ABSTRAK

ANALISIS SIFAT MEKANIKA BATUAN PADA FORMASI *DEEP SALINE AQUIFER* SISTEM *CARBON CAPTURE AND STORAGE* DENGAN INTEGRASI DATA *WELL LOGGING* DAN SEISMIK, CEKUNGAN MELAWI, KALIMANTAN BARAT

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Penggunaan energi konvensional yang terus meningkat menyebabkan pelepasan emisi CO_2 ke atmosfer semakin besar dan berdampak terhadap perubahan iklim global, sehingga diperlukan teknologi yang mampu mengurangi dampak perubahan iklim, salah satunya melalui *Carbon Capture and Storage* (CCS). Keberhasilan penyimpanan CO_2 tidak hanya dipengaruhi kapasitas reservoar, tetapi juga kestabilan mekanika batuan selama proses injeksi. Penelitian ini bertujuan menganalisis distribusi sifat mekanika batuan, mengevaluasi respon geomekanika, serta menentukan tekanan injeksi maksimum yang aman pada sistem *geological storage* di Cekungan Melawi, Kalimantan Barat. Metode penelitian dilakukan melalui integrasi data *well logging* dan enam *line* seismik berbasis pemodelan 3D. Parameter yang dianalisis meliputi parameter petrofisik, *rock mechanic*, dan geomekanik, kemudian dievaluasi menggunakan pendekatan *Mohr-Coulomb Failure* guna mengetahui batas kestabilan batuan terhadap injeksi CO_2. Hasil penelitian menunjukkan bahwa distribusi parameter geomekanika mampu menggambarkan karakter mekanik reservoar dan *seal rock* secara lateral maupun vertikal. Zona dengan nilai *young's modulus* tinggi menunjukkan batuan lebih kaku, sedangkan nilai *poisson's ratio* tinggi mengindikasikan batuan lebih *deformable* terhadap tekanan injeksi. Berdasarkan evaluasi geomekanika, sistem *geological storage* di daerah penelitian masih memiliki kemampuan menerima injeksi CO_2 secara aman pada batas tekanan tertentu.

Kata kunci: *carbon capture and storage*, geomekanika, *deep saline aquifer, mohr-coulomb failure*, tekanan injeksi.

ABSTRACT

ANALYSIS OF ROCK MECHANICAL PROPERTIES IN THE DEEP SALINE AQUIFER FORMATION OF A CARBON CAPTURE AND STORAGE SYSTEM USING INTEGRATED WELL LOGGING AND SEISMIC DATA, MELAWI BASIN, WEST KALIMANTAN

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The continued increase in conventional energy use is leading to greater CO_2 emissions into the atmosphere and contributing to global climate change; therefore, technologies capable of mitigating the impacts of climate change are needed, one of which is Carbon Capture and Storage (CCS). The success of CO_2 storage is influenced not only by reservoir capacity but also by the mechanical stability of the rock during the injection process. This study aims to analyze the distribution of rock mechanical properties, evaluate the geomechanical response, and determine the maximum safe injection pressure for the geological storage system in the Melawi Basin, West Kalimantan. The research methodology involves the integration of well logging data and six seismic lines using 3D modeling. The parameters analyzed include petrophysical, rock mechanical, and geomechanical parameters, which were then evaluated using the Mohr-Coulomb Failure approach to determine the rock's stability limits against CO_2 injection. The results indicate that the distribution of geomechanical parameters effectively characterizes the mechanical properties of the reservoir and seal rock both laterally and vertically. Zones with high Young's modulus values indicate stiffer rock, while high Poisson's ratio values indicate rock that is more deformable under injection pressure. Based on the geomechanical evaluation, the geological storage system in the study area still has the capacity to safely accommodate CO_2 injection within certain pressure limits.

Keywords: carbon capture and storage, geomechanics, deep saline aquifer, mohr-coulomb failure, injection pressure