

## ESTIMASI SIMPANAN KARBON BERDASARKAN INDEKS VEGETASI DI DESA PACAREJO, KECAMATAN SEMANU, KABUPATEN GUNUNG KIDUL

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### INTISARI

Perubahan iklim akibat peningkatan emisi gas rumah kaca, telah menjadi isu global yang mendesak. Tutupan vegetasi khususnya hutan berperan penting dalam menyerap dan menyimpan karbon, sehingga dapat mendukung upaya mitigasi perubahan iklim. Desa Pacarejo di Kabupaten Gunung Kidul memiliki potensi simpanan karbon karena didominasi oleh tutupan vegetasi. Informasi spasial mengenai sebaran simpanan karbon di wilayah ini masih sangat terbatas. Penelitian ini menggunakan indeks vegetasi berupa NDVI (*Normalized Difference Vegetation Index*), SAVI (*Soil-Adjusted Vegetation Index*), ARVI (*Atmospherically Resistant Vegetation Index*), dan RVI (*Ratio Vegetation Index*). Tujuan penelitian ini yaitu menentukan indeks vegetasi untuk estimasi simpanan karbon, menghitung potensi simpanan karbon, dan memetakan persebarannya.

Teknik pengumpulan data meliputi kegiatan pra lapangan yaitu preprocessing citra Sentinel-2A L2A, interpretasi citra, transformasi indeks vegetasi, dan penentuan 96 titik sampel dengan *Stratified Random Sampling*, serta kegiatan lapangan untuk pengukuran pohon DBH  $\geq 10$  cm pada plot 30x30 m. Analisis data meliputi pengukuran biomassa dengan allometrik, dan simpanan karbon. Model pendugaan simpanan karbon disusun melalui analisis regresi yaitu linear, logarithmic, polynomial, power, dan exponential. Persamaan terbaik dipilih berdasarkan nilai koefisien korelasi (R), koefisien determinasi ( $R^2$ ), signifikansi, dan *Root Mean Square Error* (RMSE).

Indeks vegetasi terbaik untuk estimasi simpanan karbon yaitu NDVI dan SAVI dalam model regresi polynomial, dengan persamaan  $Y = 254,377x^2 - 149,013x + 26,470$  (NDVI) dan  $Y = 113,056x^2 - 99,327x + 26,464$  (SAVI). Potensi simpanan karbon di atas permukaan tanah di Desa Pacarejo sebesar 19,960 ton C/ha. Pemetaan sebaran karbon menggunakan model regresi polynomial NDVI dengan hasil visual yaitu didominasi oleh kelas simpanan karbon rendah (4,64–35,05 ton C/ha), sedangkan kelas sedang (> 35,05–70,52 ton C/ha), dan tinggi (>70,52–105,99 ton C/ha) tersebar secara terbatas.

Kata Kunci: Sentinel-2A L2A, tutupan lahan, persamaan allometrik, regresi

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## ESTIMATION OF CARBON STORAGE BASED ON VEGETATION INDEX IN PACAREJO VILLAGE, SEMANU SUB-DISTRICT, GUNUNG KIDUL DISTRICT

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### ABSTRACT

*Climate change due to increased greenhouse gas emissions has become an urgent global issue. Vegetation cover, especially forests, plays an important role in absorbing and storing carbon, thus supporting climate change mitigation efforts. Pacarejo Village in Gunung Kidul Regency has carbon storage potential because it is dominated by vegetation cover. Spatial information on the distribution of carbon storage in this area is still very limited. This research uses vegetation indices such as NDVI (Normalized Difference Vegetation Index), SAVI (Soil-Adjusted Vegetation Index), ARVI (Atmospherically Resistant Vegetation Index), and RVI (Ratio Vegetation Index). The purpose of this research is to determine the vegetation index for carbon storage estimation, calculate carbon storage potential, and map its distribution.*

*Data collection techniques include pre-field activities, namely preprocessing Sentinel-2A L2A images, image interpretation, vegetation index transformation, and determination of 96 sample points with Stratified Random Sampling, as well as field activities for measuring trees DBH  $\geq 10$  cm on 30x30 m plots. Data analysis included allometric measurements of biomass and carbon storage. Carbon storage estimation models were developed through regression analysis, namely linear, logarithmic, polynomial, power, and exponential. The best equation was selected based on correlation coefficient (R), coefficient of determination ( $R^2$ ), significance and RMSE values.*

*The best vegetation indices for carbon storage estimation are NDVI and SAVI in a polynomial regression model, with equations  $Y = 254.377x^2 - 149.013x + 26.470$  (NDVI) and  $Y = 113.056x^2 - 99.327x + 26.464$  (SAVI). Potential aboveground carbon storage in Pacarejo Village is 19,960 tons C/ha. Carbon distribution mapping using NDVI polynomial regression model with visual results is dominated by low carbon storage class (4.64-35.05 tons C/ha), while medium (> 35.05-70.52 tons C/ha), and high (>70.52-105.99 tons C/ha) classes are limitedly distributed.*

*Keywords: Sentinel-2A L2A, land cover, allometric equation, regression*

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