



PEMODELAN SPASIAL DINAMIKA PENGGUNAAN LAHAN DI DAERAH PERKOTAAN YOGYAKARTA

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INTISARI

Dinamika penggunaan lahan adalah fenomena berubahnya penggunaan lahan menurut ruang dan waktu. Fenomena ini merupakan fenomena keruangan kompleks karena dipicu oleh beragam faktor dan menimbulkan bermacam dampak. Kajian terhadap fenomena keruangan kompleks memerlukan pendekatan dan metode yang sesuai. Salah satu metode yang banyak digunakan dan dikembangkan untuk mengkaji fenomena tersebut adalah pemodelan spasial.

Penelitian ini bertujuan untuk (1) mengkaji faktor-faktor yang mempunyai hubungan signifikan dengan perubahan penggunaan lahan di daerah penelitian, (2) Merumuskan model konseptual sebagai kerangka teoretis penyusunan model spasial dinamika penggunaan lahan (3) mengkaji metode dan teknik spasialisasi data untuk mengkonversi model konseptual menjadi model spasial dan (4) mengaplikasikan model spasial dalam suatu bentuk simulasi keruangan (*spatial simulation*).

Metode penelitian yang digunakan merupakan kombinasi kajian empiris dan teoretis. Kajian empiris dilakukan dengan cara memetakan penggunaan lahan dan perubahannya menggunakan citra penginderaan jauh. Hasil pemetaan dianalisis dengan teknik statistik untuk mengetahui faktor determinan perubahan penggunaan lahan. Hasil kajian empiris yang dikombinasikan dengan kajian teoretis digunakan untuk merumuskan model konseptual. Model konseptual ditransformasi menjadi model spasial menggunakan pendekatan *entity based* dan *field based*. Model spasial diimplementasikan dalam bentuk simulasi keruangan menggunakan algoritma *Cellular Automata (CA)*

Hasil penelitian menunjukkan luas perubahan berkorelasi signifikan dengan jumlah penduduk dan pertumbuhan ekonomi. Lokasi perubahan berkorelasi signifikan dengan faktor aksesibilitas lahan yaitu jarak terhadap pusat kota, jarak terhadap jalan lokal maupun jalan utama, jarak terhadap perguruan tinggi dan jarak terhadap pusat pemerintahan. Konseptualisasi menghasilkan tiga konsep terkait dengan mekanisme keruangan perubahan penggunaan lahan yaitu kebutuhan lahan (*demand for land*), preferensi keruangan (*spatial preference*) dan kalkulasi keruangan (*spatial calculation*). Melalui proses spasialisasi, konsep kebutuhan lahan dan preferensi keruangan diubah menjadi Peta Area Transisi (PAT) dan Peta Probabilitas Transisi (PPT). Simulasi keruangan dengan *Cellular Automata* menghasilkan peta penggunaan lahan dan peta perubahan penggunaan lahan. Ketelitian peta hasil simulasi ditunjukkan dengan nilai *overall accuracy* antara 94,33% dan 95,02% , serta indeks Kappa antara 0,89 dan 0,9.

Kata kunci : Pemodelan Spasial, Simulasi Keruangan, *Cellular Automata*



SPATIAL MODELING OF LAND USE DYNAMICS IN URBAN AREA OF YOGYAKARTA

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ABSTRACT

Land use dynamics are phenomena of land use changes over space and time. These phenomena are triggered by a variety of factors and cause a variety of effects, therefore called complex spatial phenomena. Type of change as well as the causes and effects of change vary according to time and space. Directly study to land use dynamics is difficult or complicated, hence require more appropriate approaches and methods. Method which broadly used and developed is spatial modeling.

The objectives of the study were (1) to examine the factors that have a significant relationship to land use changes in the study area, (2) to formulate a conceptual model or a theoretical framework to develop a spatial model of land use dynamics (3) to transform the conceptual model in to a spatially explicit model of land use change, using appropriate methods and techniques (4) simulate and predict land use change in the research area based on developed spatial model

The methods used were combination of empirical and theoretical studies. Empirical study was conducted by mapping land use and changes using remote sensing imagery. The mapping results were then analyzed using statistical techniques to find out the determinant factors of land use change. These empirical studies are then integrated with a theoretical study to formulate a conceptual model. The conceptual model is then converted or transformed into a spatially explicit model using two main approaches called entity-based and field-based. The spatial model was implemented in the form of spatial simulation, using an algorithm known as Cellular Automata (CA)

Empirical study showed that there were several factors which have a significant correlation to land use change in the study area. Areas or quantities of land use changes have significant correlation to population and economic growth. Locations of land use changes have significant correlation to accessibility factors. A spatial mechanism of land use change was conceptualized using three fundamental aspects namely demand for land, spatial preferences and spatial calculation. Concepts of demand for land and spatial preferences were transformed into maps namely Transition Area Map (MAT) and Transition Probability Map (PPT). Cellular Automata algorithm was used to represent the concept of spatial calculation as well as to performed spatial simulation. Outputs of spatial simulations were a number of maps which called simulated land use and land use change maps. Accuracy assessment indicated that overall accuracy of those simulated maps have values ranging from 94.33% to 95.02%. Kappa index of agreement (KIA) between simulated and actual land use maps has values ranging from 0.89 to 0.9.

Keyword: spatial modeling, simulation, *Cellular Automata*