Study and survey of trend and physical-space expansion of Babolsar city with using Shannon’s Entropy and Holdern models

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Extended Abstract

Introduction
With the wave of industrialization to the third world, production and income and consequently demand for municipal services. From the early twentieth century, has increased. This trend raised the number and size of cities in these countries and led to urbanization and. So cities were encountered with specific problems. Cities physical development and urban population growth and subsequently changes in physical and spatial development of cities to become a problem or issue in recent decades. And attention to urban issues - particularly the physical issues - in the form of a scientific framework is the importance and necessary. Babolsar city with having a natural, tourism, academic attractions and ... has grown as one of the main poles of attraction of population in the Mazandaran province, in recent years. This trend of population growth and Entry Immigration and tourism led to the construction without plan and large change in the space - physical structure of city and its development in the coastal strip and surrounding agricultural land.

Research Methodology
Methodology depends on the purpose and nature of its research and administrative facilities.

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Thus, the approach of this research is field, library and descriptive - analytical. Data and information needed to research has been taken from field and processed. 
So, after select the topic, at first with examining documents and library data bank Online, physical development and population trends of Babolsar in different periods of history was determined. After collecting the required data, with relying on the information obtained, the physical development and population trends of Babolsar in different periods of history was determined. After collecting the required data with relying on the information, obtained the physical development and expansion of Babolsar city with use of Shannon’s entropy and holder models. But the main research approach has been based on descriptive- analytical methods.

Results
Today, knowledge of space form of city can be one of the most important affecting factors in success rate of urban planners to meet the needs of present and future. In this paper have been helped two models: Shannon’s entropy model to analyze the physical development of Babolsar City in 1379 and 1389 which are respectively 11 and 22 quarters (Map 3).

Shannon’s entropy model: we use this model to analyze the Ugly urban growth phenomenon. The overall structure of this model is as follows:

\[ H = - \sum_{i=1}^{n} P_i \times \ln(P_i) \]

The results found that amount of entropy in Babolsar city was 20166 / 2 in 1379. While the maximum value is \( \ln(11) = 2 / 3978 \) is Can be mention to being close the amount of entropy to maximum amount (2 / 3978). This issue represents dispersed (sprawl) the physical expansion of the city. 11 neighborhoods of the city were separated into 22 neighborhoods in 1389. The estimated amount of entropy is calculated equal to 94214 / 2, while the maximum value is\( \ln(11) = 3 / 0910 \) that it shows, the physical expansion of the city, was scattered over the past ten years.

Holdern model: Results of the Holdern model about the Babolsar city shows that within the 1385-1335 years About 60 percent of physical growth, population growth related to population growth and 40 percent of physical growth was related to horizontal growth and urban sprawl that it’s result was decrease density Gross population and increase of Per capita net urban land and eventually ugly Horizontal spread (sprawl) of Babolsar city.

Conclusion
In this paper has been discussed and analyzed pattern of physical development of city in different periods and with use of related models. the amount of Shannon’s entropy of Babolsar City showed diffuse growth (sprawl) in 1379 and 1389 that led to destruction of part of quality agricultural land. In survey of appropriateness of the size of the city’s development with population during the decade (1385-1335) with Holdern model came to the conclusion that About 60 percent of the city expansion
was consistent with population growth and 40 percent of physical expansion, was
due to Ugly urban growth and inharmonious (sprawl) of city. This is the result of
uncontrolled urban growth And not having a written plan for the physical
development of city. Population growth and limitless expansion of the nearby city of
Babolsar, Cause excessive pressure on water resources and other infrastructure, the
destruction of good agricultural land around the city and has many other issues. We
found out that something's helps city to prevent uncontrolled physical expansion;
can be developed within the context of the city, expansion the culture of vertical
wings the city, and eventually Providing facilities in the villages to prevent
migration of villagers to the city's.

**Key Words**: Physical and Spatial Expansion, horizontal and sprawl growth,
Holdren’s model Shannon’s Entropy Model, Babolsar city.

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