

Investigating the pattern of physical expansion in Northern Cities (A Case Study of Kiakola City)

Ghadami, Sepideh^a

Lotfi, Sedigheh (PhD)^b

Nikpour, Amer (PhD)^c

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Abstract

With the rapid growth of urbanization in Iran, in addition to increasing the number of cities and their population size, the size of cities also grew and expanded rapidly, so much so that the rapid physical expansion of cities even surpassed the rate of population growth. This unplanned growth led to the horizontal expansion and created a phenomenon known as sprawl. Accordingly, the purpose of this study is to investigate the stages and pattern of physical development of Kiyakola city during the past decades and to analyze the factors affecting them. The city has experienced significant physical growth in recent years as a political center of newly established township of Simorgh. The methodology of the research is based on descriptive and analytical approaches that will determine the direction and form of physical development using physical expansion models such as spatial population density analysis, Moran's spatial autocorrelation methods, and hot spots in GIS. The results of applying the models for city show that the physical expansion of the city was dispersed and non-condensed during 1976-2006 which prepared the ground for rapid growth without planning. The results of spatial analysis show that the density in all three indices of population, housing and construction has a cluster distribution pattern and spatial autocorrelation. Most of the hot spots are in the western and central parts of the city, and the coldest spots are in the eastern and southeastern parts of the city.

Keywords: physical expansion, sprawl, spatial analysis, Kiakola

Introduction

The city is a collection of spatial embodiment and crystallization of human roles in a geographical environment that is shaped and developed in proportion to the facilities, talents, cultural richness and individual tastes. Conversely, population growth and the size of cities and towns in the world have had a profound effect on humans and the environment as a result of increasing urbanization. Therefore, one of the vital issues for urban scientists in connection with the sustainability of the city is the form of the city (compression or distribution). The spatial growth of any city can be horizontal or vertical. Spatial growth appears in the form of an increase in the city limits, the so-called horizontal expansion, and in the event of an intensification of the situation, in the form of sprawl and Physical growth in the form of infill development leads to the formation of compact city. These different patterns have different consequences than the type of expansion they create in the city. In fact, the rapid expansion of cities has caused many problems in most countries of the world; so that not only urban development policies but also socio-economic and environmental issues in many urban areas have been affected by this phenomenon. The problem of rapid growth and horizontal

^a MA Student of Geog. & Urban Planning, University Mazandaran

^b Prof. of Geog. & Urban Planning, University of Mazandaran, s.lotfi@umz.ac.ir

^c Associate Prof. Geog. & Urban Planning, University of Mazandaran

expansion of cities in Third World countries is more acute than in many developed countries. Kiakla city was selected as the political and administrative center of Simorgh city in 2011. Therefore, it has gone through its stages of growth and expansion faster than natural growth between 1996 and 2016.

Materials and Methods

The methodology of the research is based on analytical and descriptive approaches. The statistical population in this study, according to the research topic, is all 7 neighborhoods which consisted a population of 8040. The GIS layers of the city were prepared to determine the form of the city for the years 2016 and 2006; and then, based on the neighborhood of the municipality, the information of statistical blocks was extracted in relation to population, building area, ownership, etc. And was added to the GIS documentation table. After determining the form of the neighborhoods, using the entropy models of Shannon and Holdren, the physical expansion pattern of Kiakla city was determined and then the amount of spatial self-correlation in the city and its neighborhoods was investigated using Moran and hot spots.

Results and Discussion

Building density in 2016 in Shahid Beheshti neighborhood with 60.89% had the highest density and in Dastkandeh Kola and Abandan fuel districts with 17.64 and 25.99%, respectively, had the lowest density. Also, in 2006, the neighborhoods of Shahid Beheshti town and the new neighborhood of Islam with 70.62% and 69.7%, respectively, had the highest building density and Vazimal neighborhoods, Abandan fuel and Dastkandeh, respectively, with 22.04, 24.29 and 25.45%. They had the highest building density. According to Moran model, it can be inferred that the phenomenon of population density, residential and building density in Kiakla city in 2016 follows the cluster pattern; it means that blocks with high or low population densities are adjacent to each other and are neighbors. The hot spot index in population density, residential density and building density of blocks of Kiakola city in 2016 showed that the western part of the city has had the most positive spatial correlation in population, residential and building density. The eastern and northeastern parts of Kiakla have had the highest negative spatial correlation in population, residential and building density. The estimated entropy value in 2006 was calculated about 1.729. Also, the entropy value of Kiakla city in 2016 was equal to 1.6366, which shows that the physical expansion of the city in the last ten years is scattered and dense. The results of the analysis of the Holdren model in the period 2006-2016 showed that 72 percent of the city's physical growth was due to population growth, and about 28 percent of the city's growth was related to the city's horizontal and sprawl growth, which led to a decrease in gross population density and an increase in gross per capita of urban land. Therefore, it can be said that the main cause of instability of the physical expansion pattern of Kiakla city during the years 2006-2016 was population growth, which is due to the rural-urban migration.

Conclusion

The results of this study showed that spatial self-correlation in the city in all three indicators of density is positive and close to one. Thus, the spatial self-correlation of density in the city of Kiakla follows a high cluster pattern. The results of the hot spots model revealed that the western parts of the city have a high density of population and buildings, as a result of the formation of hot space clusters in these areas and also the eastern areas of the city have less

density of population and buildings. As a result of the formation of cold space clusters. Based on the results of the Shannon and Holdren entropy model, it can be said that the pattern of expansion and the physical-spatial form of the city follow the scattered form and expands horizontally. This indicates sprawl growth and physical expansion, which has led to the deterioration of the city and the destruction of some of the best agricultural land.

Keywords: Physical expansion, sprawl, spatial analysis, Kiakla

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