

## Analysis of Land Use Changes and Urban Sprawl Simulation in Mid-Sized Cities (Case Study: Khoy City)

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### Extended Abstract

#### Introduction

One of the characteristics of spatial organization in developing countries is unplanned and irregular changes in physical evolution. Most of the problems in planning systems and political–decision flows are emerging from unplanned irregular, spatial– physical approaches in human settlements. The land control is one of the important issues in the recent world that has accelerated rapid growth of urbanization. The factors such as urbanism and village aversion began in Europe in the half of 18<sup>th</sup> century following the industrial revolution. The factors have resulted in urbanization growth and extension of periphery areas. While this problem has partly been controlled in the European states, it is yet expanding in developing countries. In Iran, the urban limits was adequate for traditional urban land control and there have being existed a balance between environment and city. It was happened until the spatial growth and development pattern was organic and domain factor of urban growth was indigenous. However, since the development and expansion is faced with a natural exogenous, it is also affected by social, economical and political changes. The incomes of oil were injected in the economic growth of cities followed by urban industrialization. It has forced our cities to be affect by world economy system. Consequently, the development patterns of most of Iranian cities are influenced by an improper and rapid process.

#### Methodology

This research is an applied study conducted by an analytical– description strategy. Data from multi-temporal Land Sat Tm5 for 1989, 2000 and 2011 were used to assess and model the changes in urban land use in Khoy City. To this end, satellite images for 1989, 2000, and 2011 of Landsat Tm5 were gathered and then the process of image processing and change detection of land uses were done using Erdas software. Following the image processing, the results of data analysis were inserted to Idrisi software to obtain the process of modeling for Khoy urban growth. Accordingly, the modeling was developed using Markov chain and Autocells Markov chain.

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## Results and Discussion

Khoy City has experienced extended physical development from spatial dimension in study period. This resulted in urbanization policies and consistent with political, economical and social changes in Iran. The results of changes in land use assessment indicated that most of the changes are related to urban land uses due to urban construction. Under this condition, urban land use has increased from 995.13 hectares in the beginning of the period to 2084.22 hectares in 1989 and 2557.12 hectares in 2000, respectively. The greatest growth with 27 was experienced between 1989- 2000. The land uses of gardens, green spaces and agriculture section have respectively experienced the decline of 13% and 8% in favor of construction uses in the period under study. As a result, the land uses has reached from 717.03 hectares to 623, 25 hectares in 1989 and 165.06, 288.54 hectares in 2011. The results of Markov chain modeling indicated that, the sections with the maximum changes are related to gardens and green spaces with 70.92% and agriculture lands with 55.80% based on a prespective for 2032. The results of forecasting changes by using Auto cells Markov chain also implied that the most recent changes will happen in urban built land use. It is predicted that land use area of 2557.62 hectares (62.6%) in 2011 to 2872.620 hectares (70.47%) will be reached in 1400. The greatest reduction in the area will be gardens and agricultural land uses. As the land use area will be reduced from 165.06 and 288.54 hectares in 2011 to 44.91 and 140.76 hectares in 1400, respectively.

## Conclusion

Unorganized and unplanned urbanization is viewed as one of the major factors of changes in land use throughout the world. This is accounted as one of the main characteristic of cities in developing countries formed under the influence of exogenous factors and consumer economic conditions. The transition from agriculture based economy to industry based economy has caused the breakdown of the sources of rural production which in turn has increased the inorganic and uncontrolled urbanization expansion and immigration. This has resulted in demolition of spatial dimension of gardens and green spaces. Comparison between the results of changes in Khoy's land use with previous studies indicates that physical development of Iran's countries is due to the unsustainable patterns of urban development. It is consistent with the results of a study by Ahadnejad et al. (2011). They have analyzed the changes in land use in Ardabil during 1989– 2011. Their analysis has indicated that most of the changes with 68.6% are related to changes in agriculture land use with regard to urban construction lands. It is also consistent with the results of Roostaie et al. (2014) that have assessed the changes of land use in Urmia. Based on the results of their study, the area of this city has become more than quintuple during the 1989 -2011. It has also reported that, most of the change with 2998.89 hectares is related to agriculture use. It is concluded that the pattern of physical development of Iran cities is unsustainable and anti-environmental for the lack of appropriate policies in local, regional and national levels.

**Keywords:** Automated Cell Markov Model, Khoy, land use changes, simulation.

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