Pendugaan Simpanan Karbon Mangrove Kawasan Pantai Kabupaten Rembang Berdasarkan Kajian Indeks
Vegetasi Citra PlanetScope
Karuna Deva Sakuntala, Prof. Dr. Ir. Ris Hadi Purwanto, M.Agr.Sc., IPU.; Dr. Drs. Ir. Senawi, M.P., IPU.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

PENDUGAAN SIMPANAN KARBON MANGROVE KAWASAN PANTAI KABUPATEN REMBANG BERDASARKAN KAJIAN INDEKS VEGETASI CITRA *PLANETSCOPE*

Karuna Deva Sakuntala[1], Ris Hadi Purwanto[2], Senawi[3]

INTISARI

Pemanasan global akibat peningkatan emisi gas rumah kaca (GRK) diikuti tren kenaikan karbondioksida (CO_2) menjadi tantangan besar dunia. Pesisir pantai Kabupaten Rembang memiliki ekosistem *blue carbon* berupa hutan mangrove. Pengurangan emisi GRK menjadi komitmen nasional salah satunya dengan inventarisasi serapan dan simpanan karbon. Alternatif metode pendugaan simpanan karbon adalah penginderaan jauh dengan memanfaatkan hubungan nilai indeks vegetasi dan simpanan karbon. Penelitian ini menggunakan indeks vegetasi *Normalized Difference Vegetation Index* (NDVI), *Soil-Adjusted Vegetation Index* (SAVI), dan *Enhanced Vegetation Index* (EVI). Tujuan penelitian ini adalah menentukan formulasi indeks vegetasi terbaik, merumuskan model persamaan alometrik terbaik, dan memetakan sebaran simpanan karbon atas permukaan.

Pengumpulan data meliputi kegiatan pra-lapangan yaitu pre-processing citra *PlanetScope*, transformasi indeks vegetasi, dan penentuan 36 plot sampel dengan *Statified Random Sampling.* Kegiatan lapangan meliputi pengukuran DBH pada plot 20 x 20 m. Analisis data meliputi perhitungan simpanan karbon, pembuatan model alometrik, validasi, perbandingan model, dan pedugaan serta pemetaan simpanan karbon. Model dibuat menggunakan analisis regresi dengan tipe linear, logaritmik, power, dan eksponensial. Model terbaik dipilih berdasarkan nilai koefisien korelasi (R), koefisien determinasi (R^2), *Standard Error of Estimate* (SEE), signifikansi, *Mean Absolute Error* (MAE), dan *Root Mean Square Error* (RMSE).

Indeks vegetasi terbaik untuk menduga simpanan karbon adalah EVI dalam model regresi eksponensial: CStock (ton/ha) = $12{,}252^{e0{,}903(EVI)}$ (R^2 = 0,816). Dihasilkan tiga kelas simpanan karbon yaitu rendah (13,22 < CStock ≤ 27,44) seluas 10,29 ha, sedang (27,44 < CStock ≤ 42,57) seluas 37,39 ha, dan tinggi (42,57 < CStock ≤ 71,03) seluas 23,21 ha. Rata-rata simpanan karbon sebesar 38,34 ton/ha. Total simpanan karbon diestimasikan sebesar 2.150,617 – 3.522,656 ton.

Kata Kunci: Gas rumah kaca, persamaan alometrik, simpanan karbon, ekosistem mangrove

[1] Mahasiswa Fakultas Kehutanan UGM
[2] Staff Pengajar Fakultas Kehutanan UGM
[3] Staff Pengajar Fakultas Kehutanan UGM

Pendugaan Simpanan Karbon Mangrove Kawasan Pantai Kabupaten Rembang Berdasarkan Kajian Indeks
Vegetasi Citra PlanetScope
Karuna Deva Sakuntala, Prof. Dr. Ir. Ris Hadi Purwanto, M.Agr.Sc., IPU.; Dr. Drs. Ir. Senawi, M.P., IPU.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

ESTIMATION OF MANGROVE CARBON STOCKS IN THE COASTAL AREA OF REMBANG REGENCY BASED ON VEGETATION INDEX ANALYSIS USING *PLANETSCOPE* IMAGERY

Karuna Deva Sakuntala[1], Ris Hadi Purwanto[2], Senawi[3]

ABSTRACT

Global warming caused by increasing greenhouse gas emissions, accompanied by the rising trend of carbon dioxide (CO_2) concentrations, has become a global challenge. The coastal area of Rembang Regency possesses a blue carbon ecosystem in the form of mangrove forests. Reducing GHG emissions has become a national commitment, one of which is through the inventory of carbon sequestration and carbon stocks. An alternative method is remote sensing by utilizing the relationship between vegetation index values and carbon stocks. This study uses Normalized Difference Vegetation Index (NDVI), Soil Adjusted Vegetation Index (SAVI), and Enhanced Vegetation Index (EVI). The objectives of this study were to determine the best vegetation index formulation, develop the best allometric model, and map the distribution of aboveground carbon stocks.

Data collection consisted of pre-field activities: PlanetScope imagery pre-processing, vegetation index transformation, and determination of 36 sample plots using Stratified Random Sampling. Field activities: DBH measurements within 20 × 20 m plots. Data analysis involved carbon stock calculation, allometric model development, validation, model comparison, and carbon stock mapping. The models were developed using regression analysis with linear, logarithmic, power, and exponential regression types. The best model was selected based on the values of the correlation coefficient (R), coefficient of determination (R^2), Standard Error of Estimate (SEE), significance, Mean Absolute Error (MAE), and Root Mean Square Error (RMSE).

The best vegetation index for estimating carbon stocks was EVI using an exponential regression model: $CStock(ton/ha)=12.252^{e0.903(EVI)}$ ($R^2 = 0.816$). Three carbon stock classes were identified: low ($13.22 < CStock \leq 27.44$) covering 10.29 ha, moderate ($27.44 < CStock \leq 42.57$) covering 37.39 ha, and high ($42.57 < CStock \leq 71.03$) covering 23.21 ha. The average carbon stock was 38.34 ton/ha, while the total estimated carbon stock ranged from 2,150.617 to 3,522.656 tons.

Keywords: *Greenhouse gas, allometric equation, carbon stock, mangrove ecosystem*

---

[1] Student of Faculty of Forestry UGM
[2] Lecturer of Faculty of Forestry UGM
[3] Lecturer of Faculty of Forestry UGM