

# PERBANDINGAN MODEL REGRESI LINEAR DAN MACHINE LEARNING UNTUK ESTIMASI STOK KARBON ATAS PERMUKAAN MANGROVE DI TELUK PANGPANG, KABUPATEN BANYUWANGI MENGGUNAKAN CITRA SENTINEL-2A MSI

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## INTISARI

Pemanasan global yang disebabkan oleh efek gas rumah kaca, terutama Karbon Dioksida (CO<sub>2</sub>) yang disebabkan oleh aktivitas manusia berdampak signifikan pada kehidupan di bumi. Mangrove, sebagai vegetasi pesisir mampu menyerap karbon lebih besar dibandingkan hutan *terrestrial*. Kawasan mangrove di Teluk Pangpang, Kabupaten Banyuwangi belum ada upaya inventarisasi distribusi data kuantitatif terkait stok karbon atas permukaan mangrove. Penelitian ini bertujuan untuk membandingkan akurasi hasil estimasi dan menghitung total nilai stok karbon atas permukaan mangrove pada citra Sentinel-2A MSI antara model regresi linear berganda dan *random forest regression* di Teluk Pangpang, Kabupaten Banyuwangi. Indeks vegetasi GEMI, DVI, dan EVI digunakan pada penelitian ini sebagai variabel prediktor. Hasil penelitian menunjukkan bahwa model *random forest regression* memiliki akurasi yang lebih baik dengan nilai *Standard Error of Estimate* (SEE) sebesar 29,66 ton/ha, sementara model regresi linear berganda menghasilkan nilai SEE yang lebih tinggi yaitu 34,38 ton/ha. Plot 1:1 menunjukkan bahwa kedua model memiliki distribusi yang kurang lebih sama, walaupun model *random forest regression* memiliki distribusi titik yang sedikit lebih rapat dibandingkan model regresi linear berganda. Estimasi total nilai stok karbon atas permukaan mangrove dengan luas area kajian 503,29 ha pada model regresi linear berganda sebesar 33.079,07 ton C dan model *random forest regression* sebesar 32.011,83 ton C.

**Kata Kunci:** Mangrove, Estimasi stok karbon, Perbandingan model, Regresi linear berganda, *Random Forest regression*, Sentinel-2A MSI, Teluk Pangpang

# COMPARISON OF LINEAR REGRESSION AND MACHINE LEARNING MODELS FOR ESTIMATING MANGROVE ABOVEGROUND CARBON STOCK IN PANGPANG BAY, BANYUWANGI USING SENTINEL-2A MSI IMAGERY

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## ABSTRACT

Global warming caused by the greenhouse effect, especially Carbon Dioxide (CO<sub>2</sub>) caused by human activities has a significant impact on life on earth. Mangroves, as coastal vegetation, can absorb carbon more than terrestrial forests. Mangrove areas in Pangpang Bay, Banyuwangi Regency have not yet been inventoried for quantitative data distribution related to mangrove aboveground carbon stock. This study aims to compare the accuracy of estimation results and calculate the total value of mangrove aboveground carbon stock on Sentinel-2A MSI imagery between multiple linear regression models and random forest regression in Pangpang Bay, Banyuwangi Regency. Vegetation indices GEMI, DVI, and EVI were used in this study as predictor variables. The results showed that the random forest regression model had better accuracy with a Standard Error of Estimate (SEE) value of 29,66 tons/ha, while the multiple linear regression model produced a higher SEE value of 34,38 tons/ha. The 1:1 plot shows that both models have similar distributions, although the random forest regression model has a slightly tighter distribution of points than the multiple linear regression model. The total estimated surface carbon stock value of mangroves with a study area of 503.29 ha in the multiple linear regression model was 33.079,07 tons C and the random forest regression model was 32.011,83 tons C.

**Keywords:** Mangroves, Carbon stock estimation, Model comparison, Multiple linear regression, Random Forest regression, Sentinel-2A MSI, Pangpang Bay