

## DINAMIKA TUTUPAN LAHAN DAN SIMPANAN KARBON TAHUN 2019 DAN 2023 DI KECAMATAN TEMANGGUNG, JAWA TENGAH MENGGUNAKAN CITRA SENTINEL-2A

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### INTISARI

Peningkatan suhu bumi akhir-akhir ini terjadi karena adanya ketidakseimbangan iklim akibat pemanasan global (*global warming*). Peningkatan penduduk memicu terjadinya peningkatan aktivitas transportasi yang dapat menimbulkan emisi gas rumah kaca (GRK). Peningkatan penduduk ini juga menyebabkan bertambahnya luas lahan terbangun di Kecamatan Temanggung. Tujuan penelitian ini yaitu mengetahui dinamika tutupan lahan, menyusun model penduga simpanan karbon berdasarkan nilai NDVI, dan mengetahui dinamika simpanan karbon tahun 2019 dan 2023 di Kecamatan Temanggung.

Penggunaan citra penginderaan melalui NDVI diharapkan dapat memberikan informasi tutupan lahan secara baik untuk perhitungan biomassa dan dinamika simpanan karbon. Metode penelitian ini terdiri dari studi literatur, pengumpulan data, dan analisis data. Teknik pengumpulan data meliputi kegiatan pra lapangan yaitu *preprocessing* citra, interpretasi citra, transformasi NDVI, dan penentuan sampel sebanyak 76 titik serta kegiatan lapangan yaitu pengukuran pohon berdiameter  $\geq 5$  cm pada petak ukur persegi berukuran 30x30 meter. Teknik analisis data meliputi uji akurasi, pengukuran biomassa di atas permukaan tanah dengan allometrik Brown (1997), dan pengukuran simpanan karbon setiap plot sampel. Model penduga simpanan karbon disusun sebagai hubungan antara nilai NDVI dengan nilai simpanan karbon setiap plot sampel menggunakan *Random Forest Regressor*.

Hasil penelitian menunjukkan tutupan lahan di Kecamatan Temanggung mengalami perubahan dari tahun 2019 sampai 2023. Tipe tutupan lahan yang mengalami peningkatan luasan yaitu permukiman sebesar 1,93% dan sawah sebesar 0,54%, sedangkan pertanian lahan kering campur mengalami penurunan luasan sebesar 9,25%. Model penduga simpanan karbon di Kecamatan Temanggung berdasarkan nilai NDVI yang dipilih yaitu *Random Forest Regressor* dengan persamaan  $y = 0,88958 * NDVI + 0,20381$ . Simpanan karbon di atas permukaan tanah pada Kecamatan Temanggung termasuk ke dalam klasifikasi rendah (<35 ton/ha) dan mengalami sedikit penurunan dari 20,12 ton/ha pada tahun 2019 menjadi 19,95 ton/ha pada tahun 2023.

Kata kunci: Sentinel-2A, NDVI, dinamika, tutupan lahan, simpanan karbon

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## THE DYNAMICS OF LAND COVER AND CARBON STOCK IN 2019 AND 2023 IN TEMANGGUNG DISTRICT, CENTRAL JAVA USING SENTINEL-2A IMAGERY

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### ABSTRACT

The recent increase in earth's temperature is due to climate change as the effect global warming. The increase of population in accordance with transportation activities triggers greenhouse gas (GHG) emissions production rises. Besides, this has also caused an expansion in the area of built-up land in Temanggung District. The aim of this research is to determine the dynamics of land cover, develop a carbon stock estimation model based on NDVI values, and observe the dynamics of carbon stock in 2019 and 2023 in Temanggung District.

The use of sensing imagery via NDVI is expected to provide good land cover information for calculating biomass and carbon stock dynamics. This research method consists of literature study, data collection, and data analysis. Data collection techniques include pre-field activities, namely image preprocessing, image interpretation, NDVI transformation, and determining 76 samples as well as field activities, namely measuring trees with a diameter  $\geq 5$  cm on a square area that covers 30x30 meters. Data analysis techniques include accuracy tests, above-ground biomass measurements using Brown (1997) allometrics, and carbon stock measurements for each sample plot. The carbon stock estimation model is structured as a relationship between the NDVI value and the carbon stock value for each sample plot using *Random Forest Regressor*.

The results of the research show that land cover in Temanggung District experienced changes from 2019 to 2023. The types of land cover that had an increase in area were settlements by 1.93% and rice fields by 0.54%, while mixed dry land agriculture experienced a decrease in area by 9.25%. The selected carbon stock estimation model in Temanggung District is based on the NDVI value, namely *Random Forest Regressor* with the equation  $y=0.88958*NDVI+0.20381$ . Above ground carbon stock in Temanggung District are classified as low ( $<35$  tonnes/ha) and experienced a slight decrease from 20.12 tonnes/ha in 2019 to 19.95 tonnes/ha in 2023.

Keywords: Sentinel-2A, NDVI, dynamics, land cover, carbon stock

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