

ABSTRAK

Perubahan Tata guna lahan di DAS Garang terjadi sangat cepat seiring dengan pertumbuhan penduduk dan pertumbuhan ekonomi, Perubahan tata guna lahan terjadi terutama dari kebun campuran, sawah, tegalan, menjadi lahan permukiman, industri, dan perkantoran, Perubahan tata guna lahan pada sistem DAS mengakibatkan limpasan permukaan dan laju erosi meningkat, Tujuan penelitian: 1) menganalisis bentuk tata guna lahan DAS Garang tahun 1995–2013, 2) menganalisis penerapan model hidrologi SWAT dalam menghasilkan nilai limpasan, erosi dan sedimentasi, 3) menemukan tata guna lahan optimal dalam pengelolaan DAS melalui analisis simulasi model hidrologi SWAT,

Penelitian dilakukan di DAS Garang Jawa Tengah, Data dianalisis melalui beberapa tahapan yaitu; pemilihan model, melakukan kalibrasi, validasi, dan evaluasi model SWAT dengan software berbasis SIG tipe ArcGIS 9,3, Tahapan penelitian meliputi kegiatan: 1) menyiapkan database SWAT, 2) pembuatan batas DAS dan identifikasi jenis tata guna lahan, 3) penentuan sebaran HRU, 4) menyiapkan masukan data, 5) *Edit ArcSWAT Input Data*, 6) melakukan Simulasi ArcSWAT (*running process*),

Hasil penelitian 1) Perubahan penutup lahan DAS Garang tahun 1995–2013 menunjukkan kecenderungan pengurangan luas lahan pada lahan kosong (88,5%), hutan (6,7%), sawah (35,6%), sedangkan peningkatan luas lahan tegalan (8,72%), kebun campuran (2,9%) dan permukiman (49,48%), 2) Kondisi pengelolaan tataguna lahan *existing* menunjukkan bahwa aliran *surfaceflow* terhadap curah hujan tertinggi berada pada bulan Januari sebesar 39,59% dan terhadap *water yield* 88,11% dengan curah hujan 325,81 mm, Debit tertinggi terjadi pada bulan November dan Desember, tidak diikuti dengan nilai sedimen tinggi, Sedimentasi tinggi terjadi pada bulan Januari, 3) Hasil simulasi tataguna lahan menunjukkan bahwa perbedaan nilai neraca air, debit dan sedimen hanya kecil, Dibandingkan dengan kondisi eksisting, skenario I berupa penambahan luas hutan menghasilkan nilai debit, nilai rasio debit (maksimum/minimum) dan sedimen yang lebih kecil, Skenario II berupa pengurangan luas hutan akan menghasilkan nilai debit, rasio debit, dan sedimentasi yang besar melebihi kondisi eksisting, Skenario III berupa pengurangan luas kebun campuran menjadi tegalan akan menghasilkan nilai debit dan sedimentasi yang besar melebihi kondisi eksisting, Skenario IV berupa penambahan lahan permukiman menghasilkan nilai debit dan rasio debit yang lebih besar dari II dan III.

Kata Kunci: tata guna lahan, simulasi, model hidrologi SWAT



LAND USE SIMULATION OF GARANG WATERSHED MANAGEMENT OF CENTRAL JAVA

ABSTRACT

In line with population and economic growth, Garang watershed area land use, especially on mixed-use farms, rice fields, and moors, has been rapidly changed into residential, industrial, and commercial purposes. These changes result in surface runoff and increasing erosion rate. This study aimed to analyze land use form in Garang watershed area during 1995–2013 as well as to analyze the rate of land runoff, erosion, and sedimentation to define optimal land use plan for watershed area management using SWAT hydrology simulation model analysis.

Research was conducted in Garang watershed area, Province of Jawa Tengah. Data was analyzed through various stages: model selection, calibration, validation, and SWAT model evaluation using SIG type ArcGIS 9.3 – based software. Whereas research activity consisted of: 1) SWAT database preparation, 2) determination of the watershed boundaries and identification of land use classification, 3) determination of HRU (hydrology response unit), 4) data input preparation, 5) ArcSWAT data input editing, 6) ArcSWAT simulation running process.

Results showed that: 1) Land use of Garang watershed area during 1995–2013 indicated decrease in vacant lands (88.5%), forests (6.7%), and rice fields (35.6%), while increase occurred in moors (8.72%), mixed-use farm (2.9%) and residence (49.48%); 2) Condition in existing land use pattern showed that surface flow of 39.59% on highest rainfall of 325.81 mm occurred in January with water yield of 88.11%. Highest debit was occurred in November and December, not followed by high sediment rate. High sedimentation occurred in January. 3) Simulation of land use showed low rate of water balance, debit and sediment difference. Based on data from existing condition, scenario I of forest expansion resulted in lower debit value, maximum/minimum debit ratio, and sediment rate. On the contrary, scenario II of forest reduction resulted in high debit value, debit ratio, and sedimentation even higher than actual existing condition. This result was similar to scenario III of mixed-use farm reduction into moors which resulted in debit value and sedimentation higher than existing condition. And even higher debit value and ratio than scenario II and III were resulted by scenario IV of residential expansion.

Keywords: Land Use Management, Watershed Area, SWAT Hydrology Model