Pengembangan model asesmen kerentanan sumber daya air berbasis fuzzy sistem informasi geografis sebagai landasan pengelolaan lingkungan = Development of vulnerability assessment model of water resources based fuzzy geographic information systems for environmental management platform

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Abstrak

Perkembangan penduduk yang tinggi disertai penyimpangan implementasi Rencana Tata Ruang Wilayah (RTRW) telah mengakibatkan berbagai perubahan lingkungan, salah satunya adalah alih fungsi lahan yang berakibat pada berubahnya kuantitas sumber daya air suatu wilayah, yang semuanya berakibat pula pada kerentanan wilayah khususnya kerentanan sumber daya air. Model kerentanan sumber daya air secara spasial telah dilakukan sebelumnya, namun terdapat kekurangan untuk menghadapi data dengan jumlah besar dan satuan beragam. Metode lain yakni Sistem Informasi Geografis (SIG) fuzzy dilakukan, dengan tujuan untuk mengembangkan model spasial kerentanan sumber daya air berbasis fuzzy SIG pada skala ordo-3 DAS, serta menerapkan model tersebut pada asesmen Rencana Tata Ruang Kabupaten/Kota. Metode penelitian dilakukan melalui penerapan metode SIG fungsi fuzzy dengan pengolahan dan analisis indikator kerentanan menurut ICCSR (Indonesia Climate Change Sectoral Roadmap). Indikator pertama yakni eksposur, dengan variabel kepadatan penduduk, luas sawah tadah hujan, luas tegalan serta indeks kekeringan, indikator kedua yakni sensitivitas, dengan variabel jumlah penduduk usia rentan, jumlah penduduk miskin, jumlah kejadian konflik air, akses masyarakat terhadap air bersih serta indeks kekritisan air serta indikator ketiga berupa kapasitas adaptif, dengan variabel debit andalan, luas hutan, produktivitas pertanian serta kelembagaan DAS.
Hasil penelitian menunjukkan bahwa 11 sub DAS Citarum Hulu berada dalam kondisi kerentanan sangat tinggi, 6 sub DAS dalam keadaan kerentanan tinggi, 6 Sub-DAS pada kelas sedang, serta 53 sub-DAS dengan kondisi baik. Model kerentanan divalidasi dengan pengecekan lapang melalui pendekatan lingkungan fisik, sosial, dan binaan. Hasil permodelan dapat diterapkan dalam pengelolaan lingkungan, serta digunakan untuk melakukan asesmen terhadap Rencana Tata Ruang Wilayah Kabupaten dan Kota. Penelitian ini menghasilkan kesimpulan bahwa pengkajian kerentanan sumber daya air dapat dilakukan melalui perhitungan indikator eksposur, sensitifitas serta kemampuan adaptif melalui basis SIG Fuzzy, yang mempunyai kemampuan cakupan wilayah yang detail (ordo sungai - catchment), menerima jumlah data besar, mampu mengolah beragam jenis data, dapat dilakukan validasi serta implementasi demi terciptanya sistem pengelolaan lingkungan DAS yang handal.
.....High population growth accompanied by irregularities implementation Spatial Plan has resulted in a variety of environmental changes, one of which is conversion resulting in a change in the quantity of the water resources of an area, all of which resulted in the particular area of vulnerability vulnerability of water resources. Vulnerability model of water resources spatially been done before, but there is a lack of data to deal with a large number and variety of units. Another method used fuzzy in Geographic Information Systems (GIS), with the aim to develop a model of spatial vulnerability of water resources based on fuzzy SIG 3rd order watershed scale, and apply the model to assess the Spatial Plan of the District/City.

Research methods were used the application of fuzzy GIS methods with processing and analysis of indicators of vulnerability according ICCSR (Indonesia Climate Change Sectoral Roadmap). The first indicator that exposure, with variable population density, extensive rainfed lowland, upland and widespread drought index, an indicator of the sensitivity of the two, with a variable number of vulnerable population ages, the number of poor, the incidence of water conflicts, community access to clean water and criticality index water as well as a third indicator of adaptive capacity, with variable discharge mainstay, forest, agricultural productivity and institutional watershed.

The results showed that 11 sub Citarum Hulu is in a state of vulnerability is very high , 6 sub- watershed in a state of high vulnerability, 6 Sub- basin in the medium class, and 53 sub-watersheds in good condition. Vulnerability models validated with field checking approach the physical environment, social, and built. Modeling results can be applied in environmental management, and is used to assess the Spatial Plan of the District and the City.

This study concluded that water resource vulnerability assessment can be done through the calculation of indicators of exposure, sensitivity and adaptive capacity through Fuzzy GIS base, which has the ability to detail the extent of the (order of the river - the catchment), received a large amount of data, capable of processing various types of data, can do the validation and implementation of the environmental management system for the creation of a reliable watershed.