

## **PENGUNAAN DATA PENGINDERAAN JAUH UNTUK ANALISIS DINAMIKA HUBUNGAN KUALITAS TUTUPAN LAHAN DENGAN KOEFISIEN ALIRAN DAS JUWANA (1993 – 2023)**

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### **INTISARI**

Degradasi Daerah Aliran Sungai (DAS) Juwana akibat deforestasi, alih fungsi lahan, dan pertumbuhan penduduk telah menurunkan kualitas tutupan lahan. Kondisi ini memperbesar risiko banjir, kekeringan, dan sedimentasi yang merugikan masyarakat. Indeks Kualitas Tutupan Lahan (IKTL) digunakan sebagai indikator untuk menilai kondisi lingkungan, sementara koefisien aliran menjadi parameter hidrologi penting dalam memahami stabilitas debit sungai. Tujuan penelitian ini adalah menentukan metode klasifikasi tutupan lahan yang akurat untuk kajian dinamika luas dan indeks kualitas tutupan lahan, dinamika koefisien aliran, dan pengaruh kualitas tutupan lahan terhadap koefisien aliran.

Penelitian ini menggunakan metode penginderaan jauh dan SIG secara terpadu dengan data citra Landsat (1993, 2003, 2013, 2023), data curah hujan, dan debit aliran. Data diolah melalui tahapan koreksi geometrik, koreksi radiometrik, masking, serta klasifikasi supervised menggunakan algoritma Maximum Likelihood Classification (MLC), Support Vector Machine (SVM), dan Random Forest (RF). Hasil penelitian menegaskan bahwa algoritma Random Forest paling akurat untuk klasifikasi tutupan lahan, sehingga dapat dijadikan acuan utama dalam analisis penginderaan jauh untuk klasifikasi tutupan lahan. Dinamika luas hutan dari 40.013 ha (1993) menjadi 35.691 ha (2023), dengan IKTL yang berfluktuasi pada kategori “sangat kurang baik (–)” hingga “waspadanya (–)”. Curah hujan yang tidak stabil memengaruhi debit aliran, serta meningkatkan KRA dan KAT terutama pada periode 2013–2023. Analisis regresi menunjukkan curah hujan berpengaruh kuat terhadap debit aliran ( $R^2 = 0,90$ ), sementara tutupan hutan berpengaruh terhadap KAT ( $R^2 = 0,49$ ) dan KRA ( $R^2 = 0,13$ ). Degradasi tutupan hutan di DAS Juwana berdampak langsung terhadap stabilitas aliran sungai. Penurunan luas hutan tidak hanya menurunkan nilai IKTL, tetapi juga meningkatkan risiko hidrologis berupa banjir saat musim hujan dan kekeringan saat musim kemarau. Hal ini memperkuat urgensi konservasi hutan dan pengelolaan DAS berkelanjutan guna mengurangi risiko bencana hidrologi DAS Juwana.

**Kata Kunci:** Sistem informasi geografis, hidrologi, pengelolaan DAS, klasifikasi citra

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## The Use of Remote Sensing Data for Analyzing the Dynamics of the Relationship Between Land Cover Quality and Flow Coefficient in the Juwana Watershed (1993–2023)

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### ABSTRACT

*Degradation of the Juwana Watershed (DAS) due to deforestation, land conversion, and population growth has reduced land cover quality. This condition increases the risk of floods, droughts, and sedimentation that harm the community. The Land Cover Quality Index (IKTL) is used as an indicator to assess environmental conditions, while the runoff coefficient becomes an important hydrological parameter in understanding river discharge stability. The purpose of this study is to determine an accurate land cover classification method for studying the dynamics of area and land cover quality index, runoff coefficient dynamics, and the influence of land cover quality on the runoff coefficient.*

*This study uses remote sensing and GIS methods in an integrated manner with Landsat imagery data (1993, 2003, 2013, 2023), rainfall data, and streamflow discharge. The data were processed through stages of geometric correction, radiometric correction, masking, as well as supervised classification using Maximum Likelihood Classification (MLC), Support Vector Machine (SVM), and Random Forest (RF) algorithms. The results of the study affirm that the Random Forest algorithm is the most accurate for land cover classification, so it can be used as the main reference in remote sensing analysis for land cover classification. The dynamics of forest area from 40,013 ha (1993) to 35,691 ha (2023), with IKTL fluctuating in the category of “very poor ()” to “alert ().” Unstable rainfall affects streamflow discharge, as well as increases KRA and KAT especially in the 2013–2023 period. Regression analysis shows that rainfall has a strong influence on streamflow discharge ( $R^2 = 0.90$ ), while forest cover influences KAT ( $R^2 = 0.49$ ) and KRA ( $R^2 = 0.13$ ). Forest cover degradation in the Juwana Watershed directly impacts river flow stability. The decline in forest area not only reduces IKTL values, but also increases hydrological risks in the form of floods during the rainy season and drought during the dry season. This strengthens the urgency of forest conservation and sustainable watershed management to reduce the risk of hydrological disasters in the Juwana Watershed.*

*Keywords: Geographic Information System, hydrology, watershed management, image classification*

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