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## **Modeling Agricultural and Arid Land use Changes Into Built-up in Ardail Urban Region Using CLUE-S Model**

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### **Introduction**

Rapid expansion of cities, has led to emerging some problems in physical and spatial locations of them. Urban development in the last decades, caused fractal in urban land use which followed by conversion of agricultural lands to urban built up area. Nowadays, activities concerning the land use are the most important challenges of urban and environmental planners to make healthy locations. However, human activities have an important role as a threat for environment that has some negative impacts such as soil erosion, global warming and different pollutions. In small scale, humankind is the key issue on urban extensive land use changes. In most cases, human role in revolution of natural and agricultural structures has been seen which urban development in Ardabil has been followed from this trend. During the last 20 years, urban development within the urban region of Ardabil has been affected from tremendous increase in both population and physical area. Hence, one of the main issues in these areas is the growing trend of land use change to build up regions in urban fringes. This study will be performed to the aim of describing the decrease of the agricultural lands and increase of build up uses within the project horizon and with respect to the past trends. The remarkable thing in this research is combining the benefits of urban development with environmental values. As a result, in this study three land use types of urban region of Ardabil entitled agricultural, built up areas and water levels were analyzed using historical data, then future patterns of land use has been simulated.

### **Research Methodology**

In this research, in order to determine the factors which affecting on the change of agricultural land use to urban areas, documentary method and interviews with the experts of some related organizations such as Housing and Urbanism organization, Province office, consulting engineers company of master and detailed plan and finally academic centers have been used. In order to simulate the future land use patterns in urban region of Ardebil, together with geographic information systems, the Clue-S model has been used. It should be mentioned that, the process of future land use pattern simulation has

followed the hierarchical order, so the first step was defining and indicating the issue. Review and data collection followed as the second step. Conversion of data into the same format as vector, raster, and Ascii was the last step in the process of entering data into Clue-S model. Scenarios definition with respect to the present and future land uses situation, as well as a restriction model and ultimately defining the parameters for running model were provided. For explanation of relationships between land use and factors which affecting them, the cause-effect method was used. On the other hand, statistical analysis of data in SPSS needs to tabular format. Thus, the text files of research variables using Convertor sub model of Clue-S model have been converted to tabular format. For statistical analysis, logistic regression method was used. Running model and calculation of probability maps, was the final step in data processing of research. At each step of the implementation of this model, the spatial pattern of land use will be store in the target drive as Ascii files. GIS packages such as ArcView, ArcGIS and Idrisi can be used to see the final outputs.

### **Discussion and Results**

The setting of converting each one of usages to another one is performed with respect to the relation between usages. These settings are specified in a conversion matrix. This matrix defines that land use types in present situation can be converted to another land use types or not. In this study, it is assumed that changing agricultural and arid lands to build up usages is possible and changing the recent usages and water levels is not possible.

Spatial policies and restrictions can indicate areas where land use changes are restricted through policies or tenure status. The CLUE-S model has the possibility to indicate where these area restrictions are located. All files in the installation directory called regi\*.\* (e.g. region1.fil) will appear in the 'Area restriction' selection box. Active cells should have the value 0, no data cells should have the value -9999 and restricted area cells should have the value -9998.

The rock unit, altitude, slope, slope direction, distance from city center, distance from roads, land types, population density and land price are the main driving forces in land use changes of urban region of Ardabil. These driving forces have been selected using stepwise regression by binary logistic method. After running model, it is possible to produce probability maps of land use types.

Investigation and comparison of logistic regression results and future pattern of land use in two scenarios shows that in the first one, agricultural and arid lands will be decrease in low rate (less than 0.5 percent) until terminal age. While, the other lands will increase in that period. Therefore, built up areas will have nearly 1 percent of development. Justification for development of this land uses, is the probability of continuing investment in this part as fast as possible. While the increase rate of build up uses in the second scenario is 2% and decrease rate of agricultural and arid uses is about 0.8%. Matching this map with the situation of the existing town ships at the south and south west areas of Ardebil indicates the reliability of these places for the coming years.

## Conclusion

Conclusions can be addressed as:

- 1- Clue is a useful tool to model land use pattern of urban areas in Ardabil.
- 2- Clue is a useful tool to produce probability maps of land use types in case study area.
- 3- The edition of input and output maps is possible in various software entitled GIS and text processors.
- 4- The comparison of population density with land use maps proves low rates of gross density and figures of population density in case study which even the recommendation of 87 person per hectare by master plan cannot prevent land use changes in Ardabil urban fringes.
- 5- The most important land use changes of agricultural and arid lands will be occurred in south and south west regions of city includes Kovsar, Dadgostari, Mokhaberat, Velayat, Naderi and Karshenasan.

Land use changes of agricultural and arid lands to urban built up uses will be inevitable regarding the realities of urbanization in Ardabil urban areas.

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