PEAT LAYER THICKNESS IDENTIFICATION ON RESIDENTIAL LAND OF SUNGAI RAYA DALAM II ROAD USING THE GEOELECTRICAL RESISTIVITY METHOD

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THESIS

DEPARTMENT OF PHYSICS
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS TANJUNGPURA
PONTIANAK
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Thesis
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Identifikasi Ketebalan Lapisan Gambut pada Lahan Permukiman Warga di Sekitar Jalan Sungai Raya Dalam II Menggunakan Metode Geolistrik Tahanan Jenis

Abstrak

Penelitian ini bertujuan untuk mengidentifikasi ketebalan lapisan gambut pada lahan permukiman di sekitar Jalan Sungai Raya Dalam II, Kabupaten Kubu Raya, Kalimantan Barat, dengan memanfaatkan metode geolistrik tahanan jenis konfigurasi Wenner-Schlumberger. Metode ini dipilih karena kemampuannya dalam mendeteksi variasi vertikal tahanan jenis batuan, yang sangat berguna dalam memetakan struktur bawah permukaan secara dua dimensi. Pengambilan data dilakukan pada dua lintasan pengukuran sepanjang 62 m menggunakan 32 elektroda dengan jarak antar elektroda 2 m. Data tahanan jenis yang diperoleh dianalisis menggunakan perangkat lunak Res2DInv untuk menghasilkan penampang resistivitas 2D bawah permukaan. Hasil interpretasi menunjukkan bahwa nilai tahanan jenis lapisan gambut berada pada rentang 59,9–332 Ωm, sedangkan lapisan lempung di bawahnya memiliki nilai tahanan jenis lebih rendah yaitu 1–59,9 Ωm. Ketebalan gambut bervariasi antara 1,12–2,56 m pada lintasan pertama dan 1,47–3,07 m pada lintasan kedua. Validasi dilakukan melalui pengambilan sampel tanah menggunakan bor gambut hingga kedalaman 2 m, yang menunjukkan korespondensi antara hasil geolistrik dan observasi langsung. Informasi ini digunakan untuk perencanaan konstruksi bangunan serta restorasi lahan gambut di kawasan yang memiliki daya dukung tanah rendah. Penelitian ini menunjukkan bahwa metode geolistrik tahanan jenis merupakan pendekatan non-destruktif yang efektif dalam mengkarakterisasi ketebalan lapisan gambut di daerah tropis.

Kata kunci: Identifikasi lapisan gambut, geolistrik, tahanan jenis, Wenner-Schlumberger, tanah lempung.

Peat Layer Thickness Identification on Residential Land of Sungai Raya Dalam II Road Using the Geoelectrical Resistivity Method

Abstract

This research aims to identify the thickness of the peat layer on residential land around Sungai Raya Dalam II Road, Kubu Raya Regency, West Kalimantan, by utilizing the Wenner-Schlumberger configuration of the geoelectrical resistivity method. This method was chosen because of its ability to detect vertical variations in rock density, which is very useful in mapping subsurface structures in two dimensions. Data were collected on two 62 m long measurement lines using 32 electrodes with a distance of 2 m between electrodes. The obtained specific gravity data were analyzed using Res2DInv software to produce a 2D subsurface resistivity cross section. The interpretation results show that the resistivity value of the peat layer is in the range of 59.9-332 Ωm, while the underlying clay layer has a lower resistivity value of 1-59.9 Ωm. The peat thickness varied between 1.12-2.56 m in the first measurement lines and 1.47-3.07 m in the second lines. Validation was carried out through soil sampling using a peat drill to a depth of 2 m, which showed correspondence between the geoelectrical resistivity modelling results and observation. This information is used for building construction planning and peatland restoration in areas with low soil bearing capacity. This research demonstrates that the geoelectrical resistivity method is an effective non-destructive approach to characterizing the thickness of peat layers in the tropics.

Keywords: Identification, peat layer thickness, geoelectrical resistivity, Wenner-Schlumberger, clay soil.

PREFACE

Assalamu'alaikum Warrahmatullahi Wabarakatuh.

Praise Gratitude to Allah SWT for all His Grace and Gifts so that the thesis with the title **"Peat Layer Thickness Identification on Residential Land of Sungai Raya Dalam II Road Using The Geoelectrical Resistivity Method"** as one of the academic requirements to complete the course at Universitas Tanjungpura can be completed properly.

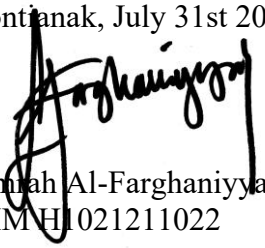
The researcher realizes that the writing of this thesis can be completed with the help of various parties. With the completion of this thesis, I would like to express my deepest gratitude to:

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Thus, sincerely, this preface is delivered. Hopefully, the results of this thesis research will enrich the scientific treasury in the field of management and organization theoretically and practically, useful for readers and institutions where research is conducted.

Pontianak, July 31st 2025



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CHAPTER I
INTRODUCTION

1.1 Introduction

Peatlands in the Kubu Raya district, West Kalimantan Province, cover 3.84% of its total area (Huaan *et al.*, 2021). One area in the Kubu Raya district with peatland is Punggur Kecil village, Sungai Raya Dalam Sub-district. The community utilizes the peatland for residential development. Peat soils are classified as soft soils because of their large pore spaces (Sampurno *et al.*, 2018). The moisture content of peat soil reaches 400%, with the density of the soil being 0.8-1.04 g/cm^3, and high organic content (more than 75%) (ASTM D4427-23, 2023). These unfavourable physical properties impact the low bearing capacity of peat soils (Yulianto, 2017). The soil will experience large anisotropic compressions accordingly. As a result, buildings on peat soils are easily defective (Mochtar *et al.*, 2014). To overcome these difficulties, the structural basement is placed below the peat layer, making the information on peat thickness essential.

This information is necessary for building construction engineering (El-qady *et al.*, 2005) and peatland restoration activities (Ma'ruf and Yulianto, 2016). One of the approaches used for this purpose is the geoelectrical resistivity method. The resistivity method has previously been reported to successfully identify peat soil layers (Muliadi *et al.*, 2019; Kanyawan and Zulfian, 2020; Fajania *et al.*, 2021). The resistivity value of the peat soil is reported to be higher when compared to the non-peat layer below it, in particular to the clay layer. (Basri *et al.*, 2019). This method has several types of current and potential electrode configurations that can be used for lateral and vertical mapping of subsurface structures.

In summary, the thickness of the peat layer located in Punggur Kecil village, Sungai Raya Dalam sub-district, Kubu Raya district will be identified utilizing the geoelectrical resistivity method. The electrode configuration is Wenner-Schlumberger. This configuration was chosen due to its sensitivity to changes in

vertical rock density. The resulting rock layer model is 10% deeper than the Wenner configuration (Loke, 2021).

1.2 Statement of the Problem

This research aims to determine the thickness of peat soil based on the rock's resistivity values.

1.3 Scope and Limitations

The limitations of this research are as follows:

1. The research is conducted in Punggur Kecil village, located in the Sungai Raya Dalam sub-district of Kubu Raya regency.
2. The determination of peat layer thickness is based on resistivity values.
3. The configuration used for both the current and potential electrode is the Wenner-Schlumberger configuration.

1.4 Objective

This research aims to identify the thickness of the peat layer around Sungai Raya Dalam II road, Punggur Kecil village, Sungai Raya Dalam sub-district, Kubu Raya district, based on the resistivity value.

1.5 Advantage

This research contributes to the collection of information regarding peat thickness near Sungai Raya Dalam II Road in the Sungai Raya Dalam sub-district of Kubu Raya district, which can be utilized for analyzing residential land planning.