An analysis of spatial inequalities based on social indices in Tabriz metropolitan

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A B S T R A C T

Inequality in many countries is considered a major challenge to development, especially for those countries whose sovereignty includes vast geographical areas. These inequalities are a serious threat to obtain balanced development of regions, and makes it difficult to achieve national unity and integrity. So, addressing the issue of spatial justice and, consequently, spatial inequality in urban issues has been of great significance. This research has considered spatial analysis of inequalities in Tabriz metropolitan by considering social indices in 2011. In this applied research a descriptive-analytic method was used. The spatial auto-correlation technique was used to identify and measure the inequality by using hot spot analysis in ArcGIS software. In order to understand the scope of study from the perspective of spatial inequalities, data from statistical blocks of 2011 and nine social indices have been used. Also, findings of research indicated that Tabriz does not have a suitable status in terms of the distribution of social indices. According to the results, in the distribution of social inequalities, the largest number of urban blocks are related to very deprived and deprived blocks, and only a small number of urban blocks are completely possessed ones. Also, the results of spatial inequality zonation based on social indices revealed that completely deprived urban blocks have expanded in the marginal blocks of Tabriz, while moderate and completely possessed blocks are expanded towards the blocks inside the city. Also, the distribution of blocks in terms of desirability is in clustered form and has spatial correlation.

K e y w o r d s: *Spatial analysis, spatial justice, inequality, social indices, Tabriz metropolitan*

Introduction

From geographical point of view, social justice of any city is synonymous with equitable distribution of resources and facilities between urban areas and the equal access of citizens to them, because their lack of fair distribution will lead to social crises and complex spatial problems (Sharifi, 2006: 6). On the other hand, the issue of inequality in many countries is considered a major challenge to development, especially for those countries whose sovereignty includes vast geographical areas. These inequalities are a serious threat to obtain balanced development of regions, and makes it difficult to achieve national unity and integrity (Shankar & Shah, 2003: 1432). In the meantime, social inequality in the urban environment is the result of differential access of the city to valuable social resources such as wealth, power, dignity and cultural capitals. The initial

meaning of inequality refers to the distinction between individuals, so there is a clear difference between their lives, especially in terms of rights, life opportunities, rewards and privileges. In each society, inequality occurs in a variety of ways, and usually inequality and stratification happen in urban areas more than rural areas (Chen & Sun, 2006: 521). Spatial organizing is one of the determining dimesons of human societies and reflection of social events and the place of manifestation of social communication. So, the analysis of interaction between space and community is necessary for understanding social injustice and the way in which planning policies are regulated to reduce or solve them (Dufaux, 2008:2). Social inequality is a situation in which socially valuable things, including wealth, power, social status, and cultural capital, are not equally accessible to the inhabitants in a way that this differential access creates different social bases for the people of that community and makes a great deal of clear and hidden discrepancies between them. These distinctions are often manifested and sustained by education, residential position, occupational dignity, ownership, property and wealth, and will gradually lead to "spatial separation". Urban unequal spaces make unequal opportunities available to residents of different regions, unequal distribution of welfare services, formation and growth of worn-out areas, urban slums. Urban decline and deprivation are considered as the main consequences of inequality in urban areas (Khalu Bagheri, 2012: 51). Therefore, due to the importance of this subject and mentioned issues, the present study has been designed to analyze the spatial inequality based on social indices in Tabriz metropolitan. In addition to the identification of unequal areas and blocks and achieving the amount of inequality between blocks and urban cells, we try to answer the following two questions:

1. Is there spatial inequalities based on social indices in Tabriz?
2. How is spatial distribution of these inequalities?

Literature Review

So far, a lot of books, studies, and articles have been published at home and abroad, centered on social justice, and each of them has tried to investigate the socio-spatial inequality within human society and topics such as social inequality in space, urban services and marginalization, spatial inequality in city and region have been discussed. We will mention some of them.

Duncan et al. (2012), in an article entitled "Space, race, and poverty: Space inequalities in welfare ability to walk in neighborhood" concluded that, there is a significant and spatial auto-correlation within the study area but it lacks the amenities of walking in that neighborhood. Also, the coefficient of Spearman correlation between the social-demographic characteristics of the neighborhood and the amenities for walking opportunities in that neighborhood was not significant.

K. Manderschei (2012), in his article entitled "Sustainable Planning: refers to intra-generation and intergenerational justice in Spatial Planning Strategies" came to the conclusion that German spatial planning report focusing on social spaces suggested an economic advancement and a diminution of social justice perspective.

Nikpour et al. (2015), in an article entitled "Spatial analysis of social inequalities in urban areas with a condensed city approach: A case study of Babol city" concluded that distribution and dispersion of development indices in Babol showed a kind of spatial imbalance. Also, the central areas of the city were more developed than marginal and semi-marginal regions, and there was a significant difference between coefficients of development among the regions based on classification of building density. So, the average of this coefficient in condensed areas was more than the areas with less density. Finally, districts 3 and 4 were identified as developed areas, while districts 6 and 9 were identified as less developed areas of Babol.

Sasanupour et al. (2015), in an article entitled "Analysis of spatial inequality in utilization of urban services: A case study of 22 districts of Sanandaj" concluded that there was no logical and balanced relationship between distribution and level of utilization of services in these areas. In other words, the discrepancy between spatial distribution of services and demographic needs was confirmed in the scope of the study area.

Imanzad Andarian (2015) in his MA thesis entitled "Analysis of spatial inequalities and urban planning process in Tabriz: A case study of access to emergency medical services and fire-fighting of urban worn-out areas in district 4 of Tabriz municipality" concluded that the dominant approach in the urban planning process and dominance of the technocratic attitude among policymakers and urban planners has led to inclination for a focus on the current situation of cities in terms of idealism and inclusiveness instead of understanding the nature of city and considering urban literature in designing its policies and targets. As a result, the goals of policies and plans as well as the process of formulation and implementation would be on the opposite sides. As a result, we are witnessing overcoming of this attitude among urban managers and creation of dichotomy in accessing basic services in urban areas of the study area.

Ahar Abian Sadr (2017), in a paper entitled "Critical review of theoretical approaches in the analysis of spatial inequality (emphasizing spatial inequality in contemporary Tehran)" concluded that there were common assumptions in studies of this field. At the same time, some aspects of spatial inequality in Tehran have not yet been analyzed historically and sociologically and more detailed investigations are needed.

Theoretical Principles
The concept of equality and inequality

Throughout history, there have been questions about inequality between individuals and societies. The question is: What is inequality? How is it formed?

What are its characteristics? How can it be measured? How can it be adjusted or eliminated? and so on. In different situations, answers to these questions were different. Therefore, each scientist has given different responses to this question based on the structure of his own system, temporal and spatial conditions, his ideology and worldview. Because inequality is one of the most important facts of life, it's clear even for the most observers with a superficial view. However, inequality is not a problem that can be solved or explained simply, and questions such as inequality may not be clear and simple (Jamali et al., 2010). Inequality is a concept that is in the opposite side of inequality, and like freedom it is considered as a concept without a single definition by philosophers. Equality is a concept with different meanings, so the presentation of its wrong definition can be misleading. For inequality there is no single definition. Therefore, whatever is referred to as equality in social and political systems should be interpreted within the framework of the structure of that system. Equality is a notion in which social conditions are considered identical between people, but the content of these homogeneities varies in different periods between different classes (Sheykhavandi, 2004: 4). Sometimes inequality just refers to the possibility of having equal opportunities and the opportunity to use them (Ahmadian, 2001; Preface, quoted by Ghanbari, 2009: 8). Inequality also refers to the distinction between individuals, so that there will be a lot of clear and hidden differences between their lives, especially in terms of rights, life opportunities, rewards and privileges (Grip, 1994: 10).

The concept of spatial inequality

Spatial inequality, a term composed of inequality and space, depicts a form of social inequality that differs in many ways from other types of social inequalities; however, in some respects, there are also overlaps between them. The common borders between spatial, racial and ethnic inequality are fully recognizable when in the real world people of a race and ethnicity reside in a particular region, but they have unequal

opportunities compared to others. But in spite of relative clarity of the concept of spatial inequality, there are also vague aspects in this compound term which is largely confined to the concept of space (Dehghan, 2007: 127). In short, space inequality can be regarded as unequal distribution of social opportunities and positions in space, which reflects socio-economic inequalities of societies and can have different manifestations in any society (Daneshpour, 2006: 5). In other words, spatial inequality refers to the condition in which different spatial or geographical units are at different levels in the context of some variables (Kanbur & Venables, 2005: 2). Spatial inequality (socio-economic inequality) as a planning problem arises when spatial structures of different regions of a city have distinct and clear differences. Differences requiring different planning solutions for different areas and they should meet the ambitious goal of creating spatial equality in a city (Khalu Bagheri, 2012: 51). Understanding the causes of spatial inequality in urban areas requires understanding structure of city and role of affecting forces in the formation of space and the significant differences in its various districts. Given that the city is the spatial manifestation of natural, spatial, activity and decision making structures in the history, understanding of spatial inequality with all its complexities, requires understanding and recognition of the structures, communications and complexities that are established between the forces of these three structures. Urban unequal spaces can provide unequal opportunities for residents of different districts which results in uneven distribution of welfare services, formation and growth of worn-out areas and slums and urban decline and deprivation as the main consequences of inequality in urban areas (Khalu Bagheri, 2012: 51). Such a process in a feedback cycle, exacerbates spatial contradictions and the existing spatial inequalities, which is the basis of residential divisions and deepening the gap between developmental levels of urban areas (Kalantari, 2001: 58).

The concept of spatial justice

The concept of justice can be considered from different perspectives. Concepts such as social, spatial, geographical, and environmental justice are also affected by multi-dimensionality of this concept. But the important point is that, the basis of any change in the spatial organization directly affects the economic and social relations, and distribution of income in community. And, certainly the use of different mechanisms and programs can have contradictory effects on justice (Marsusi, 2004: 91). The issue of spatial justice has evolved over the past two decades, but so far planners have been incapable of providing a complete and all-inclusive assessment of spatial justice, because spatial justice wasn't practical so far (Kinman, 1999: 663). On the other hand, there have been few scientific studies on spatial justice, and studies have focused more on the distribution of public facilities mainly on a special unit (Tsou et al, 2005: 425). Simply, it can be said that spatial justice is a combination of space and social justice. As Henry Lefebvre mentions, human community organizes space, and when we examine this space, justice and injustice can be observed in a tangible and subjective structure (Ahmad Tooze, 2013: 24). In general, it should be said that spatial justice is a milestone in planning and urban facilities and is considered a branch of social justice. David Harvey, a well-known figure in this field, points to social justice as a central concept that needs to be applied through geographic analysis methods (Ebrahimabadi, 2008:19). Based on this, urban justice is a moral and political concept that includes unequal distribution of income and wealth, spatial separation of residential places, unequal allocation of public and civil goods and services among the classes, races, ethnicities and genders within the framework of communities, cities and urban areas. Therefore, researchers focus on social and spatial inequalities, poverty, racism, and sexism in cities (Fujita 2009: 337). The term "spatial justice" has not been limited to specific times and is applicable as long

as it is used so that today among geographers and planners there is a tendency to prevent from injustice and search for justice and democracy in contemporary societies (Souja, 2006: 6). This concept has mainly been addressed in recent literature, which seeks to examine the concepts and functions of justice from a geographical perspective. And geographical analysis has shown that the spatial structure of city is explained based on a set of diverse experiences (Wisser, 2003: 99). Therefore, in spatial justice, the spatial aspects that affect the state of justice are the main subjects of debate. Along with spatial justice, spatial injustice or spatial inequality is also posed. Spatial inequality can be considered both as a product and as a process. For example, we can refer to dispersion patterns that are fairly or unfairly distributed (Iveson, 2011: 254). And finally, from Harvey's point of view, social justice in the city should be such that it meets the needs of urban populations. And allocation of regional resources should be guided in a way that individuals encounter with the lowest gaps and objections to their rights (Varesi et al., 2008: 194). Based on this, analysis of spatial inequalities in cities can be useful in assessing the level of social justice and meeting the basic needs of citizens in the framework of developmental, social and economic plans, and dispersion of population and services should be balanced and fair.

Research Methodology

In terms of aim, this study is an applied one and regarding the nature and method of research it is descriptive and analytical. The sample of study was Tabriz in 2011. According to Statistical Database Blocks of 2011, social indices have been extracted. To illustrate the state of social inequality, spatial autocorrelation techniques and hot spot analysis have been used in ArcGIS software. Moran's statistic was to analyze the pattern of social inequality dispersion. Also, for zoning social inequality based on social indices, ArcGIS software was used.

Table 1: Variables and research indices, and way of calculation

Variables	Indices	Way of calculation
social	Average household size The rate of population aging Youth population Adult literacy rates The rate of illiteracy in population who need education Rate of women's enrolment for training Rate of enrolment for training Illiteracy rate Literacy ratio	1. Population/number of household 2. Population above 65/total population 3. Population under 15/total population 4. Literate population (45-64)/population at age 6 and higher than 6 5. Population between 6-13/population at age 6 and higher than 6 6. Enrolled women/population at age 7 and higher than 7 7. Enrolled people/population at age 7 and higher than 7 * 100 8. Number of illiterates/population at age 6 and higher than 6 * 100 9. Number of literate people/population at age 7 and higher than 7 * 100

Hot Spot Analysis

Hot spot analysis calculates Gates-Geordian statistic for all existing complications in data. The calculated Z score indicates where high and low values are clustered in data. This tool actually looks at any complication within the context of complications in its neighborhood. If the value of complications is high, it would be interesting and important, but alone, a hot spot may not be statistically significant. In order to be considered a complication as hot spot and be significant statistically, both the complication and neighboring complications must have high values. Local sum of a complication and its neighbors are relatively compared with total sum of complications.

When the local sum is unexpectedly more than the expected local sum, the difference is to the extent that it cannot be considered random, as a result, Z score will be obtained. The Gates-Geordian statistic is calculated as follows:

$$G_i^* = \frac{\sum\limits_{j=1}^{n} w_{i,j} x_j - \bar{X} \sum\limits_{j=1}^{n} w_{i,j}}{S \sqrt{\dfrac{\left[n \sum\limits_{j=1}^{n} w_{i,j}^2 - \left(\sum\limits_{j=1}^{n} w_{i,j} \right)^2 \right]}{n-1}}}$$

Moran's I statistics

One of the tools that is used to analyze patterns of distribution and dispersion of complications and phenomena in space and place is spatial auto-correlation analysis also known as Moran's I statistic. Spatial statistical tool, spatial auto-correlation is one of the most practical and important analytical tools for research on spatial data. This analysis not only provides useful information about internal relationship of complications, but it also is used for many more complex statistical analysis (Asgari, 2011: 60). The spatial auto-correlation analysis tool of Moran's examines spatial auto-correlation based on the location of two values and attributes of geographical complications. This analysis evaluates the pattern of distribution of complications in space with simultaneous consideration of location and features. The results of this analysis show that the complications are randomly distributed, dispersal or they are clustered in the space. This instrument actually calculates the Moran's Index or statistics and measures the significance of the calculated index using the standard Z score and P-Value. The Moran's index for spatial randomly is calculated as follows:

$$I = \frac{n}{S_0} \frac{\sum\limits_{i=1}^{n} \sum\limits_{j=1}^{n} w_{i,j} z_i z_j}{\sum\limits_{i=1}^{n} z_i^2}$$

The scope of study

Tabriz, the capital of East Azarbaijan, is one of the biggest cities in Iran. It is the largest city in the northwestern region of the country and is considered as administrative, communication, commercial, political, industrial, cultural and military pole of the region. Tabriz has spread in an area of 150 square kilometers (Zadolli, 1393: 63). The scope of our research in this study is Tabriz Metropolitan in 2011.
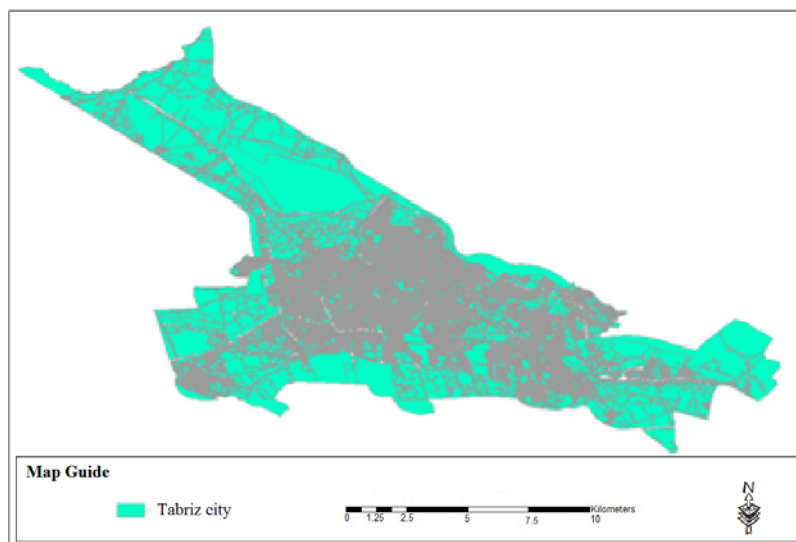
Figure 1: The scope of the study area

Research Findings

Results of the investigation of spatial inequalities based on social indices in 2011

In this study, after calculating social indices (average household size, the rate of population aging, youth population, adult literacy rates, the rate of illiteracy in

population who need education, rate of women's enrolment for training, rate of enrolment for training, illiteracy rate, literacy ratio) from statistical blocks, we separately conducted the analysis of hot spots for each social index. This analysis calculates Gates-Arg-de-Gate statistic for all the complications in the data. Also, according to calculated Z score, it can be shown that in which place high or low data are clustered. Indeed, the

larger the z score, the large amounts are highly clustered and construct a hot spot. Statistically, in terms of negative and significant Z score, when the Z score is low, clustering of low values will be more significant which actually indicates cold spots. The following figure shows the analysis of hot spots on 9 social indices in 2011.
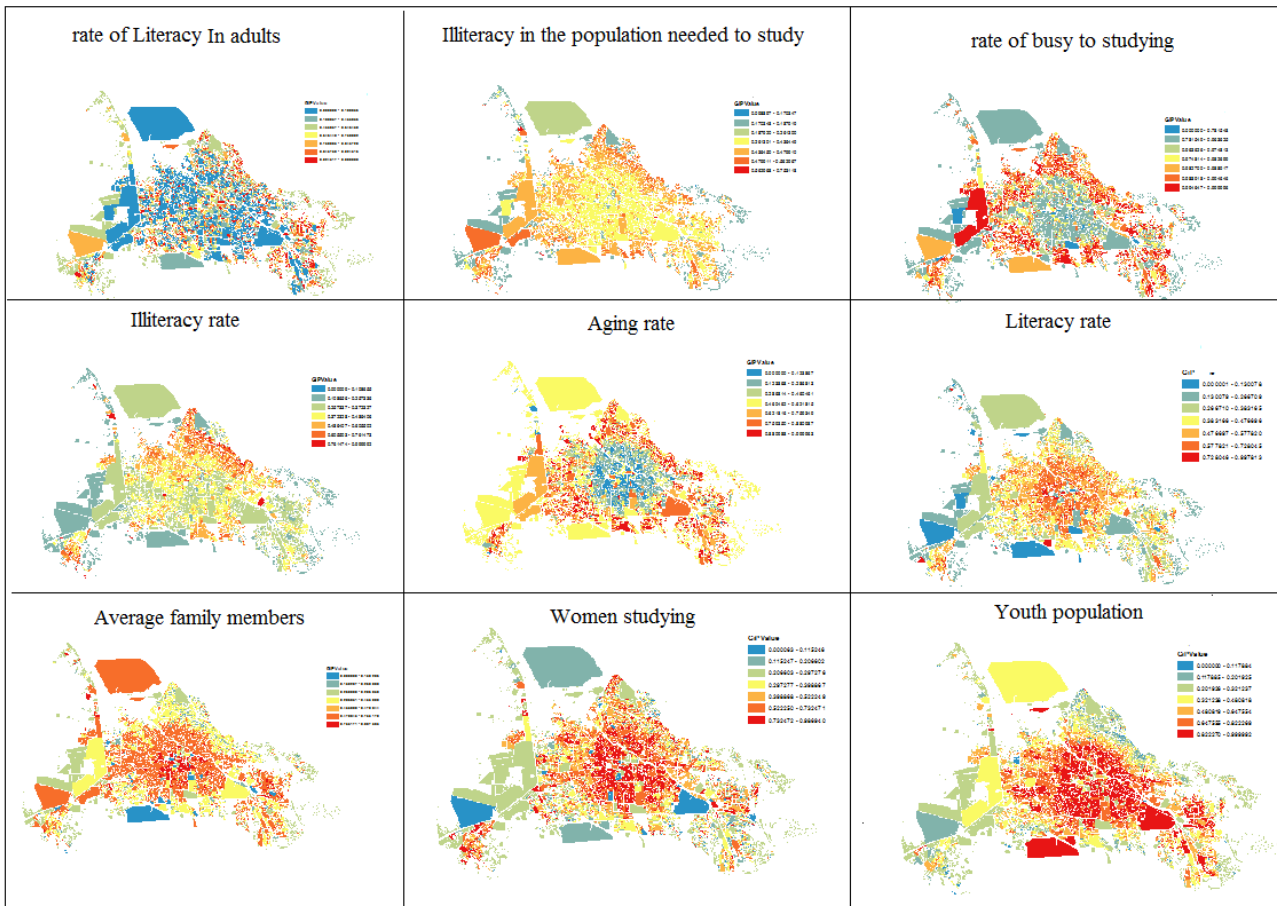

Figure 2: Analysis of hot spots on social indices in 2011

The red spots on the above map represent the larger Z values that created hot spots. In fact, these spots indicate that large amounts of the study index in each map are clustered to a large extent and created a hot spot. No matter how much Z decreases and Z gets smaller and smaller, we come closer to cold spots, and in the above map dark blue spots refer to cold spots.

After identifying hot and cold spots for each index, we have integrated these maps to create a single map called the Status of Social Indices in 2011. This map is classified according to Mauritius index in 5 levels. The following figure shows the status of social indices in urban blocks of Tabriz in 2011.

Figure 3: The status of social indices in urban blocks of Tabriz in 2011
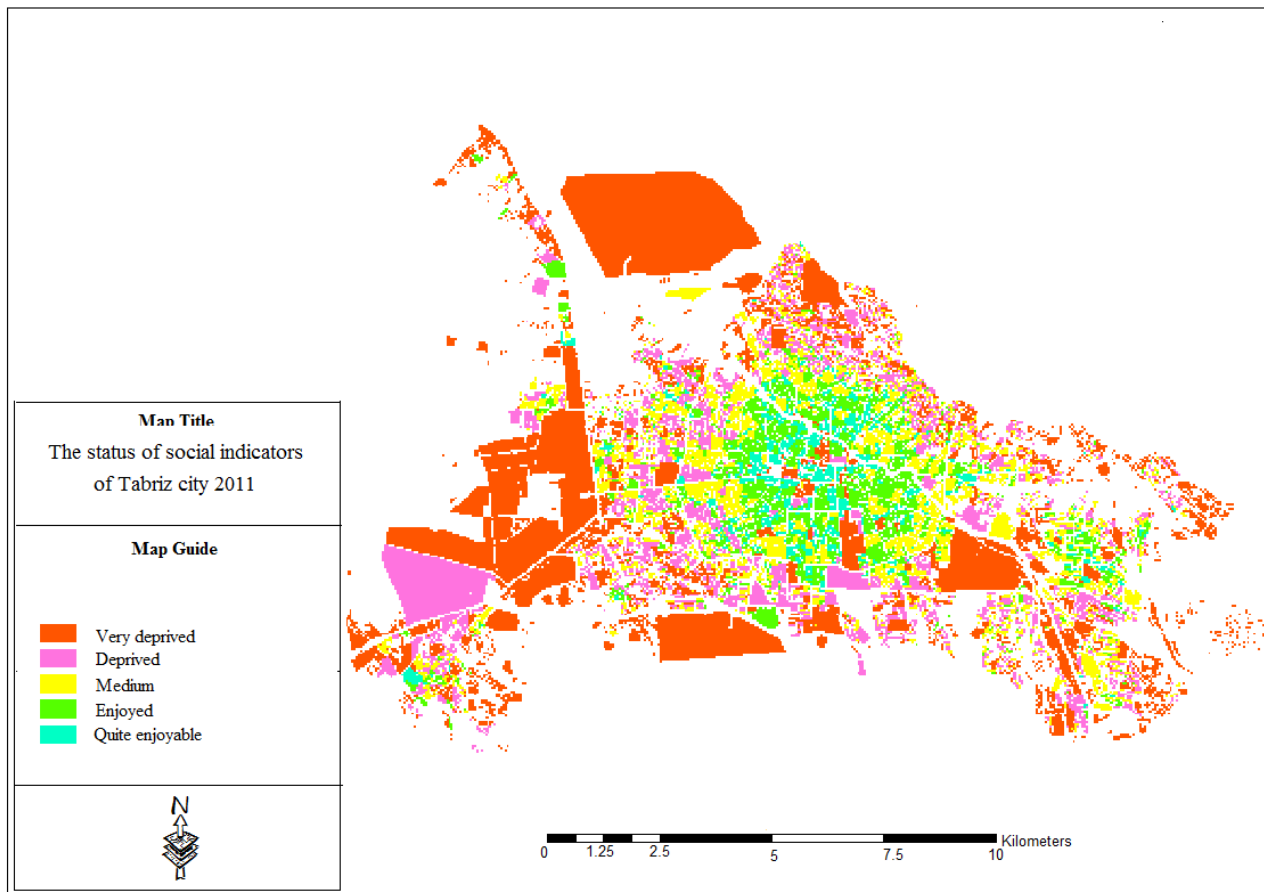
According to figure (3), social indices are classified into five levels of, very deprived, deprived, moderate, possessed and fully possessed. The most deprived blocks marked in red and are placed on the margins of city. These blocks with 4955 blocks of urban areas have devoted the largest number of blocks to themselves. The deprived blocks are shown in purple, and according to figure (3), they are distributed uniformly in almost all urban blocks other than the center of the city. These blocks also have devoted 2019 blocks of urban blocks. As it was shown in figure (3), moderate, possessed and fully possessed blocks with yellow, green, and green-blue respectively were concentrated in the central blocks of city. These blocks

have devoted 1869, 1348 and 716 blocks of the total blocks to themselves.

The Moran's Index for social indices of 2011, calculated on the basis of the average of these indices, and is equal to 0.317598, and since its value is positive and close to one, and also regarding the small value of p-value, we can conclude that our social indices have spatial auto-correlation. These indices are distributed in clustered form in statistical blocks. This index also shows a Z score equal to 15.00557 for the respective indices in 2011. Below is a numerical description table and a graphical figure for Moran's Index of investigated social indices.

Table 1: Descriptive table of spatial auto-correlation analysis regarding social indices of Tabriz in 2011

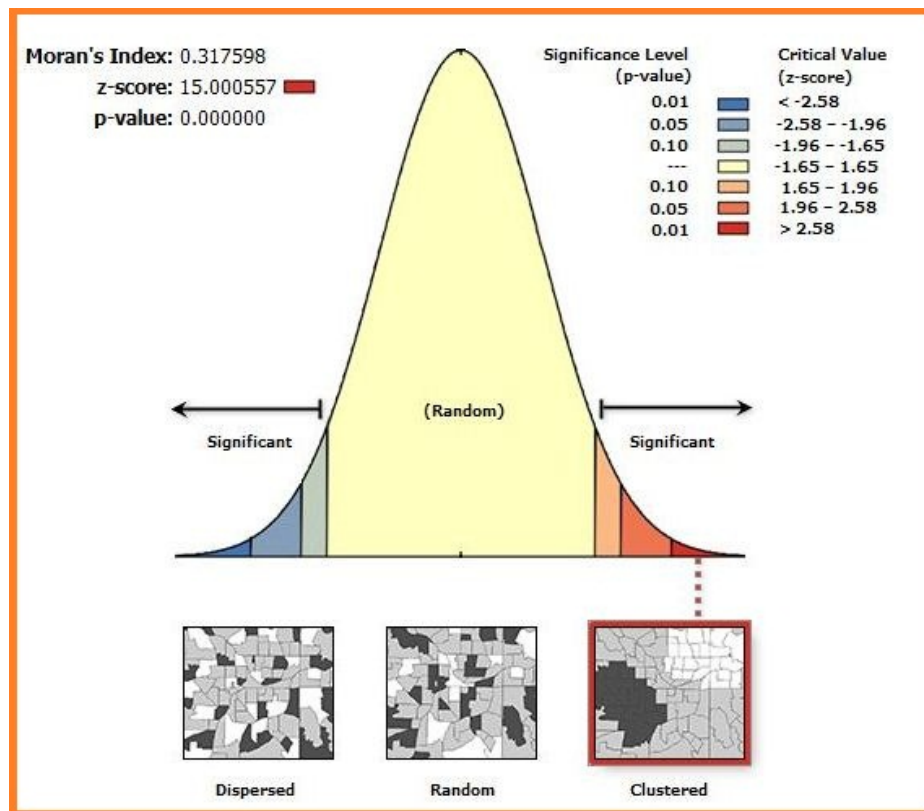| *Global Moran's I summary*	
Moran's Index	**0.317598**
Expected Index	**-0.000102**
Variance	**0.000449**
z-score	**15.000557**
p-value	**0.000000**

Figure 4: Graphical figure of spatial auto-correlation analysis for social indices in 2011

Investigation of class gap in urban areas of Tabriz from the perspective of spatial analysis in 2011

In this part of research, investigation of class gap in urban areas of Tabriz was considered from the perspective of spatial analysis in 2011. The map below shows the zoning of inequalities based on social indices.
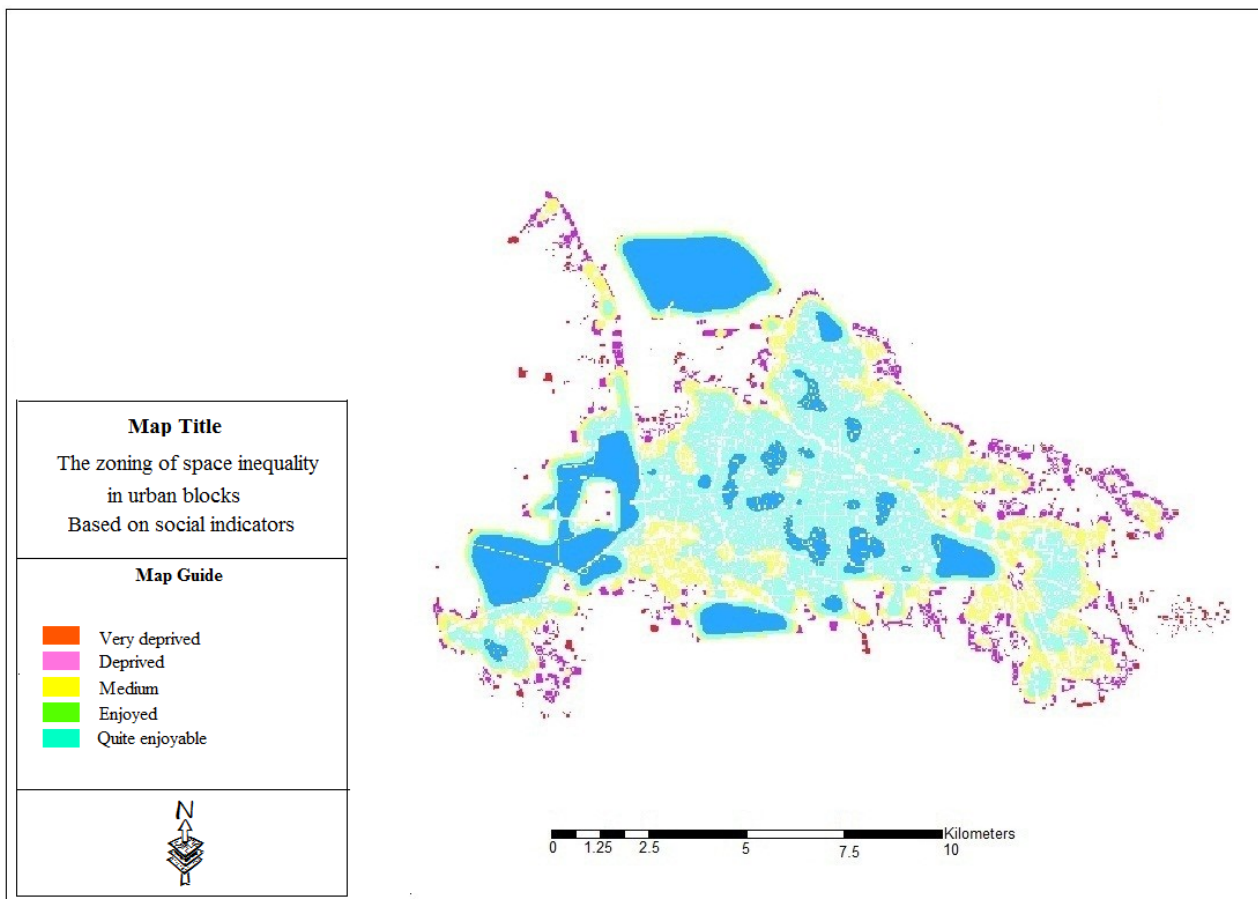
Figure 5: Spatial inequality zoning based on social indices of urban blocks of Tabriz in 2011

Figure (5) shows that deprived and totally deprived urban blocks are dispersed in marginal blocks of Tabriz. While moderate, possessed and fully possessed blocks are dispersed towards the blocks inside the city. Also, the distribution of blocks in terms of desirability is clustered form and has spatial correlation. As can be seen, Figure (5) shows that the study blocks are less clustered and have been expanded normally in most points in terms of desirability and undesirability. However, according to Figure (5), it can be concluded that the class gap is still persistent in terms of the study indices, given that it was decreasing and it needs radical solutions to eradicate this inequality and the gap between people and urban blocks.

Conclusion and suggestions

Expansion of spatial-local inequality in the cities of Iran, especially in Tabriz, embraces a growing trend, which requires conscious actions to prevent the spread

of this phenomenon. The present study attempted to investigate the process of cellular inequality in Tabriz and tried to identify the inequality organization and recited its trend by analyzing the spatial statistics. Spatial-local inequality indicates that we need a coherent planning for this crisis. The present study suggests some recommendations based on its findings. We hope to provide a basis for removing the barriers and problems of the society. Findings of the research show that in the distribution of inequalities, the highest number of our urban blocks based on social indices are related to very deprived blocks and they have devoted 46% of total urban blocks to themselves. After theses blocks, we have deprived blocks with 19% of total blocks, and the smallest number of urban blocks are related to fully possessed blocks that include only 6% of total blocks. Considering the importance of addressing the issue of justice and equality in urban planning and management as well as the existence of managerial problems, inequality will be formed, so

some suggestions will be offered to improve the situation of the city:

➤ Zoning investigations indicate the existence of a kind of gap in city, so planners should try to find a solution,

➤ Organizing marginal parts of city by city management in order to reduce the distance between blocks and deprived groups against possessed blocks.

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