

KAJIAN PENGINDERAAN JAUH DAN SISTEM INFORMASI GEOGRAFI UNTUK ANALISIS MORFOMETRI DAS DAN PENGGUNAAN LAHAN DALAM PENETAPAN PRIORITAS PENGELOLAAN DAS SERANG DI DAERAH ISTIMEWA YOGYAKARTA

Intisari

Das Serang di wilayah Kabupaten Kulonprogo yang termasuk kategori DAS kritis terkait frekuensi kejadian banjir, memerlukan upaya pengelolaan secara terpadu. Dalam penetapan sub DAS prioritas pengelolaan diperlukan data dan informasi morfometri DAS dan penggunaan lahan dalam skala detail. Pemanfaatan teknologi penginderaan jauh dengan memanfaatkan *digital elevation model* (DEM) dan teknologi sistem informasi geografis (SIG) telah berkembang pesat dan terbukti efisien untuk kajian morfometri dan penggunaan lahan DAS. Tujuan penelitian ini adalah (1) mengkaji kualitas data DEM TerraSAR-X, SRTM dan GDEM Aster (2) mengekstraksi parameter morfometri DAS serta menetapkan tingkat kerentanan morfometri terhadap debit puncak (Q_p). (3) mengekstraksi penggunaan lahan melalui interpretasi visual citra SPOT 6 digunakan untuk analisis koefisien limpasan permukaan (C) sub DAS dan (4) menetapkan sub DAS prioritas pengelolaan.

Data DEM TerraSAR-X dibandingkan kualitasnya terhadap SRTM 1 *arc* dan GDEM Aster Versi 2 melalui analisis *RMS error* elevasi dan uji statistik ANOVA, serta analisis hasil ekstraksi batas DAS dan morfometri dibanding data DAS Serang BPDAS SOP. Tingkat kerentanan morfometri ditetapkan berdasar 9 parameter yaitu *bifurcation ratio*, kerapatan aliran, frekuensi aliran, *elongation ratio*, *circularity ratio*, faktor bentuk, tekstur rasio, *relief ratio* dan indek kekasaran.

Analisis statistik ANOVA menghasilkan nilai Sig sebesar 0,999, sehingga nilai rerata keempat kelompok adalah tidak signifikan ($p=1,000>0,05$) yang menunjukkan tidak ada perbedaan signifikan dari keempat kelompok data tersebut. Nilai *RMS error* elevasi DEM TerraSAR-X 8,564 m, GDEM Aster (9,708 m), sedangkan SRTM (5,584 m). DEM TerraSAR-X terbukti lebih akurat dan detail dalam menghasilkan batas DAS dan alur sungai, dibandingkan SRTM dan GDEM Aster dan digunakan untuk menetapkan tingkat kerentanan morfometri sub DAS. Hasil interpretasi penggunaan lahan digunakan untuk perhitungan nilai koefisien limpasan rata-rata sub DAS antara 0,139 sampai dengan 0,371. Hasil analisis prioritas Sub DAS menggunakan parameter morfometri DAS dan penggunaan lahan, diperoleh hasil prioritas pengelolaan meliputi ; Prioritas 1 = Sub DAS II, Prioritas 2 = Sub DAS III, Prioritas III = Sub DAS 1, Prioritas IV = Sub DAS 4, Prioritas V = Sub DAS 5 dan prioritas VI = Sub DAS VI .

Kata Kunci: DEM, TerraSAR-X, Morfometri DAS, Penggunaan Lahan, Sub DAS Prioritas

THE REMOTE SENSING AND GIS STUDY OF SERANG WATERSHED PRIORITIZATION BASED ON MORPHOMETRIC AND LANDUSE AT YOGYAKARTA

Abstarct

Serang watershed in Kulonprogo Regency that categorized as a critical watershed associated with the frequency of flood occurrence and landslides, need an integrated watershed-management efforts to restore the watershed functions in hydrological term. Morphometric and landuse on detail scale are a significant tool for prioritization of Serang's watershed-management. The remote sensing (RS) with the digital elevation model (DEM) and geographic information system (GIS) techniques has been proven as an efficient method for extracting morphometric and landuse information. The purposes of this study are (1) assessing the quality TerraSAR-X, SRTM and GDEM Aster DEM (2) extracting morphometric parameters and to determine the vulnerability morphometry of the peak discharge (Q_p). (3) extracting landuse data, and to determine sub-watershed management priorities.

RMS error and analysis of varian (ANOVA) were used to analyse the data quality of TerraSAR-X, SRTM 1 arc, and GDEM Aster version 2 compared with RBI map. Extraction result of the watershed boundary and morphometric parameter of the DEMs were compared with BPDAS Serayu Opak Progo's watershed data. The morphometric-vulnerability levels of sub-watershed were determined by nine parameter such as bifurcation ratio, drainage density, flow frequency, elongation ratio, circularity ratio, form factor, texture ratio, relief ratio and roughness index. The landuse data extracted from visual interpretation of SPOT-6 image, is used for weighted-average runoff coefficient (C) analysis of sub-basins.

The ANOVA analysis shows that the Sig.value is 0.999, mean that the average values of the four groups were not significant ($p = 1.000 > 0.05$). This means that the accuracy of three of the DEM data are same as the elevation data from RBI map. The rated of RMS error TerraSAR-X DEM elevation is 8.564 m, GDEM Aster 9.708 m, while the SRTM is 5.584 m. The extraction of watershed boundary and morphometry analysis reveals that DEM TerraSAR-X is more accurate and provide more detail and better than SRTM and GDEM Aster. The DEM TerraSAR-X is used to determine the level of vulnerability of sub-basins morphometry. The interpretation of landuse used to calculated the weighted-average runoff of sub-basins, indicated that the (C) value is in the range of 0.139 up to 0.37. Serang watershed is divided into six sub-watershed according to BPDAS SOP data. Morphometric and landuse analysis result show that Sub-watershed II categorized as first priority ; second priority = Sub-watershed III, third priority = Sub-watershed I, fourth Priority = Sub-watershed 4, fifth priority = Sub-watershed 5 and Sub-watershed VI as the last priority of watershed management.

Keywords: DEM, TerraSAR-X, Morphometry, Land Use, Watershed, Prioritization