

COOLING DEGREE DAYS SEBAGAIN INDIKATOR KONSUMSI ENERGI PENDINGINAN DI ZONA IKLIM TROPIS INDONESIA

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ABSTRAK

Peningkatan suhu global akibat perubahan iklim telah berdampak langsung terhadap meningkatnya kebutuhan energi pendinginan, terutama di kawasan tropis seperti Indonesia. *Cooling Degree Days* (CDD) digunakan sebagai indikator untuk mengukur kebutuhan energi pendinginan berdasarkan selisih antara suhu rata-rata harian dan suhu dasar kenyamanan termal. Penelitian ini bertujuan untuk menganalisis nilai CDD di delapan kota Indonesia yang mewakili zona iklim terpadu berdasarkan data iklim harian selama periode 2020–2024. Tiga suhu dasar digunakan dalam perhitungan, yaitu 18°C, 24°C, dan 26°C. Hasil penelitian menunjukkan adanya variasi spasial dan temporal dalam distribusi nilai CDD dan kebutuhan energi pendinginan. Kota-kota seperti Surabaya dan Semarang mencatat nilai CDD tertinggi dan konsumsi energi terbesar, sedangkan Kerinci menunjukkan nilai terendah karena karakteristik iklim dataran tinggi yang relatif sejuk. Simulasi energi bangunan menggunakan perangkat lunak DALEC mengonfirmasi adanya hubungan linier positif antara nilai CDD dan prediksi konsumsi energi tahunan. Penelitian ini menegaskan bahwa CDD merupakan alat prediktif yang efektif dalam merencanakan desain bangunan hemat energi serta strategi adaptasi iklim di wilayah tropis.

Kata Kunci: *Cooling Degree Days*, Konsumsi Energi, DALEC, Zona Iklim Terpadu, Efisiensi Energi Bangunan

COOLING DEGREE DAYS AS AN INDICATOR OF COOLING ENERGY CONSUMPTION IN INDONESIA'S TROPICAL CLIMATE ZONES

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ABSTRACT

The increase in global temperatures due to climate change has directly impacted the growing demand for cooling energy, especially in tropical regions such as Indonesia. Cooling Degree Days (CDD) is used as an indicator to quantify cooling energy requirements based on the difference between daily average temperature and a defined thermal comfort base temperature. This study aims to analyze CDD values in eight Indonesian cities representing integrated climate zones, using daily climate data from 2020 to 2024. Three base temperatures were applied in the calculation: 18°C, 24°C, and 26°C. The results show spatial and temporal variations in CDD distribution and corresponding cooling energy demand. Cities such as Surabaya and Semarang recorded the highest CDD values and energy consumption, while Kerinci had the lowest due to its relatively cool highland climate characteristics. Energy consumption simulation using the DALEC software confirms a positive linear relationship between CDD values and predicted annual cooling energy use. This study highlights CDD as an effective predictive tool for planning energy-efficient building designs and climate adaptation strategies in tropical regions.

Keywords: *Cooling Degree Days, Energy Consumption, DALEC, Integrated Climate Zones, Building Energy Efficiency*