
Analysis of Physical Characteristics of Peat Soil and Peat Land Distribution Based on Laboratory Testing Case Study: South - Southeast Pontianak District

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Abstract

The existence of peat soil with unfavorable properties has caused several problems that can arise and affect the construction conditions on the soil layer. This unfavorable soil condition is not favorable for civil buildings and if without proper planning will impact the strength and safety of the building. So it is necessary to analyze data using experimental methods in research that begins with investigating soil characteristics at the research location and investigations in the laboratory based on test data in the laboratory for further geotechnical analysis. Classification of peat soil at the research location of South Pontianak and Southeast Pontianak Districts based on test results, can be determined as follows: a. Based on ash content, the peat soil is Medium ash, which is peat soil with ash content between 5% and 15%. b. Based on the absorption level, peat soil is included in the Moderately absorbent and Highly absorbent types, where peat soil can hold 300 – 1500% water. c. Based on the level of maturity (Von Post Classification System), in this study 3 layers of conditions were obtained, namely surface, 50cm and 100cm. In general, for the surface layer, peat soil is classified as sapric, the 50 cm layer is classified as hemic and the 100 cm layer is classified as fibric.

Keywords: Peat Soil, Peat Soil Classification, Conditions.

INTRODUCTION

In general, land in West Kalimantan is dominated by clay and peat soils, which are not favorable for construction works. These poor soil conditions are disadvantageous for civil structures and, if not properly planned, can adversely affect the strength and safety of buildings.

West Kalimantan Province has a total area of 147,307 km². Geographically, most of the province consists of lowland areas and is traversed by hundreds of navigable rivers. Hilly terrain stretches from west to east along the Kapuas Valley and extends toward the Natuna Sea/Karimata Strait.

Most areas of West Kalimantan consist of PMK soil types (Red Yellow Podzolic soils), covering approximately 10.5 million hectares or 17.28 percent of the total regional area. In addition, OGH soils (Organosol, Gley, and Humus) as well as Alluvial soils cover about 2.0 million hectares or 10.29 percent, distributed along coastal regions such as the coasts of Sambas, Mempawah, North Kayong, and Ketapang Regencies.

According to the West Kalimantan Regional Peat Restoration Team, the existing peatland area in West Kalimantan is approximately 1.68 million hectares, or 11.4 percent of the total area of West Kalimantan, which is 14.68 million hectares.

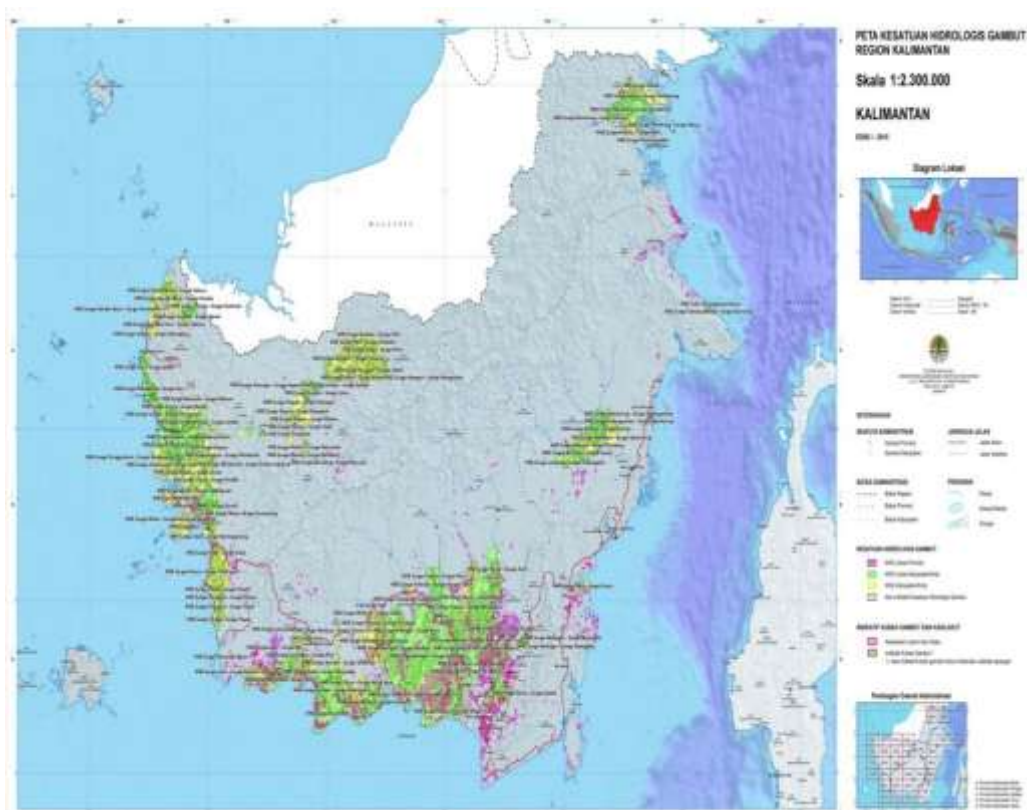


Figure 1. Peatland Distribution Map in Kalimantan Island
(Source: Ministry of Environment and Agriculture, 2015)

Peat soil consists of organic fragments derived from vegetation that has chemically transformed into fossilized material. Peat soil belongs to a broader category known as organic soil, which is characterized by a significant organic content that influences its geotechnical properties. The characteristics of peat soil include very high water content and compressibility, as well as a distinctive dark brown to black color. Peat layers are commonly found in tropical forest areas and lowlands with abundant water inundation, high humidity, and relatively lower air temperatures.

Pontianak City is one of the areas in West Kalimantan where peat soil is widely distributed. The presence of peat soil significantly affects construction in Pontianak, particularly in terms of road stability and settlement of building structures. Considering these conditions, this undergraduate thesis discusses an investigation of peatland locations in Pontianak City by examining the physical properties of peat soil. The peatland areas analyzed in this study are located in South Pontianak District and Southeast Pontianak District.

RESEARCH METHODS

Research Location

The research was conducted on peatland areas in South Pontianak District and Southeast Pontianak District. The determination of observation points was based on visual identification of the land conditions.

Geographically, South Pontianak District and Southeast Pontianak District are located adjacent to each other. Southeast Pontianak District is an administrative expansion of South Pontianak District.

In this undergraduate thesis, the subsequent research steps were carried out by combining the two observation locations within the study area.

Data Collection Methods

Field Research Method

Based on the sources of data obtained, the research data were classified into two types, namely primary data and secondary data. Primary data were obtained directly from the research location, while secondary data were obtained from previous research reports or documented sources.

Primary data, consisting of:

Data from hand auger boring

Laboratory test data, including:

Water content

Specific gravity

Unit weight

Ash content

Organic content

Secondary data, consisting of:

Maps of South Pontianak and Southeast Pontianak Districts

Peatland distribution maps from the West Kalimantan Peat Restoration Agency, the Peat Hydrological Unit Map of the Kalimantan Region, and the 2021 PIPPIB Map (Indicative Map for Suspension of New Permit Issuance, Ministry of Environment and Forestry)

The field survey method in this undergraduate thesis was carried out through several activities, namely:

Field Condition Observation

Field condition observations were conducted through surveys to assess peat soil conditions and determine sampling locations.

Peat Soil Sampling (hand auger boring)



Figure 2. Hand Boring Tool

(Source: <https://rktekniksipil.co.id/alat-hand-bor-tanah-boring-tanah/>)

Laboratory Research Method

After the soil samples were collected, laboratory tests were conducted to determine the classification and physical properties of peat soil in accordance with ASTM testing standards.

RESULTS AND DISCUSSION

Peat Soil Classification Analysis

Peat soil classification is based on the organic content and fiber content of the peat soil. Based on the results of the Peat Soil Maturity Test, the classification obtained is as follows:

Table 1. Results of the Maturity Level Test

No	Depth	Degree of Decomposition
1	Surface	Sapric (H9)
	50 cm	Hemic (H4)
	100 cm	Fibric (H2)
2	Surface	Sapric (H8)
	50 cm	Hemic (H5)
	100 cm	Fibric (H2)
3	Surface	Sapric (H8)
	50 cm	Sapric (H8)
	100 cm	Sapric (H10)
4	Surface	Sapric (H10)
	50 cm	Hemic (H5)
	100 cm	Hemic (H4)
5	Surface	Sapric (H10)
	50 cm	Hemic (H7)
	100 cm	Fibric (H2)
6	Surface	Sapric (H9)
	50 cm	Fibric (H2)
	100 cm	Hemic (H4)
7	Surface	Sapric (H10)
	50 cm	Hemic (H5)
	100 cm	Hemic (H6)

**Analysis of Peatland Distribution in South Pontianak and Southeast Pontianak Districts
Map of West Kalimantan**

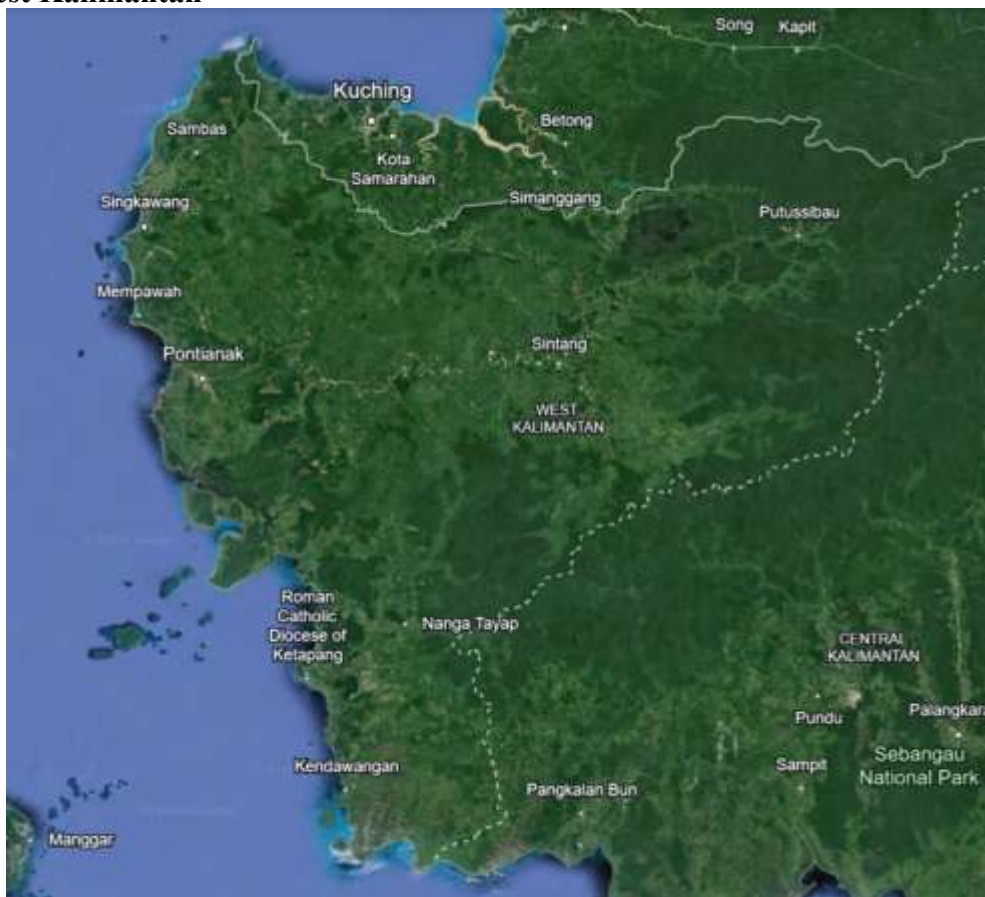


Figure 3. West Kalimantan Region
Source: Google Earth

Map of Peatland Distribution in Pontianak City

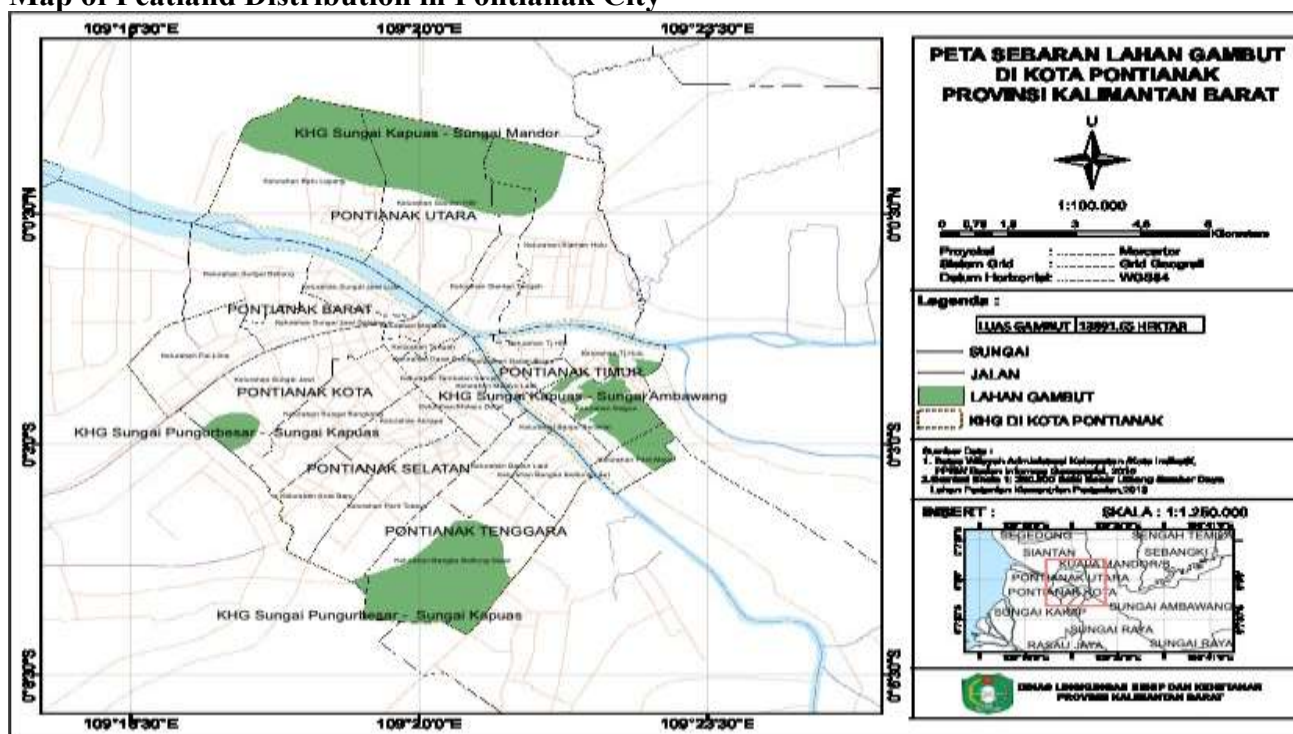


Figure 6. Distribution of Peatland in Pontianak City
 Source: Department of Environment and Forestry

Observation Points for South Pontianak and Southeast Pontianak



Figure 7. Observation Points in South Pontianak and Southeast Pontianak
 Source: Google Maps

Discussion

The peat soil classification at the research site, namely the South Pontianak and Southeast Pontianak Districts, based on test results, can be determined as follows:

Based on ash content, the peat soil is classified as medium ash, meaning peat soil with an ash content between 5% and 15%.

Based on absorption level, the peat soil is classified as moderately absorbent and highly absorbent, meaning the peat soil can hold 300–1500% of water.

Based on maturity level (Von Post Classification System), this study identified three layers: the surface, 50 cm, and 100 cm. Generally, the surface layer is classified as sapric, the 50 cm layer is classified as hemic, and the 100 cm layer is fibric.

CONCLUSIONS

Based on the data, analysis, and discussion, the following conclusions can be drawn:

The soil conditions in the Southeast Pontianak and South Pontianak Districts at the research location are classified as peat soil to a depth of 1.00–3.00 meters.

The peat soil classification based on ash content is classified as medium ash, meaning peat soil with an ash content between 5% and 15%. Based on absorption levels, peat soils are classified as moderately absorbent and highly absorbent, meaning they can hold 300–1500% of water.

This study conducted a maturity level analysis (Von Post Classification System), resulting in three layers of conditions: the surface, 50 cm, and 100 cm. Generally, the surface layer is classified as sapric, the 50 cm layer is hemic, and the 100 cm layer is fibric.

A review of the peat soil distribution at the research location was conducted using several maps. The distribution of peat soil at the research location shows that the position of the peat soil layers generally aligns with the reference map issued by the Ministry of Environment and Forestry.

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