

RINGKASAN

RENDY SEPTIANSYACH. Judul Skripsi/Tesis Hubungan Stok Karbon Mangrove di Permukaan dengan Tutupan Kanopi di Kawasan Pesisir Sagulung Kota Batam. Dibimbing oleh FEBRIANTI LESTARI dan ANDI ZULFIKAR.

Pemanasan global yang ditandai oleh peningkatan konsentrasi gas rumah kaca, terutama CO₂, telah memicu percepatan perubahan iklim global yang berdampak langsung terhadap ekosistem pesisir, termasuk mangrove. Mangrove merupakan ekosistem kunci yang berperan dalam mitigasi perubahan iklim melalui kemampuan menyerap dan menyimpan karbon dalam biomassa di atas permukaan (AGB) maupun bawah permukaan. Besarnya simpanan karbon pada mangrove sangat dipengaruhi oleh struktur kanopi sebagai indikator produktivitas vegetasi. Kanopi yang rapat umumnya menggambarkan tingkat kesehatan tegakan serta akumulasi biomassa yang lebih tinggi. Namun, kajian mengenai hubungan stok karbon dengan tutupan kanopi masih relatif terbatas, terutama pada kawasan mangrove urban seperti Sagulung, Kota Batam, yang mengalami tekanan antropogenik cukup tinggi akibat industrialisasi dan alih fungsi lahan. Penelitian ini bertujuan untuk mengidentifikasi persentase tutupan kanopi, menghitung estimasi biomassa serta serapan karbon permukaan, dan menganalisis hubungan keduanya pada ekosistem mangrove Sagulung. Metode yang digunakan yaitu survei lapangan dengan teknik simple random sampling sebanyak 10 titik, menggunakan pendekatan allometrik SNI 7724:2011 secara non-destruktif. Diameter batang dan tinggi pohon diukur untuk memperoleh biomassa yang kemudian dikonversi menjadi stok karbon dan serapan CO₂. Tutupan kanopi dianalisis melalui hemispherical photography berbasis aplikasi MonMang 2.0 untuk memperoleh persentase penutupan vegetasi. Data karbon dan tutupan kanopi kemudian diuji korelasi menggunakan Jamovi dengan pendekatan Pearson atau Spearman sesuai distribusi data. Hasil penelitian menunjukkan kontribusi mangrove Sagulung sebagai penyerap karbon melalui akumulasi AGB dan struktur kanopi yang bervariasi pada setiap plot. Nilai biomassa, stok karbon, serta serapan CO₂ yang diperoleh memberikan gambaran kapasitas ekosistem dalam mitigasi iklim. Analisis korelasi menghasilkan hubungan antara tingkat penutupan kanopi dengan jumlah karbon tersimpan di atas permukaan, sehingga parameter kanopi dapat menjadi indikator ekologis dalam pengelolaan hutan mangrove berkelanjutan. Penelitian ini diharapkan menjadi dasar pengembangan kebijakan konservasi, pengelolaan karbon biru, serta rujukan penelitian lanjutan berbasis pemodelan spasial dan penginderaan jauh.

Kata kunci: Biomassa, Karbon, Kanopi Mangrove, Pemanasan Global, Sagulung Batam

SUMMARY

RENDY SEPTIANSYACH. The Title of the Thesis The Relationship Between Above-Ground Mangrove Carbon Stock and Canopy Cover in the Coastal Area of Sagulung, Batam City. Supervised by FEBRIANTI LESTARI and ANDI ZULFIKAR.

Global warming, characterized by increasing concentrations of greenhouse gases, particularly CO₂, has triggered the acceleration of climate change that directly affects coastal ecosystems, including mangroves. Mangroves are key ecosystems that play an essential role in climate change mitigation through their ability to absorb and store carbon within above-ground biomass (AGB) as well as below-ground biomass. The magnitude of carbon storage in mangroves is strongly influenced by canopy structure as an indicator of vegetation productivity. A dense canopy generally reflects healthier stands and higher biomass accumulation. However, studies examining the relationship between carbon stock and canopy cover are still relatively limited, particularly in urban mangrove areas such as Sagulung, Batam City, which are subjected to high anthropogenic pressure due to industrialization and land conversion. This study aims to identify canopy cover percentage, calculate biomass estimation and above-ground carbon sequestration, and analyze the relationship between both variables in the Sagulung mangrove ecosystem. The method employed was field surveys using simple random sampling at 10 sampling points, applying the allometric approach of SNI 7724:2011 in a non-destructive manner. Diameter and height of mangrove trees were measured to obtain biomass, which was then converted into carbon stock and CO₂ absorption. Canopy cover was analyzed using hemispherical photography based on the MonMang 2.0 application to determine vegetation cover percentage. Carbon and canopy cover data were subsequently tested for correlation using Jamovi with Pearson or Spearman approaches depending on data distribution. The results indicate the contribution of Sagulung mangroves as a carbon sink through AGB accumulation and canopy structure variation across plots. The obtained biomass, carbon stock, and CO₂ absorption values illustrate the ecosystem's capacity in climate mitigation. Correlation analysis revealed a relationship between canopy cover and above-ground carbon storage, implying that canopy parameters may serve as ecological indicators for sustainable mangrove forest management. This research is expected to serve as a foundation for the development of conservation policies, blue carbon management, and further studies based on spatial modeling and remote sensing.

Keywords: Biomass, Carbon, Mangrove Canopy, Global Warming, Sagulung Batam.