

**OPTIMASI *CURVE NUMBER* DAN *SOIL EVAPORATION
COMPENSATION FACTOR* PADA MODEL HIDROLOGI
MENGUNAKAN SWAT DI DAS CIWULAN**

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ABSTRAK

Pengelolaan sumber daya air di wilayah tropis seperti Indonesia dihadapkan pada tantangan variabilitas iklim dan kompleksitas karakteristik Daerah Aliran Sungai (DAS). Studi simulasi model hidrologi yang komprehensif di DAS Ciwulan saat ini masih sangat terbatas, di mana penelitian terdahulu menggunakan model HEC-HMS menghasilkan akurasi yang kurang memuaskan. Penelitian ini bertujuan untuk mengidentifikasi karakteristik fisik DAS Ciwulan, menganalisis debit aliran sungai menggunakan model terdistribusi Soil and Water Assessment Tool (SWAT), serta melakukan optimasi parameter *Curve Number* (CN2) dan *Soil Evaporation and Compensation Factor* (ESCO) menggunakan SWAT-CUP. Hasil analisis menunjukkan karakteristik fisik wilayah studi didominasi oleh hutan lahan kering sekunder dan hutan tanaman, jenis tanah Andosol, serta kelas kelerengan yang curam hingga sangat curam. Pemodelan hidrologi awal menggunakan SWAT merefleksikan tren debit simulasi yang tidak memuaskan terhadap debit terukur dengan nilai NSE $-0,689$ dan PBIAS $-36,033$. Meskipun telah melalui proses kalibrasi dan optimasi parameter CN2 dan ESCO menggunakan SWAT-CUP, akurasi model tetap tidak memuaskan dengan nilai NSE $-0,017$ dan PBIAS $-29,381$. Rendahnya peningkatan akurasi ini mengindikasikan beberapa kendala fisik, seperti minimnya persebaran pos penakar curah hujan di dalam DAS, potensi adanya galat pada pencatatan debit terukur di lapangan, serta kompleksitas hidrologi lokal wilayah tropis yang belum sepenuhnya terakomodasi model. Hasil penelitian ini berkontribusi dalam menyediakan basis data karakteristik awal dan referensi metodologi optimasi SWAT bagi pengelolaan sumber daya air yang lebih adaptif di DAS Ciwulan.

Kata Kunci: DAS Ciwulan Hulu, Pemodelan Hidrologi, SWAT, SWAT-CUP

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OPTIMIZATION OF CURVE NUMBER AND SOIL EVAPORATION COMPENSATION FACTOR IN HYDROLOGICAL MODEL USING SWAT IN CIWULAN WATERSHED

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ABSTRACT

Water resource management in tropical regions like Indonesia faces challenges due to climate variability and the complexity of watershed characteristics. Comprehensive hydrological simulation studies in the Ciwulan Watershed are currently very limited, where previous research utilizing the HEC-HMS model yielded unsatisfactory accuracy. This study aims to identify the physical characteristics of the Ciwulan Watershed, analyze streamflow discharge using the distributed Soil and Water Assessment Tool (SWAT) model, and optimize the Curve Number (CN2) and Soil Evaporation Compensation Factor (ESCO) parameters using SWAT-CUP. The results of the analysis indicate that the physical characteristics of the study area are dominated by secondary dryland forest and plantation forest, Andosol soil types, and steep to very steep slope classes. The initial hydrological modeling using SWAT reflects an unsatisfactory simulation discharge trend against the measured discharge, with an NSE value of -0.689 and a PBIAS of -36.033% . Although it has undergone calibration and parameter optimization for CN2 and ESCO via SWAT-CUP, the post-optimization model accuracy improves but remains within the unsatisfactory category, yielding an NSE value of -0.017 and a PBIAS of -29.381% . This low increase in accuracy indicates several physical constraints, such as the minimum and unrepresentative distribution of rainfall gaging stations within the watershed, potential errors in field-measured discharge records, and the complexity of local tropical hydrological interactions that have not been fully accommodated by the model. Nonetheless, this research contributes to providing a baseline database of initial characteristics and a methodological reference for SWAT optimization towards more adaptive water resource management in the Ciwulan Watershed.

Keyword: *Ciwulan Watershed, Hydrological Modeling, SWAT, SWAT-CUP*

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