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Analysis of spatial inequalities in Tabriz Metropolis through Analysis Hierarchy Process (AHP)

Afshin Gorbani Param[1*], Mohammad Shali [2], Habibeh Imani[3]

[1] *Assistant Professor, Department of Assistant Professor, Islamic Azad University of Damavand Branch, Tehran, Iran*

[2] *Ph.D. Department of Geography and Urban Planning, Shahid Beheshti University, Tehran, Iran*

[3] *MSc. Department of of Economic* Development and Planning, Tabriz University, Tabriz, Iran

** Corresponding Author, Email: Drafshinparam100@gmail.com*

A B S T R A C T

In today's world, spatial duality, growth of poverty-stricken urban districts and urbanization of poverty are considered as key destabilizers of sustainable urban development. As a result, recognition and discernment of such urban districts is a critical step for de-escalating poverty and inequality. The research methodology of the present study is descriptive-analytical. In the present study, spatial inequalities of districts of Tabriz metropolis is analyzed through utilization of analysis hierarchy process (AHP) with three main criteria of economy, urban physicality and population, which include 11 sub-criteria. According to the level of urban development, Tabriz metropolis is divided into five zones which are developed, relatively developed, medium developed, less developed and undeveloped. The findings of the study indicate the fact that there is a steep physical and class gap between undeveloped, less developed and other zones of the metropolis. Furthermore, quality and quantity of social, economic and physical criteria of undeveloped and less developed zones are lower than other zones. We believe that continuance of the present circumstances will exacerbate inequality and urban poverty, and endanger sustainable urban development.

K e y w o r d s: *Sustainable development, spatial inequality, Analysis Hierarchy Process (AHP), Tabriz metropolis.*

Introduction

Proliferation of metropolises and increase in urbanization have become two dominant trends in today's world, especially in developing countries (Azimi, 2001: 44; Saraffi, 2000: 41). According to the report of the UN-Habitat, 6.5% of the world's population lives in cities (UN, 2011: 12) and one third of this urbanized inhabitants lives in poverty-stricken areas (UN-HABITAT, 2007). Therefore, it can be inferred that urbanization of poverty is a key challenge of global development. It is estimated that if the current unpleasant set of conditions continue, over 2 billion people will be living in urban poverty-stricken areas in the upcoming twenty years. This figure can soar up to 5.3 billion people in 2050 (UN-HABITAT, 2007).

Other statistics and figures indicate the escalation of poverty worldwide. In 1970, 20% of the world's population lived in the wealthiest countries of the world and had 32 times more income than the income of 20% of the poorest countries of the world; the kind of ratio which changed from 32 to 45 and, 59 and 78 in 1980, 1989 and in the beginning of the 21st century, respectively (UN-HABITAT, 2003: 36).

A country's economy and set of urban spaces are the main source of inequality and nefarious heterogeneity in urban areas. Furthermore, governments can intensify socioeconomic displacements (Kaplan & Woodhouse, 2004: 581). A lot of documents and evidences exist to prove the fact that in many cases spatial inequalities intensifies social inequalities (Skop, 2006: 394).

Economic focalization in some cities such as Tehran and other regional metropolises results in unbalanced distribution of demographic and economic growth in the country. Cities such as Tehran have become demographic and economic attractors and, as a result, have been allocated with large portions of economic growth, production resources, human resources and investment. Consequently, cities such as Tehran have relatively become bigger than other cities (Zeberdast, 2006: 29). Due to development of urban sprawls, metropolises, problems such as poverty, unemployment, infrastructural and service incompetence, social anomalies, housing shortage and environmental threats have been materialized (Saraffi, 1998: 35). In such metropolises, economic dualities, spatial inequalities and heterogeneities have been intensified and resulted in realization of dual-class urban lifestyles. Saraffi (2000: 166) believes that an impotent system is causing urban polarizations and is realizing poverty and unemployment alongside wealth and lucrative enterprises and jobs.

In its historical ups and downs, Tabriz as an Iranian-Islamic city has acquired various roles and functions in military, economic, cultural, political and administrative affairs. In recent decades, Iran has experienced a rapid growth of urbanization due to political, economic and social developments. Unfortunately, in Iran's urbanization, mere urban growth and its quantitative features have advanced over its genuine development and qualitative characteristics, resulting in environmental and social difficulties. Today, the arising challenges from spatial and social segregation threaten Iran's urban sustainability status. For instance, from 1956 to 2016, Tabriz's population has risen from 289996 to 1558693. In relation to the statistics of 1956, Tabriz's population in 2016 has risen 5 times. Today, Tabriz comprises 40% and 5.58% of the population of the province and the country, respectively (Tavakoliniya & Shali, 2011: 139). It also needs to be heeded that Tabriz's geographical extent has increased from 2127 acres to 25000 acres (nearly 12 times) between 1966 and 2011 (Tabriz Municipality, 2013). It is recognized that spatial duality and inequality of the city is one of its key challenges and difficulties. Therefore, identification of the extent and intensity of these challenges is considered to be a significant step towards curbing poverty and inequality. Furthermore, the level of development of neighborhoods of Tabriz metropolis needs to be discerned so that an accurate planning can be materialized for accomplishing sustainable urban development. In the present study, development level of spatial features of Tabriz's neighborhoods as a metropolis will be investigated.

Theory and Methodology

In today's world, economic and social inequalities are considered to be widespread and expanding phenomena (Lees, 2010: 1; UNDP, 2010). Spatial inequalities are reflected in poor and deficient lifestyle, hygiene, schools, job opportunities, diet, transportation, education, housing, security, information accessibility and utilities such as electricity and water/gas piping (Ulrich & Hall, 2000: 14). Spatial justice and concomitantly social justice are considered as fundamental concepts in sustainable urban development. In other words, curbing poverty and inequalities, and relying on social justice and

geographical equality need to be regarded as key steps in realizing sustainable urban development (Mosavi & Hekmatnia, 2006: 35).

Justice depends on time and space, and the modality of the relations between social orders and structures (Piran, 2005: 14). It emphasizes the fact that each individual should be given something on the basis of his/her merit and eligibility. In other words, justice is an act or a disposition that espouses truth and fairness (Hoggart, 1995: 174). Edward Soja infers that justice has a geographical dimension. He believes that just distribution of and accessibility to services and resources constitute the core of mankind's fundamental right (Soja, 2010). As a universal concept, justice emphasizes observation of the equal rights among individuals and other social actors, preservation of human dignity, securement of living basic needs and protection of individuals' self-esteem (Abdelahi & Javan, 2008: 137).

Since 1960, social justice as a scholarly concept has entered urban studies, affecting liberalism and radicalism. Liberalists see social justice as a means for preserving the status quo, and do not regard it as a human duty and moral virtue. Besides, they insist on just distribution than just production means. On the other hand, radicals such as Henry Lefebvre, Manual Castells, David Harvey and Edward Soja investigate the means of commodity production of consumption as well.

David Harvey believes that social and spatial realities are realized within a mutual relationship. In other words, society's social and economic inequalities affect its spatial organization, and at the same time, any change in spatial organization impacts socio-economic relations and revenue distribution directly (Steil & Connolly, 2013: 34). Therefore, like the unbreakable rapport of time and space, social and spatial inequalities are inseparable from each other. Harvey thinks that the logic of the private sector only intends to maximize profit, resulting in development of already wealthy areas than developing poor and less developed ones. Such a result will intensify current inequality in revenue distribution (Harvey, 1997: 85). Therefore, distinct urban formations are resultant of various social processes predicting the level of social justice in a city.

Manuel Castells as another radical thinker has precious viewpoints regarding social and spatial inequalities in cities. He believes that urban order constitutes a key part of the dominant administrative order of a country, and cannot be separated from it. As a matter of fact, the urban order is the materialization of the administrative order in the spatial aspect of a city. Within this aspect, mass consumption takes place, and as a result, any change in the dominant administrative order will cause similar kind of change in the urban order. The urban order comprises economic, political and ideological levels. The political level refers to the urban management, which coordinates the relations between various levels, and facilitates administration coherence. The ideological level includes urban symbols and the significance of socio-spatial icons. The economic level comprises production, consumption and exchange as its three interdependent factors in the urban order (Afroogh, 1997: 164).

Due to the increase of social inequalities, spatial inequities are intensified in metropolises, resulting in spatial and social inequalities as well (Skop, 2006: 394). In this regard, Tonnies believes, "Urban space is the site of class division, hostility, segregation and nefarious contradictions between finance and work, and personal gains and economic foresight." Like George Zimmel, he thinks that "city is the center of intensification of social inequalities and class divisions." Furthermore, he infers that the resultant displacement of socio-economic inequalities can be regarded as the ultimate outcome of governments' policies. Therefore, even governments can intensify urban displacements as well (Woodhouse & Kaplan, 2004: 581). Harvey recognizes the interdependency between social inequalities and spatial structures (Shakuei, 1999: 141).

When the present study talks about spatial justice, it refers to the fair distribution of basic needs, facilities, conveniences and urban services among various areas of a city. When spatial justice is observed, no area or neighborhood will have a more dramatic accessibility to spatial benefits than others, and as a result, equal accessibility for all the urban areas and zones is maintained. Due to the disparities of natural infrastructures and spatial planning patterns, unequal urban spaces are materialized. The key processes and phenomena that affect spatial inequalities in urban neighborhoods are economic, social, political and cultural, architectural, decision making and decision taking, municipalizing and environmental processes and natural phenomena (Hataminejad, 2001: 290).

The present study is a descriptive-analytical research. For recognizing spatial inequalities of Tabriz metropolis, Analytical Hierarchy Process (AHP) and Delphi Process are utilized. AHP is one of the most prevalent multi-criteria decision-making methods (Sushil & Omkarparsad, 2006: 1). In 1977, AHP was invented by Thomas L. Saaty. This method has had various applications in different branches of science (Zeberdast, 2001: 13). The basis of this method is to devise binary comparisons and recognize the level of preference and priority of compared elements over each other and in relation with the predefined criterion. The method is used to solve evaluative and multi-criteria problems, prioritize the contested options on the basis of the predefined criteria and sub-criteria (Bertolini, 2006: 423). Due to versatility of criteria and indexes in identification process of spatial inequalities, the present study believes that AHP is considered to be an ideal research methodology. The first step in AHP is to generate a hierarchical structure of the research problem. In this hierarchical structure, objectives, criteria, options and their interrelations are discerned. The next four steps in AHP are to calculate criteria and sub-criteria weights, calculate options weights, calculate options scores, and to analyze logical incompatibility of judgments (Ghodsipour, 2009: 12; Edwin & Grace, 2008: 157).

In order to identify development level of neighborhoods of Tabriz metropolis through utilization of statistical data of 2016 census report, 11 indexes are categorized in three main criteria, which pertain to the city's physicality (which includes indexes such as areas less than 100 square meters, the number of residents in each residential unit and the number of families in each residential unit) population (which includes population density index, the immigrant population percentage, family dimension and 0 to 14 year report on population) and socio-economic aspects (which includes literacy index, dependency ratio, and unemployment rate). After this categorization, all the aforementioned criteria are compared in pairs through utilization of Delphi Process, AHP and Expert Choice software platform. This comparison will indicate the weight and significance of each criterion in the development level of the city. In the next stage, sub-criteria of each main criterion are evaluated and scored in relation to each other. After calculating incompatibility coefficient, the final weight of each neighborhood is realized. Table 1 shows criteria, sub-criteria and their allocated weights. In the last stage, hierarchical clustering is utilized to cluster neighborhoods of Tabriz metropolis on the basis of their development levels. The results of this clustering are represented and mapped in GIS interface.

Table 1: Relative weights of criteria and sub-criteria of the study

Criteria	*Sub-criteria*	*Weight*	*Incompatibility coefficient*	
physicality	percentage of residential unit with areas less than 100 square meters	0.128	0.05	0.02
	number of residents in each residential unit	0.051		
	the number of families in each residential unit	0.08		
population	population density	0.173	0.03	

	percentage of immigrant population	0.05	
	family dimension	0.112	
	percentage of 0 to 14 year report on population	0.079	
socio-economic	literacy rate	0.141	0.04
	dependency ratio	0.068	
	Activity rate	0.045	
	unemployment rate	0.073	

Research Location

In its historical ups and downs, Tabriz as an Iranian-Islamic city has acquired various roles and functions in military, economic, cultural, political and administrative affairs. In recent decades, Iran and consequently Tabriz as an Iranian metropolis has experienced a rapid growth of urbanization due to political, economic and social developments. This growth has been reflected in realization of unofficial housing, dramatic population growth, city's physical expansion, destruction of agricultural lands and gardens and unequal distribution of services and facilities. Today, the arising challenges from spatial and social segregation threaten Iran's urban sustainability status. For instance, from 1956 to 2016, Tabriz's population has risen from 289,996 to 1,558,693. In relation to the statistics of 1956, Tabriz's population in 2016 has risen 5 times. Today, Tabriz comprises 40% and 5.58% of the population of the province and the country, respectively (Tavakoliniya & Shali, 2011: 139). It also needs to be heeded that Tabriz's geographical extent has increased from 2,127 Acres to 25,000 acres (nearly 12 times) between 1966 and 2011 (Tabriz Municipality, 2013). The research location comprises the neighborhoods of Tabriz metropolis and it needs to be emphasized that research data are collected from 2016 census report (Figure 1).

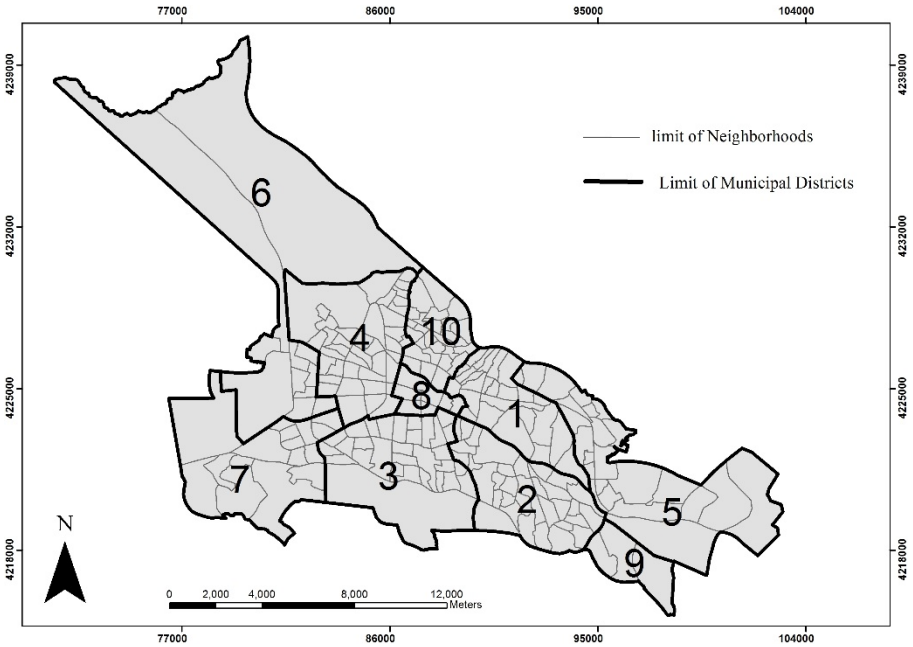

Figure 1: Municipal districts and neighborhoods of Tabriz metropolis

Results and Discussion

In order to analyze the urban spaces and to recognize spatial inequalities of neighborhoods of Tabriz metropolis, significance coefficients of all criteria within the standardized data are combined. After this combination, the score of the city's neighborhoods are calculated, and after their cluster analysis, they are categorized in different categories as follows.

When it comes to the urban physicality of the city, indexes such as areas less than 100 square meters, the number of residents in each residential unit, and the number of families in each residential unit are used. In the next stage as indicated in Figure 2, the city and its neighborhoods are categorized into five development levels. As shown in Figure 2, when the study analyzes Tabriz's physicality, a dramatic spatial segregation among its neighborhoods is recognized. Therefore, the northern and southern neighborhoods are categorized into the fourth and fifth development levels and the central and eastern neighborhoods are placed within the first and second development levels. Other neighborhoods belong to the third development level.

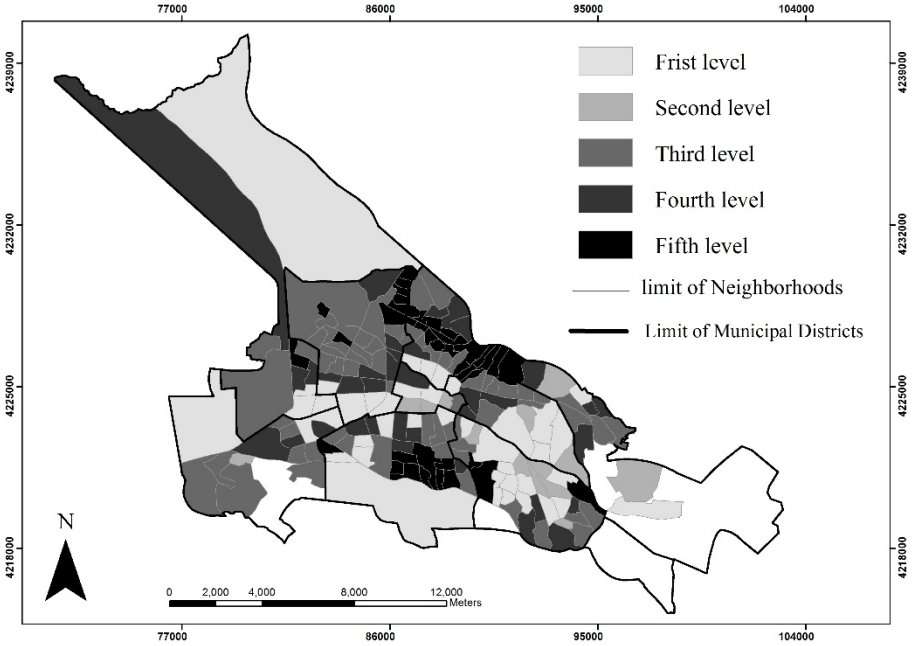

Figure 2: Categorization of Tabriz's neighborhoods through urban physicality criteria

When the study considers the population indexes of the city (which includes population density index, the immigrant population percentage, family dimension and 0 to 14 year report on population), spatial inequalities among the neighborhoods have been recognized (Figure 3). The first level neighborhoods are located in the central and eastern parts of the city. The second level neighborhoods are situated around the first level neighborhoods and the third and fourth level neighborhoods are scattered around the northern and southern parts of the city.

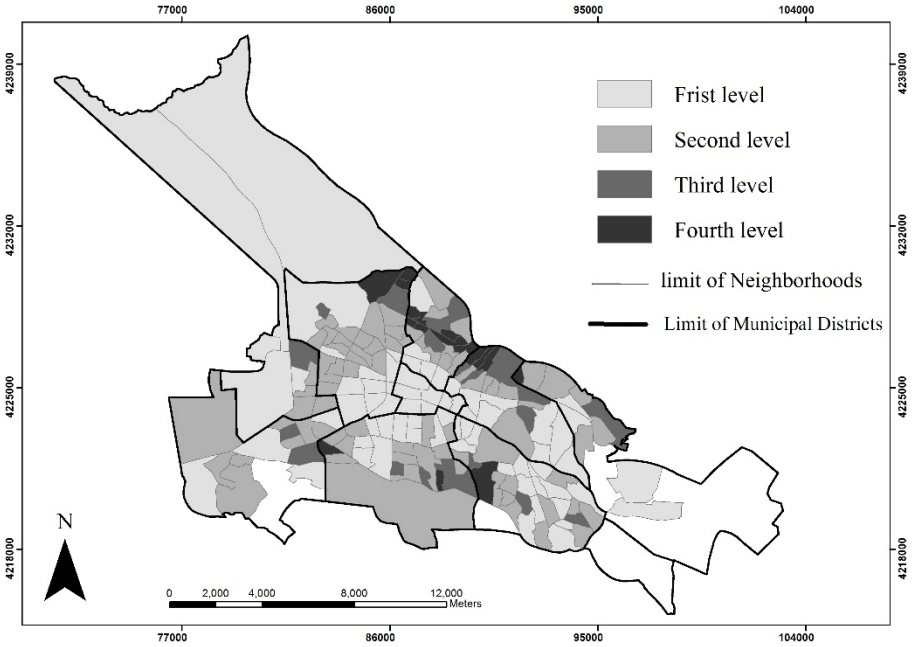

Figure 3: Categorization of Tabriz's neighborhoods through population criteria

When it comes to the socio-economic aspect (which includes literacy index, dependency ratio, and unemployment rate), it is indicated that neighborhoods of Tabriz metropolis is categorized into four categories (Figure 4). The first and second neighborhoods are situated in the central, eastern and western parts and the third and fourth levels are mostly in northern and southern parts of the city.

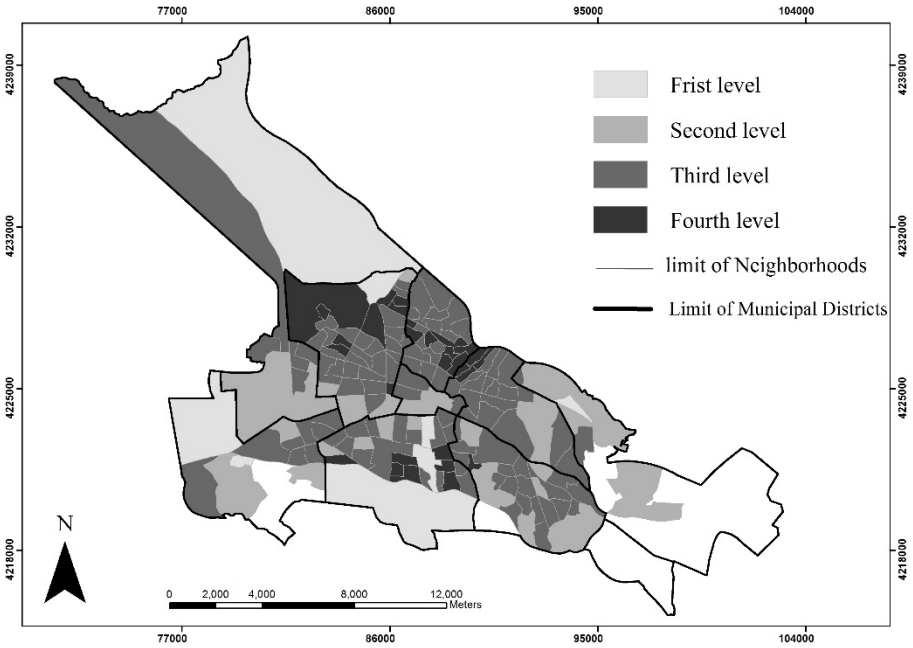

Figure 4: Categorization of Tabriz's neighborhoods through socio-economic criteria

In the last stage, development coefficients are combined and neighborhoods of Tabriz metropolis are categorized in five levels, indicated in Figure 5.

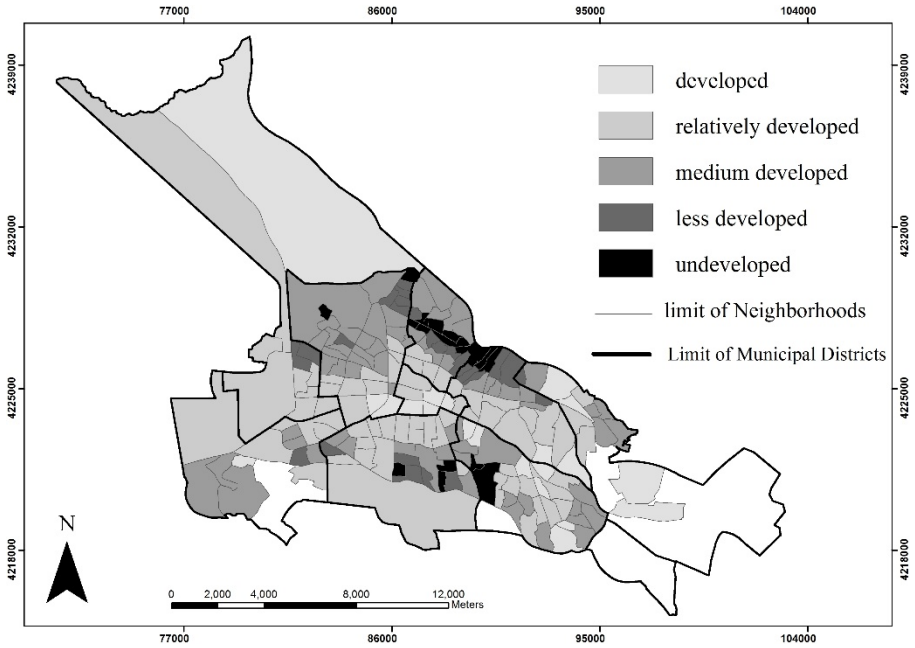

Figure 5: Categorization of Tabriz's neighborhoods through all criteria

The first category includes developed neighborhoods such as the South Valiasr, Parvaz Alley, Elahi Parast, Elahiyeh, Roshdiyeh, Ferdows, Shahrake Mosalla, Eil Goli Park and Golbad in the eastern parts of the city and Abresan, Gharehbaghiha, Daneshsara, Mansour, Maghsudiyeh, Ahrab and Khayyam in the central parts of the city.

The neighborhoods of the second category are situated around the neighborhoods of the first category, and as a result, are in the eastern and central parts of the city. In the eastern parts, neighborhoods such as Valiasr, Zaferaniyeh, Golshahr, Golshan, Golpark and Golkar can be named, and in the central parts, neighborhoods such as Sheshgolan, Bazaar, Shahnaz, Charandab, Kuchehbagh, Polsangi, Manzariyeh and Davehchi can be included.

The third category includes neighborhoods that are scattered around the neighborhoods of the second category. Neighborhoods such as University Alley, Golgasht, Rajaiishahr, Baghmisheh, Abbassi, Ekkehdokan, Akhuni and Gharehaghaj can be included in this category.

The neighborhoods of the fourth category are in the northern parts of Tabriz, and are scattered around the neighborhoods of the fifth category. Neighborhoods such as Shahid Beheshti, Yousefabbad, Esmail Baghal, Rezvanshahr, Manba and Mofatteh are in this group.

The neighborhoods of the fifth group are considered to be the poorest and the most deprived districts of Tabriz metropolis. Situated in the northern and southern parts of the city, these deprived neighborhoods are Khalilabad, Molla Zeynal, Ghorbani, Chehelmetri, Bahmanabad, Eidehloo, Seylab Ghoshkhaneh, Maralan, Ghoorkhaneh and Sarizamin. The neighborhoods of the fourth and fifth categories comprise the unofficial housing of the city.

Table 2 shows the analysis and investigation of physicality, population and socio-economic features of each category in comparison with each other and Tabriz metropolis.

Table 2: Population, socio-economic and physical features of development zones

Title	*developed*	*relatively developed*	*medium developed*	*less developed*	*undeveloped*	*Tabriz Metropolis*
population	85975	532400	534493	249414	156411	1558693
family	29373	179553	173479	73161	42332	497898
dimension family	2.9	3	3.1	3.4	3.7	3.1
Proportion of population (%)	5.5	34.2	34.3	16	10	100
of immigrant percnteage population	6.5	30.4	35.8	17	10.2	100
year percnteage of 0 to 14 report on population	15.6	17.6	21.8	22.8	25	20.5
literacy rate	97.1	93.1	88.7	83.1	79.5	88.9
Activity rate	34.56	33.1	34.96	35.22	36.13	34.44
Unemployment Rate	9.9	13.9	14.4	17.1	18.9	14.9
dependency ratio	3.79	3.99	3.87	4.1	4.31	3.98
Units Residential	29881	171270	168779	70948	40652	481530
number of residents in each residential unit	2.88	3.11	3.17	3.52	3.85	3.24
the number of families in each residential unit	0.983	1.048	1.028	1.031	1.041	1.034
Percentage of Residential Units Below 100	28	44.3	72	89.2	92.8	63.7

According to 2016 census report, Tabriz has a population of 1558693. 5.5% of the population lived in the developed zone; 34.2% lived in relatively developed zone; 34.3% lived in averagely developed zone; 26% of the population lived in less developed zone and 10% lives in undeveloped zone.

Analysis of socio-economic indexes indicates a deep gap between less developed and undeveloped zones and other zones of Tabriz metropolis. The residents of these zones have limited access to education, and as a result, acquire insufficient level of skills. That is why they fail to gain eligibility for good jobs. The literacy percentage of undeveloped zone (which is 79.5%) is lower than the average literacy percentage of the city and literacy percentages of the city's other zones. This fact shows that residents of the undeveloped zone suffer more from illiteracy. The unemployment rates among Tabriz's zones are dramatically different. In Tabriz, 18.9% is the highest unemployment rate, and unfortunately, it belongs to the undeveloped zone. Furthermore, the average dependency ratio of the undeveloped zone (which is 4.31) is higher than the ratios of other zones of the city.

The comparison of 0 to 14 year population reports of the city's zones indicates the fact that the population rates of the undeveloped and less developed zones are younger in comparison with average age of the city and the age of other zones. This fact shows high birth rates and populated family structures in these zones. The family dimensions of the undeveloped and less developed zones are 3.7 and 3.4, respectively, both of which are higher than the average rate of the city (which is 3.1).

The population density in the poor zones of the city is high, and in the developed zones, this density is lower. It is an axiomatic fact that population density and crowdedness results in numerous social and economic difficulties. One of these difficulties pertains to the injustice residents of the deprived areas needs to suffer from in their lack of access to urban facilities.

When it comes to urban physicality and urban usability, poor zones mostly include one-storey

residential housings and the availability of services and facilities per capita are lower than the rates in other zones. Therefore, in poor zones, facilities such as clinics, health centers, post offices, libraries, banks, parks, play grounds and sport and recreational centers are rarely found, and their capita is very low in such zones. In unofficial housing regions (which include neighborhoods in undeveloped and less developed categories), no cinema, hospital or cultural center can be found. Although the zone have utility infrastructures such as electricity, telephone lines and water and gas piping, the quality of these infrastructures is very low (Shali, 2010: 193). In the undeveloped zone, the surface value of 92.8% of residential units is less than 100 square meters. Considering this index, it is indicated that undeveloped and less developed zones acquire a steep disparity in comparison with the status of this index in other zones and the average status of this index in the city. Moreover, the population of each residential unit of the undeveloped and less developed zones is more congested than the population level in other zones.

Conclusion

In today's world, spatial and social inequalities are considered to be prevalent phenomena. In metropolises, spatial identification and analysis of social, economic and physical inequalities are regarded as necessary and fundamental steps towards urban planning and accomplishing sustainable urban development. In the present study, 11 indexes, grouped into three main criteria of urban physicality, population and socio-economic features were utilized so that the level of spatial and social segregation of Tabriz neighborhoods can be identified. Through Delphi Process, AHP and Expert Choice software application, indexes weights and neighborhoods scores were calculated. Afterwards, Tabriz's neighborhoods were categorized into five categories on the basis of their development level. These categories were developed, relatively developed, averagely developed, less developed and undeveloped zones. Various population, physicality and socio-economic features of each category were analyzed in comparison with each other and the average rate of Tabriz. The findings of the study indicated the fact that there is a dramatic gap between undeveloped and less developed zones and other zones of the city. The neighborhoods, categorized in the first and second categories, were proven to have larger houses and residential units, less population density, smaller families, higher education status, lower unemployment rate, higher number of professional workforce and higher accessibility to facilities and services. Moreover, the neighborhoods of these two privileged categories were proven to be safer against environmental hazards such as floods and earthquakes. Maintaining the status quo will only result in intensification of inequalities and prevalence of urban poverty and procrastinate accomplishment of sustainable urban development. Therefore, urban and macro management sectors in developing countries, including a country such as Iran, need to proceed with effective steps for a better discernment of spatial inequalities. These steps can become practical through utilization of new and efficient initiatives in curbing nefarious effects and aspects of poverty in deprived residential areas and zones of a city. As Cheema believes, "We need to rethink about the concept of the 21st century city. It is a city where social justice, ecological sustainability, political participation and economic dynamism need to be included" (Cheema, 2000, 39). In this regard, the following suggestions are represented: • Coherence and integrity between deprived zones of the city and its urban physicality need to be established so that Tabriz's harmonious metropolises can be realized.

• Tabriz's urban development should be materialized within its current urban texture and any horizontal and unofficial housing development needs to be prevented.

• Unofficial housing zones need to be reformed and renovated through encouraging the citizens to participate.

• Barren lands needs to be put into use, and a set of land integration and land appropriation needs to be

materialized so that the quality and quantity of educational, clinical, sport and recreational facilities in deprived zones can be improved.

• Hazardous zones need to be identified and monitored. Furthermore, an efficient recycling mechanism alongside with a set of compatible usabilities needs to be devised in such zones.

• Local economy needs to be strengthened.

• Unofficial and official employment creations need to be organized.

• Immigration to Tabriz and its deprived zones need to be monitored.

• The citizens' awareness towards the benefits of observation of urbanization regulations and nefarious outcomes of unfettered urban constructions need to be materialized.

• The position and role of the citizens, local organizations and the private sector in urban decision taking and urban decision making need to be improved.

• An integrated and harmonious approach towards urban planning and management needs to be adopted.

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