

ABSTRAK

Pertumbuhan penduduk yang tinggi dan urbanisasi yang cepat pada daerah perkotaan mengakibatkan peningkatan penggunaan lahan dan pengurangan lahan terbuka. Proses urbanisasi memengaruhi kondisi permukaan alam yang mendasari dan berdampak pada karakteristik area tangkapan air serta memberikan dampak yang signifikan pada siklus hidrologi, seperti penurunan volume air yang meresap ke dalam tanah dan peningkatan limpasan permukaan. Seiring pertambahan waktu dapat mengurangi simpanan air tanah dan meningkatkan potensi terjadi bencana banjir. Infiltrasi merupakan salah satu komponen utama dalam siklus hidrologi yang menentukan jumlah dari air hujan yang masuk ke tanah dan yang menjadi limpasan permukaan dan infiltrasi berperan penting dalam ketersediaan air tanah. Banyak faktor yang memengaruhi proses infiltrasi antara lain jenis tanah, kandungan air, derajat saturasi, porositas, rasio pori, densitas total, material organik, vegetasi penutup, kemiringan lahan, tata guna lahan, dan *surface crusting*. Pada penelitian ini mengkaji pengaruh parameter litologi, jenis tanah, dan fisik tanah meliputi porositas dalam tanah, kandungan air dalam tanah, rasio pori dalam tanah, dan derajat saturasi dalam tanah terhadap nilai laju infiltrasi. Pengujian dilakukan pada 49 titik pengukuran di Kota Semarang bagian barat. Penentuan titik uji berdasarkan pembagian *grid* ukuran 2x2 km² di daerah penelitian. Data primer diperoleh dari pengukuran laju infiltrasi di lapangan menggunakan alat *turf-tech* infiltrometer, pengukuran sifat fisik tanah di lapangan, pengambilan sampel tanah, dan pemetaan litologi. Sampel tanah dan batuan yang telah diperoleh diuji di laboratorium untuk memperoleh data jenis tanah dan litologi. Data pengukuran laju infiltrasi di lapangan dihitung menggunakan model pendugaan laju infiltrasi dari Kostiakov yang selanjutnya diklasifikasikan dengan klasifikasi Konhke (1968). Data jenis litologi, jenis tanah, dan sifat fisik tanah dilakukan korelasi secara spasial dan grafik terhadap laju infiltrasi. Hasil pengukuran laju infiltrasi menunjukkan daerah penelitian memiliki nilai laju infiltrasi yang sangat bervariasi dari kelas sangat lambat hingga sangat cepat dengan kisaran nilai 0 mm/jam hingga 287,10 mm/jam. Hasil analisis korelasi secara spasial menunjukkan pola sebaran laju infiltrasi di daerah penelitian di pengaruh oleh parameter litologi, jenis tanah, dan sifat fisik tanah. Hasil korelasi grafik menunjukkan bahwa jenis tanah, kandungan air dalam tanah, derajat saturasi dalam tanah, dan porositas memiliki hubungan terhadap laju infiltrasi di Kota Semarang bagian barat. Parameter rasio pori dalam tanah memiliki hubungan paling kecil terhadap laju infiltrasi dengan nilai R^2 yaitu 0,0294, dan derajat kejenuhan dalam tanah memiliki hubungan paling besar terhadap laju infiltrasi di daerah penelitian dengan nilai R^2 yaitu 0,1038.

Kata kunci: laju infiltrasi, sifat fisik tanah, infiltrometer, regresi linear.

ABSTRACT

High population growth and rapid urbanization of urban areas have resulted in increased land use and reduced open land. The urbanization process affects the underlying natural surface conditions and impacts the characteristics of the water catchment area and has a significant impact on the hydrological cycle, such as a reduction in the volume of water infiltrating the soil and an increase in surface runoff. Over time, it can reduce groundwater stores and increase the potential for flood disasters. Infiltration is one of the main components in the hydrological cycle which determines the amount of rainwater that enters the soil and becomes surface runoff and infiltration plays an important role in groundwater availability. Many factors influence the infiltration process, including soil type, water content, degree of saturation, porosity, pore ratio, total density, organic material, vegetation cover, land slope, land use, and surface crusting. This research examines the effect of lithological parameters, soil type, and soil physical including porosity in the soil, water content in the soil, the ratio of pores in the soil, and the degree of saturation in the soil to the infiltration rate. The test was carried out at 49 measurement points in the western part of Semarang City. Determination of the test points based on the distribution of a grid of 2x2 km² in the study area. Primary data were obtained from measuring the infiltration rate in the field using a turf-tech infiltrometer, measuring the physical properties of the soil in the field, taking soil samples, and mapping lithology. Soil and rock samples that have been obtained are tested in the laboratory to obtain soil type and lithology data. Infiltration rate measurement data in the field were calculated using the infiltration rate estimation model from Kostiakov which was further classified by Konhke's classification (1968). Data on lithology, soil type, and soil physical properties were correlated spatially and graphically to the infiltration rate. The results of the measurement of the infiltration rate showed that the study area had an infiltration rate that varied greatly from very slow to very fast classes with a value range of 0 mm/hour to 287.10 mm/hour. The results of the spatial correlation analysis show that the distribution pattern of the infiltration rate in the study area is influenced by lithological parameters, soil type, and soil physical properties. The result of the correlation graph shows that soil type, water content in the soil, void ratio in soil, degree of saturation in the soil, and porosity have a relationship with the infiltration rate in the western part of Semarang City. The void ratio in soil parameter has the smallest relationship with the infiltration rate with R^2 value of 0.0294, and the degree of saturation in the soil has the greatest relationship to the infiltration rate in the study area with an R^2 value of 0.1038.

Key words: infiltration rate, soil physical properties, infiltrometer, linear regression