

# **Assessment of temporal-spatial variability of Heat Islands in relation to urban uses Case study: Urmia City**

**Saeed Maleki**

Associate Professor in Geography & Urban Planning, ShahidChamran University of Ahvaz

**Ali Shojaeecan**

GIS /RS/Spatial Planning Instructor at ShahidChamranUniversity of Ahvaz

**Ghasem Farahmand\***

M.A. in Geography and Urban Planning, ShahidChamran University of Ahvaz

**Date of receive:94.12.23**

**Date of accept:95.08.17**

## **Extended Abstract**

### **Introduction**

Urban heating is one of the most well-known forms of local manipulation of the climate by mankind, so that changes in the use of land cover in urban areas can lead to an increase in urban temperatures relative to the air temperature in rural areas. This phenomenon has been quantified in the form of the Urban Heat Islands (UHI) and has been studied and recorded for over 150 years in various cities of the world. The effect of the Urban Heat Island refers to an increase in the temperature of each man-made area, with respect to the surrounding surfaces. This phenomenon in urban areas refers to an increase in the temperature of cities with respect to the rural and suburban areas. On the other hand, the heat island directly affects the health of urban wildlife. Each year, in the United States, about 1,000 animals die due to the temperature rise, and more than that are destroyed because of the urban air harmful compounds. These changes in the pattern of winds have very important and dangerous consequences, such as the transmission of air pollution and dispersed toxic particles from cities to the suburbs, to disruption the people's comfort within the city, which is why the heat islands are now considered as the causes of worrying about people's health. Moreover, the heat islands change the wind patterns in the cities and surrounding areas. The suburban breeze is a dominant phenomenon in cities that are located on a flat land. The presence of heat islands, in addition to temperature changes, causes changes in land processes such as early flourishing of urban plants and longer growing season.

### **Materials and Methods**

The present research has been an applied research in terms of targeting and a field-analytical one in terms of data collection. In order to reach the final goal of the research, the meteorological statistics of the synoptic meteorological station of Urmia city was studied first. Then, the study of different regions of the city was done in terms of temperature given the 9 stations set up inside the city and the suburbs. The data of 9 stations set up in the city was adjusted by installing a dry temperature sensor at an altitude of 180 cm, in cooperation with the municipality of Urmia, at a minimum and maximum daily rate of two hours (7:30 am and 5:30 pm) in hourly, daily and monthly forms. It should be noted that, the desired statistical period is from April 21, 2015 to July 22, 2015, and the readout pattern is on a daily

basis, and its output is in the form of 1st to 4th of each month (days 7, 15, 22 and 29 of each month).

### Result and conclusion

The rapid growth of urbanization and the increase in the population of Urmia city has caused significant changes in the physical and natural conditions of the city. This increase and expansion of the urbanization trend has affected some of the meteorological quantities in a way that, the performed studies indicate that the minimum temperature of Urmia city during the twenty year period is increasing in all months of the year compared with the neighboring stations. Nevertheless, specifying the limits of the Urmia heat island requires more precise studies. The study of the isothermal map of the average maximum temperature in the months of May, June and July, 2015 indicates that the Velayat-e-Faqih square station with a temperature of 29.41 degrees Celsius accounts for the highest temperature compared with eight other stations and in fact, has formed the center of the heat island. At the same time, the station for the license plate exchange center in the city of Urmia with a maximum temperature of 22.27 Celsius, is the coolest station compared to other stations, indicating a heat difference of 6.64 Celsius in the city. According to the above map, the intensity of the heat island decreases by distancing from center of the city. But the most important result that can be obtained from the above maps is the extension of maximum temperature curve toward parts of the East and South-east. The reasons for the high average temperature at the station of the municipality town and the station of Golman Khane can be summarized as follows:

The existence of 90% of industrial uses, workshops and factories at the edge of these stations

#### Wind flow

Given that wind is the most effective barrier against the formation of heat islands, the combination of the wind field with the pattern of heat island's spatial variations shows significant results, which is a sign of the great impact of wind on the quality of formation of the heat island. The wind contributes to the extension of the heat island's curve through the transfer of suspended particles and gases existing in the urban atmosphere.

**Keywords:** Heat Island, Changes in Space, Geo statistics, Kriging, Urmia city