the making of land unit maps there are 17 types of land units formed after the generalization process. The generalization process is to combine several feature segments into one so that the appearance becomes simpler. The generalization process used in this study is geometric generalization. Geometric generalization is simplification in the form of the appearance of objects of land use and landforms in the field.

The physical factors of the mangrove ecosystem that will be reviewed in this study include: (1) criteria for slope (%), (2) criteria for soil conditions, (3) criteria for water conditions, (4) criteria for tidal range (m), and (5) climate criteria. Criteria for soil conditions measured and analyzed include: soil texture and soil pH. Criteria for measured water conditions include water pH, salt content (ppt), and water temperature (°C). The tidal criteria to be analyzed include size and type of tides, height of inundation, and frequency of inundation. Climate criteria include: (1) annual rainfall (mm), (2) number of wet and dry months, (3) number of annual rainy days (days), (4) average annual temperature, (5) average air humidity average per year, and (6) average solar irradiation per

year. Descriptions of physical factors that influence the growth and development of the mangrove ecosystem will be clearly described in the following sub-sections.

*Physical Factors of Slim Criteria*

The criteria for slope is one of the physical factors that affect the growth and development of mangroves. The slope of this slope indicates the most suitable place for mangroves. Mangroves will grow and develop well on the slope of 0 - 2%, while in the slope gradient  $\geq 45\%$  the mangrove will not be able to grow properly. Based on topographic maps and the results of direct observations in the field, the Coastal Areas of Pantai Labu belong to a flat/ almost flat area. According to van Zuidam van Zuidam-Cancelado [5], based on the formed coastal slope angle can be categorized as a flat/ almost flat coastal area if it has a slope angle of between 0 - 2%. The flat/ almost flat slope criteria found in Pantai Labu District strongly support the entry of mud and brackish water substrates. The mud substrate and the circulating supply of brackish water will bring nutrients to the growth and development of mangroves. The topography of the Coastal Labu Subdistrict can be seen in Figure 1.

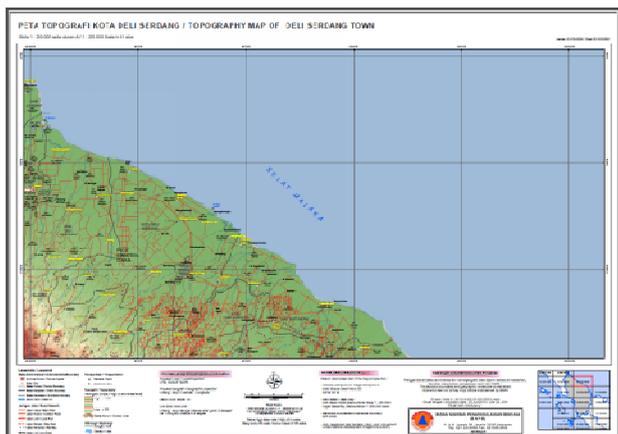


Fig. 1 Topographic Map of Coastal Areas in Pantai Labu Subdistrict, Source: National Disaster Management Agency

*Physical Factors of Criteria Of Soil Conditions*

Soil is a medium for the growth and development of mangroves in the Coastal Area of Pantai Labu District. According to Sartohadi et al, soil is a loose body that covers a large part of the Earth's surface and has the characteristics and characteristics of physical, chemical, biological and morphological characteristics as a result of a long series of various processes that shape it. The criteria for soil conditions measured in this study are soil texture and soil pH [6].

Soil texture is the proportion or amount of sand, dust, and clay. The size of coarse soil particles is sand, with a diameter of 2 - 0.05 mm. The size of fine soil particles is clay, with a diameter smaller than 0.002 mm [6]. The condition of soil texture in an area can be used as a determinant of water, air management, ease of land management, and ease of knowing the structure of the

soil. The method of measuring soil texture in this study uses the method of quick-probe results in the field. Determination of soil texture in this study is based on palpation [7]. This method has a quantitative result depending on experience and flight hours in the soil texture analyzer. The type of soil and texture of this soil is very influential on the growth and development of mangroves in the study area.

Classification of soil texture that is suitable for the growth and development of mangrove species is debris clay. Clay texture has a broad surface that facilitates chemical and physical reactions with outside air which can stimulate the growth of plankton and bacteria .Based on the results of the research, the texture of the soil found in the study area includes dusty clay, sandy loam, dusty cloud, sand, and clay. According to Begen in Harahab, mangroves will grow and develop well generally in intertidal areas whose soil types are muddy, clay or sandy [8].

Soil pH is the acidity or alkalinity of the soil measured by scaling a pH between 0 and 14. Normal and good soil pH for plant growth ranges from  $\pm 6.5$ . Based on the results of measurements using a PH meter tool, soil pH in the study area ranged from 5.60 to 7.00. The average soil pH in the Pantai Labu District area is 6.45. This shows that when viewed from the parameters of soil pH, this research area is very suitable for mangrove growth and development. The condition of soil texture and soil pH in full and complete can be seen in Table 1.

TABLE I. SOIL TEXTURE AND SOIL PH IN COASTAL AREAS OF PANTAI LABU DISTRICT

No.	Land Unit Code	Coordinate Point	Soil pH	Soil Texture
1	F.01.e Bl	0494844, 0406238	6.60	Bitter Released
2	F.01.e Kc	0494905, 0404209	6.80	Dusty
3	M.02.a Tg	0497714, 0405038	6.20	Dusty Clay
4	M.02.a M	0493811, 0406141	6.70	Dusty Clay
5	M.03.a M	0489296, 0406797	5.70	Sand
6	F.01.b Sw	0489291, 0405583	6.80	Dusty Clay
7	F.01.b Kc	0494068, 0404088	6.60	Dusty
8	F.01.e M	0480653, 0409612	6.50	Dusty Clay
9	F.01.a Tg	0480545, 0409350	7.00	Dusty Clay
10	F.01.e Sw	0478296, 0407286	6.30	Clay
11	F.01.e L	0493615, 0402424	6.40	Sand
12	F.01.b Tg	0493899, 0403449	6.40	Dusty Clay
13	M.02.a Tg	0492822, 0405719	5.40	Dusty Clay
14	F.01.e Pm	0490770, 0403305	6.80	Dusty Clay
15	M.02.a Pm	0489945, 0403816	6.80	Dusty Clay
16	F.01.e Bl	0488555, 0404879	6.60	Sandy Sandy
17	M.02.a Kc	0486310, 0407025	6.00	Dusty Clay
Average Soil pH			6.45	

Source: Results of Analysis and Measurement in the Field, 2018.

*Physical Factors of Water Condition Criteria*

Water is one of the factors that influence mangrove growth. Mangroves cannot grow and develop properly without water. The parameters of the water condition criteria used in this study are water pH, salinity (ppt), and temperature (°C). Parameters of this water condition as a

determinant of mangrove growth and development. Measuring water conditions using a PH Meter and Refractometer tool.

Water pH is the acidity or alkalinity of water measured by a pH scale between 0 and 14 .Normal and good water pH for plant growth is around  $\pm 7.00$ . The pH of water that is too high and which is too low is not good for mangrove growth. Based on the results of measurements in the field, the pH of water in the study area has a value between 5.35 - 7.36. The average value of water pH in the coastal area of Pantai Labu District is 6.69, and if rounded the pH of the water becomes 7.00. This shows that when viewed from the parameters of water pH, the Coastal area of Pantai Labu District is very suitable for the growth and development of mangroves.

Salinity is one of the factors that can affect mangrove growth. Salinity is the level of salt or the level of salinity that is covered in water. Factors that affect the salinity level in the waters are a lot of less rain, the number of rivers that empty at sea, the evaporation that occurs, the location and size of the sea, ocean currents, and wind. The mangrove is very susceptible to water salinity, the level of water salinity that is too high can cause the mangrove to die, and vice versa, the low salinity of water can cause the mangrove to die as well.Brackish waters generally have optimal salinity for ecosystems between 15-20 ‰ [9].

The salinity conditions in the study area influence the rainfall that occurs, a lot of seawater evaporation, and the presence of river estuaries. The falling rain water will mix with sea water, so that the salt content of sea water can be dissolved by rainwater. The salinity value in these waters will always change according to the season and place of sampling. Based on the results of measurements of salinity levels in the field, the salinity levels in the coastal region of Pantai Labu Subdistrict were approximately <0.01 ‰ to 26 ‰. Good salinity for mangrove growth is worth between 15 - <25 ‰. Land suitability in Pantai Labu Subdistrict when viewed from its salinity, is very suitable for the growth and development of mangroves.

Water temperature is a factor that affects the growth and development of mangroves in the coastal area of Pantai Labu Sub-district. Changes in extreme water temperatures can disrupt mangrove growth, because these mangrove ecosystems are found in water or the environment is always wet. Mangrove ecosystems are vulnerable to temperature conditions in the waters. Water temperatures that are too low and water temperatures that are too high will interfere with mangrove growth, so that mangroves cannot grow optimally. According to Walsh in Kordi, states that the temperature that limits the life of mangroves is a low temperature and a range of seasonal temperatures [10]. A good temperature for mangrove life is not less than 20°C, while the seasonal range of temperatures does not exceed 5°C. High temperatures (>

40°C) tend not to affect the growth and/ or life of mangrove plants [10].

Based on the results of measurements in the field, the condition of the water temperature in the coastal area of Pantai Labu Subdistrict ranges from 29.00 °C to 34.40°C. The lowest water temperature is found in land units with the form of coastal alluvial plains and land use of the body of the water. The highest water temperature is found in the land unit with the form of physical soil and mangrove land use.

Water temperature classification that is very suitable for mangrove growth and development ranges from 20°C to 40°C [1]. Calculation of temperature data from the field shows the condition of the average water temperature in the coastal area of Pantai Labu Subdistrict at 32,12°C. The average temperature is very supportive of mangrove growth so it is given the highest value of 5. The temperature range of the waters in the coastal region of Pantai Labu Subdistrict is very supportive for the growth and development of mangrove ecosystems well. The water temperature conditions that support and are very suitable for mangrove growth can help in the mangrove rehabilitation program around the research area. The condition of water pH, salinity, and water temperature in the Coastal Area of Pantai Labu Subdistrict can be seen in Table 2.

**TABLE II. CONDITION WATER PH, SALT CONCENTRATION, AND TEMPERATURE IN THE COASTAL AREA DISTRICT OF PANTAI LABU**

No	Land Unit Code	Coordinate point	pH of water	Salt Content (‰)	Temperature (°C)
1	F.01.e_Bl	0494844, 0406238	7.02	<0.01	30.5
2	F.01.e_Kc	0494905, 0404209	6.89	<0.01	31.4
3	M.02.a_Tg	0497714, 0405038	6.38	25	33.7
4	M.02.a_M	0493811, 0406141	6.85	7.4	33.4
5	M.03.a_M	0489296, 0406797	6.88	18	34.4
6	F.01.b_Sw	0489291, 0405583	7.00	<0.01	33.0
7	F.01.b_Kc	0494068, 0404088	6.75	<0.01	31.7
8	F.01.e_M	0480653, 0409612	7.20	17	32.4
9	F.01.a_Tg	0480545, 0409350	7.36	26	31.0
10	F.01.e_Sw	0478296, 0407286	6.71	<0.01	29.4
11	F.01.e_L	0493615, 0402424	6.78	<0.01	29.0
12	F.01.b_Tg	0493899, 0403449	6.97	<0.01	31.3
13	M.02.a_Tg	0492822, 0405719	5.35	20	32.3
14	F.01.e_Pm	0490770, 0403305	7.01	<0.01	33.4
15	M.02.a_Pm	0489945,0403816	6.31	<0.01	32.4
16	F.01.e_Bl	0488555, 0404879	5.69	<0.01	33.0
17	M.02.a_Kc	0486310, 0407025	6.63	10	33.8
Average			6.69		<b>32.12</b>

Source: Results of Analysis and Measurement in the Field, 2018.

### *Physical Factors of Criteria in The Letter*

Tidal water greatly affects the growth and development of mangroves because it can help supply water containing nutrients for mangroves. Tides are the process of rising and falling sea levels. Tide is a condition of rising sea water when compared to normal conditions. Low tide is a condition of sea water decline when compared to the usual circumstances. Factors affecting tides include: (1) based on the theory of equilibrium (rotation of the Earth on its axis, revolution of the Earth to the Sun, revolution of the Moon to the Sun), (2) based on dynamic theory (depth and breadth, rotational influence of the Earth, basic friction), (3) seabed topography, (4) strait width, and (5) bay shape.

Mangroves can grow well in areas where there are still tidal influences. Usually areas that are far from the sea and no tidal activities will be difficult for mangroves to grow. Tidal currents of sea water can influence the thickness of the mud around the mangrove. Thickness of mud can affect mangrove growth. If the tidal flow is large, it will bring a lot of mud material. Thick/ rich mud is rich in organic and inorganic materials originating from the sea or river through tidal currents, whereas thin/ small mud usually mixes with sand containing smaller organic matter with thick mud. This mud material is used as a planting medium and also as a source of nutrition for mangrove plants.

The coastal area of Pantai Labu Subdistrict does not have tidal observer stations. The tidal characteristics of the coastal region of Pantai Labu Subdistrict can be seen from the tidal data of the nearest measurement station. The closest tide measurement station from the coastal area of Pantai Labu Subdistrict is the Belawan PPS Station. The location of tidal observation stations in Pantai Labu Subdistrict is at latitude: 3.78 LU and longitude coordinates: 98.71 BT.

Observation and analysis of tidal data Belawan PPS Station starts from July 26, 2018 to August 22, 2018. Tidal data is obtained from the Maritime Research Center, the Research Center and Marine and Fisheries Human Resources Center. Based on observations of tidal data, it shows that the coastal region of Pantai Labu Subdistrict has tidal characteristics of a double daily *tilt* mixture (*mixed tide prevailing semidiurnal*). The tidal type of mixture is a double daily skew (*mixed tide prevailing semidiurnal*), which is a type of tide with the occurrence of two pairs on one day with high and different time intervals. Observation of tidal data is carried out using weekly tidal data for 1 month. The time of the ebb and flow of sea water is different every day.

According to the analysis of sea tides (2018), sea tides in the coastal region of Pantai Labu Subdistrict range from 0.76 cm to 132.46 cm, while sea tides range from -6.04 cm to -142.48 cm. Observation of tides for July 26 - August 1 2018, shows the highest tide of 109.01 cm while the lowest ebb is -121.87 cm. Observation of tides for

August 2 - August 8, 2018, shows the highest tide of 97.13 cm while the lowest tide is -108.23 cm. Observation of tides for 9 August - 15 August 2018, shows the highest tide of 132.46 cm while the lowest tide is -142.48 cm. Observation of tides for 16 August - 22 August 2018, shows the highest tide of 109.50 cm while the lowest tide is -107.15 cm.

Based on the classification of tidal range according to Sunarto and the results of tidal data analysis used in this study, the coastal area of Pantai Labu Subdistrict belongs to the class of micropases with tidal range <2 m [11]. Low tide levels cause mangroves cannot grow optimally in the study area. Mangroves can grow and develop well if the tidal range is >5 m. One visualization of tidal conditions data in the coastal area of Pantai Labu Subdistrict is presented in Table 3.

TABLE III. TIDAL ANALYSIS IN COASTAL AREAS OF PANTAI LABU DISTRICT

N o.	Observation Date	Highest Pair (cm)	Lowest ebb (cm)
1.	July 26 - August 1, 2018	109.01	-121.87
2.	August 2 - August 8, 2018	97.13	-108.23
3.	August 9 - August 15, 2018	132.46	-142.48
4.	August 16 - August 22 2018	109.50	-107.15

Source: Data Analysis, 2018.

The high inundation of sea water and inundation frequency greatly influences the growth and development of mangrove ecosystems in the coastal area of Pantai Labu Subdistrict. Inundation data in this study used data obtained from the community who worked as fishermen and residents living in the vicinity of the study area. According to fishermen and community members interviewed, the high inundation in the coastal area of Pantai Labu Subdistrict ranged from 0.5 to 1.5 meters. The results of interviews with respondents and based on inundation classifications that have been made by Hartono in Iryadi, coastal areas of Pantai Labu Subdistrict are included in the classification of inundation height <2.00 m with inundation frequency of 57 - 62 per month. High classification of inundation found in the research area is included in the excellent category and supports the growth and development of mangrove ecosystems [12].

### *Physical factors of climate criteria*

Rainfall variables related to the growth and development of mangroves, are closely related to the climate in a place. Climate is a condition of average weather in a relatively long area. Factors that affect the climate in a region include rainfall, air humidity, wind, and temperature. Climate data in this study was obtained from online data from the agency of the Meteorology, Climatology and Geophysics Agency. Climate data taken from daily record data which is then analyzed into monthly and yearly average data. The main climate data is obtained from Kualanamu Station. Climate data (rainfall) for which data is not measurable and there is no data, taken from the data of the nearest stations from Kualanamu Station. The station closest to Kualanamu Station taken to complete the missing/ non-existent

rainfall data is obtained from Deli Serdang Station and Tuntung Station.

The frequency of rain in Pantai Labu Subdistrict is the most common in September 25 times, while the least rainfall occurs in July as many as 9 times. The highest rainfall occurred in October at 405.90 mm/ month, while the lowest occurred in April at 67.90 mm/ month. The amount of annual rainfall in Pantai Labu Subdistrict is 2,230.80 mm / year. A number of annual rainy days is 203 days. The number of wet months in the coastal area of Pantai Labu Subdistrict is 9 months, while the dry month is absent. Wet months are rainfall every month that falls to the surface of the earth  $\geq 100$  mm/ year. Dry month is rainfall every month that falls to the surface of the earth  $\leq 60$  mm/ year. The monthly temperature in Pantai Labu Subdistrict is between 26.13°C to 27.68° C, while the annual average temperature is 26.91°C. The average air humidity per year ranges from 87.91%, while the average annual solar radiation is 5.16 hours. A more complete and clear table of climate data in area of Pantai Labu Subdistrict can be seen in Table 4 below.

TABLE IV. AVERAGE CLIMATE DATA  
ACCORDING TO THE MOON IN PANTAI LABU  
DISTRICT IN 2017

No.	Month	Rainy Day (day)	Rainfall (mm)	Number of Wet and Dry Months	Temperature (°C)	Moisture (%)	Length of Radiation (Hour)
1	January	17	148.50	Wet	26,13	89,55	4.04
2	February	15	86.90	Is being	26,55	87,50	6.09
3	March	14	89.50	Is being	26,89	88,19	5.40
4	April	11	67.90	Is being	27,02	88,73	4.48
5	May	19	206.40	Wet	27,60	87,90	4.48
6	June	10	102.90	Wet	27,68	86,83	7.09
7	July	9	108.10	Wet	27,44	86,90	6.22
8	August	21	220.40	Wet	27,05	88,84	5.30
9	September	25	273.40	Wet	26,68	88,63	4.88
10	October	20	405.90	Wet	27,02	85,84	6.31
11	November	23	228.10	Wet	26,52	87,80	3.05
12	December	19	292.80	Wet	26,32	88,16	4.62
Average Per Year		16.92	2,230.80		26,91	87,91	5.16

Source: [13]

According to Hartono in Johari, rainfall is very suitable for mangrove growth and development in the range of 2,000 - 3,000 mm/ year. Annual rainfall in Pantai Labu Subdistrict is 2,230.80 mm / year, indicating that it is very suitable for the growth and development of mangrove ecosystems [3]. Rainfall that is too low and too high can cause mangroves to not develop properly. Low annual rainfall <1,000 mm/ year and too high > 3,500 mm/ year are not good for mangrove growth and development. This rainfall is very helpful in flowing sediment for mangrove substrates from land to sea. This supply of sediment as a medium for the growth and development of mangroves. In addition, this rainfall also affects the salinity of sea water. Seawater salinity is one of the parameters that affects the growth and development of mangroves.

#### IV. CONCLUSION

Physical factors that affect the mangrove ecosystem in the Coastal Area of Pantai Labu Subdistrict:

1. The criteria for slope conditions in the Coastal Area of Pantai Labu Subdistrict are included in the flat / almost flat coastal area with a slope angle of 0 - 2%.
2. The criteria for the condition of soil texture in the Coastal Area of Pantai Labu Subdistrict which is suitable for the growth and development of mangrove species are debris clay, while the soil pH ranges from 5.60 to 7.00 .
3. The criteria for water conditions found in the Coastal Area of Pantai Labu Subdistrict are water pH ranging from 5.35 to 7.36, salt content (ppt) ranges from <0.01 ‰ to 26 ‰ , and temperatures range from 29.00 °C to 34.40°C.
4. The criteria for tidal conditions in the coastal region of Pantai Labu Subdistrict belong to the class of micropases with a tidal range of <2 m, inundation height < 2.00 m, and inundation frequency of 57 - 62 per month.
5. The criteria for climate conditions in the coastal region of Pantai Labu Subdistrict are 2,230.80 mm/ year of annual rainfall, the number of annual rainy days is 203 days, the number of wet months 9 and the number of dry months 0, the average annual temperature is 26.91°C, humidity the average air per year ranges from 87.91%, and the average annual solar radiation is 5.16 hours.

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