Analysis of spatial development pattern of urban neighborhoods (A case study: Zahedan urban neighborhoods in Iran)

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Abstract: Nowadays, attention to the smallest levels of spatial divisions of cities i.e. neighborhoods in urban environments in the third world has gained importance more and more in order to increase the quality of life, upgrading the income level, employment, education, health and nutrition, housing, making healthy environment, and eradicating poverty. Zahedan city is located in southeast of Iran and is the center of the most undeveloped (deprived) province (Sisstan and Baluchestan Province) in Iran. In spite of having the highest level of development in the province, this city is encountered with quite a lot of inequalities the inside the neighboring boundaries. In the present study, spatial development level of neighborhoods of Zahedan has been studied from the viewpoint of having different indices of development. Research methodology is "descriptive-analytic and suvey". The required data have been collected through 1650 questionnaires from neighbors of Zahedan. For data analysis, factor analysis and TOPSIS models were used. The findings of the study indicated that from the first 171 indices, 90 indices as effective indices in six groups of sociology, physical, educational and cultural, relations and infrastructures, economic, and environmental were effective in spatial development of Zahedan. Also the findings showed that 16.37 percent neighborhoods of Zahedan are in developed level, 76.37 percent in semi-developed level and 7.27 percent in undeveloped level. In order to decrease the inequalities of neighborhoods, it is necessary to develop undeveloped, semi-developed and developed neighborhoods respectively.

1. Introduction

The accelerating rise in aspects of urbanization and formation of a new scale from urban growth during the recent decades have been the reason that the contemporary city and urbanization have been encountered with new challenges such as increase of social abnormalities, fading of social identity and social belonging sense, environmental and ecological development, significant social-economic inequalities and in general, the decrease of quality of life. Because of this expansion of aspects and changes in the nature and complexity of urban problems, the necessity of holistic view and considering the interaction of the problems in order to solve them permanently seems inevitable (Sarafi, 2001: 73).

Attention and emphasize on urban planning and management has been in the lowest level and palpable dimensions of urban life more than any other times (Friedman, 1993: 284). A lot of research have been conducted in recent decades all of which have targeted policy, urban planning and management from the smallest unit i.e. neighborhood of the city (Madanipour, 2003: 27).

In about two recent decades, a lot of organizations and institutes involved in urban planning and management in a global level have had emphasize on promoting an attitude of participation to encourage a kind of "bottom-up" management and planning approach and empowering in order to supervise the developmental actions. And also they have considered decision-making process related to solving urban problems based on neighboring communities, with the aim of providing the required welfare conditions for citizens (Hajipoor, 2006: 38).

Management at the level of neighborhood is the connection circle of citizens and urban management; for improvement of management in cities if it could be accepted that participation of all the actors in improvement of the city such as public and governmental sections, private and civil society are necessary, management in this stage would pave the ground for cooperation of all the actors and democratic management will take place. The characteristic of this kind of management is the close connection of public living in the neighborhood with other levels of management and establishes the social supervision responsibility and participation (Sarafi, 2004: 3). Noticing to the small level (neighborhood)

is one of the ways of achieving efficient urban management. Accordingly, it is necessary to have more focus on planning dimensions in small and neighboring scales (Karimi and Tvakkolinia, 2009: 82).

Zahedan is one of the important cities in east of Iran. This city has a special position from economic-social and political aspects. Being in vicinity of Afghanistan and Pakistan this city has been noticed by immigrants of these countries. The imposed boundary on the east of Iran has separated the Baloch people from each other, the people who have shared cultural, national and linguistic features and most of them live in Baluchestan of Pakistan which is the biggest province in Pakistan. Another group of Balooch people lives in southeast of AfGhanistan, near Chaki in Pkistan and in Iran they live in Zabol and Zahedan. Some of the biggest Iranian Baloch tribes live in cities such as Koweiteh, Noshki, Dalbendin and Karachi in Pakistan and Nimrooz in Afghanistan. The common national and cultural characteristic has led to various immigrations into and out of the zone (Afrakhteh, 2006: 424). Having some employment opportunities, Zahean has been targeted by different people from different parts of the province as well as Birjand, Kerman and Yazd and other cities. Absorbing a lot of immigrants has made Zahedan to be grown and expanded excessively and from dimension of spatial structure has brought various problems and insufficiencies for the city. For the time being, the main problem is the lack of integrated spatial development in the level of zones and neighborhoods of the city so that some contradictions and inequalities between spatial boundaries are the result of susch problems.

In addition to the above cases, the lack of effective and flexible relationship between the managers of urban organizations and public and also the lack of relationship between different urban organizations have increased to the problems of the city and provided the ground for inequalities and the lack of development in the city. The mentioned problems caused the lack of a coordinated and efficient spatial structure for the city and the distribution facilities and services between different zones and neighborhoods of the city are not in a desirable mode. The present study is an attempt to examine and analyze spatial development of neighborhoods of Zahedan in order to embark on introducing a strategy for reducing the problems of the neighborhoods by recognizing their problematic neighborhoods.

2. Materials and Methods

The type present study is "applied-developmental", its approach is "strategic-participatory" and has a "descriptive-analytic and survey" design. The required data for the study have been collected through questionnaire from 55 neighborhoods of Zahedan. 30 questionnaires (1650 questionnaire in 55 neighborhoods) were filed out in each neighborhood and then the data were summarized. The examined indices are 90 indices of social, physical, educational and cultural, relations and infrastructures, economic, environmental and componental indices that from the 171 primary indices and using factor analysis with rotating and remix method (Rakhshaninasab, 2008: 19; Carpa, 2005: 69) have been summarized.

After that, using TOPSIS model in relation to neighborhoods of Zahedan, the distinction of studied indices has been ventured. Two softwares of SPSS and ArcGIS for statistical analysis and distribution analysis of spatial indices have been used. TOPSIS technique, as a multi-branch decision making method, is considered as a simple but efficient method in prioritizing (Eftekhari, et al, 2011: 31). Howang and Youn (1981) proposed TOPSIS model. In multi-branch methods such as TOPSIS, the purpose is to classify and choose the superior options (Zarabi et al, 2011: 7). In this method, the chosen option should have the shortest distance from the ideal answer and the farthest distance from the most inefficient answer (Poortaheri, 2007: 63).The advantages of this method in relation to other spatial priorities could be pointed out as follows:

Qualitative and quantitative criteria are used simultaneously,

Its output could determine the priority order of options and state this priority quantitatively,

Considers the contrast and conformity between indices,

The procedure is simple and its speed is suitable,

It receives the primary weight coefficients

The findings of this model are completely matched with experiential methods (Eftekhari et al, 2011: 31).

The structure of TOPSIS model is as follows (Asgharpoor, 2008: 260-266):

Formation of decision-making matrix: this matrix includes n indices and m zones.

Changing the existing decision making matrix to non-scaled matrix using the following formula:

$$n_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^{m} r_{ij}^2}}$$

Creating weighted non-scaled matrix assuming vector w as input of the algorithm:

$$v_{ij} = n_{ij} * w_j, \quad i = 1, 2, \ldots, m; \quad j = 1, 2, \ldots, n.$$

Determining the positive ideal solution (A+) and the negative ideal solution (A-):

$$A_j^+ =$$
$$\left\{ (Max_i v_{ij} | j \in J), (Min_i v_{ij} | j \in J') | i = 1,2,\ldots,n \right\} = \{v_1^+, v_2^+, \ldots, v_j^+, \ldots, v_n^+\}$$

$$A_j^- =$$
$$\left\{ (Min_i v_{ij} | j \in J), (Max_i v_{ij} | j \in J') | i = 1,2,\ldots,n \right\} = \{v_1^-, v_2^-, \ldots, v_j^-, \ldots, v_n^-\}$$

Calculating the amount of separation (distance):

$$d_i^+ = \sqrt{\sum_{i=1}^{n} (v_{ij} - v_j^+)^2}, \; i = 1,2,\ldots,m$$

$$d_i^- = \sqrt{\sum_{i=1}^{n} (v_{ij} - v_j^-)^2}, \; i = 1,2,\ldots,m$$

Calculating the closeness of Ai to the following ideal solution using the following formula:
$$cl_i^+ = \frac{d_i^-}{d_i^+ + d_i^-}, \; 0 < cl_i^+ < 1, \; i=1, 2, \ldots, m$$

Classifying the options based on the descending order cl_i^+.

Zahedan is located in east of Iran and in vicinity of Pakistan and Afghanistan boundary with geographical coordinate of 29 degrees, 30 minutes and 45 seconds north latitude and 60 degrees, 52 minutes and 25 seconds east longitude. This city is bordered with Zabol from north, with Afghanistan from north east, with Korasan jonubi province from North West, with Kerman province from west, with Iranshahr from south, with Pakistan from east and from south east with Khash (figure 1). The mean height of Zahedan from sea level is 1378 meters and its area is 578.181 square kilometers.

As the center of Sistan and Balochestan province located on south east side of Iran which is among the most important political-official, commercial and militarized centers in this zone, Zahedan has a one hundred history. Foundation of this city is meaningful according to the presence of Blooch nation, railway construction and Indian immigrants (Sikhs).

One of the most reasons of Zahedan's foundation is railway construction from koweyteh to Nooshki and then to Dezab by British people. Railway construction had begun from 1911 coincided with 1918 AD and lasted for 4 years during World War One.

In the past 50 years ago, although Zahedan hasn't have much urbanization history, being in vicinity of Afghanistan and Pakistan, having access

to sea from the south of the province and also being official-political center of the province, its population has been increased in a short period of time from 17495 people in 1956 to 567449 people in 2006 so that in comparison with Kerman and Birjand which have a longer history in urbanization, Zahedan has a higher growth rate in south east of Iran (Nazarian and Mirbahai, 2010: 2).

For the time being (2011), Zahedan has 5 urban zones and each one includes 11 neighborhoods. Figure 2 indicates 55 neighborhoods of Zahedan in distinction of urban zones.
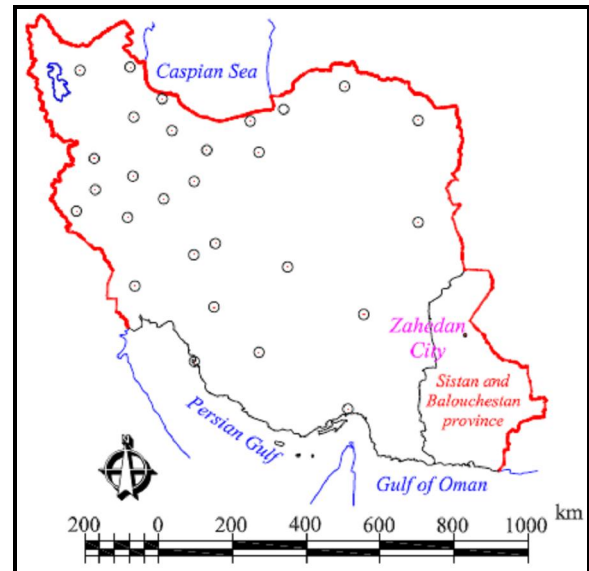

Figure 1. Geographical situation of Zahedan in Iran and Sistan and Balochestan province
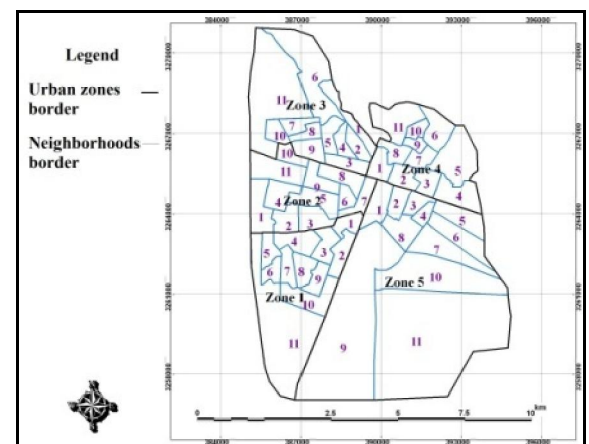*Source: Author's.*

Figure 2. Neighborhoods of Zahedan with distinction of urban zones
Source: Zahedan municipality, 2008.

3. Results

As it was mentioned, factor analysis was used to summarize and to determine effective indices of spatial development in Zahedn's neighborhoods. Regarding the indices that are figures for measuring and assessing the fluctuation of variable factors in time (Ebrahimzadeh et al, 2010: 12), the present study attempts to use componential indices. The advantage of using this kind of indices is that, for example, some neighborhoods may have suitable condition from environmental aspect but may not have a suitable development level from social aspect. Therefore, using componential indices could leads to more reliable results. In this study, the componential indices include 90 indices social, physical, educational and cultural, relations and infrastructures, economic and environmental dimensions that have been achieved through factor analysis.

The sum of six groups (factors) averagely explains 75.69 percent of the variance that shows that factor analysis and studied variables is satisfactory (Table 1).

Table 1. Eigen values and variance of the studied indices

Factors (groups)	Eigen value	Percent of variance	Number of loading indices in factors
Social	24.21	78.2	25
Physical	15.06	75.77	15
Educational and Cultural	12.96	75	16
relations and infrastructures	11.61	72.6	13
Economical	10.73	76.77	10
Bioenvironmental	10.59	75.8	11
Average	14.19	75.69	Total: 90

Source: Author's calculations.

Using TOPSIS model, six groups of indices were integrated and on this basis, the development level of neighborhoods of Zahedan were calculated (Table 2). In order to classify the neighborhoods of Zahedan, in addition to the TOPSIS amount of each group of the indices, the mean and standard deviation of their TOPSIS amount were used, too. In this way that with the increase and decrease of standard deviation to and from the TOPSIS mean of each group, the development level of each neighborhood was achieved. In general, based on the integrated indices, neighborhood 10 from zone 5, neighborhoods 3 from zones 5 and 2 and neighborhood 1 from zone 5 have first to third ranks respectively and are recognized as heterogeneous neighborhoods in Zahedan. Neighborhood 2 from zone 4 has the most adverse condition in this city. From the total of 55 neighborhoods in Zahedan, 21 neighborhoods (38.18 percent) higher than mean, 7 neighborhoods (12.72 percent) equals with mean and 27 neighborhoods (49.1 percent) lower than mean have received scores.

As it can be observed in Table 2, the mean score of TOPSIS in neighborhoods of Zahedan is 46% and its standard deviation is 0.08. Therefore, with increase or decrease of standard deviation to and from mean (0.46), scores of 0.54 and 0.38 are achieved. Accordingly, the neighborhoods which their TOPSIS amounts are more than 0.54 are developed neighborhoods, the neighborhoods which their TOPSIS score are lower than 0.38 are undeveloped neighborhoods and the other neighborhoods which their TOPSIS score is between 0.38 and 0.54 are considered as semi-developed neighborhoods. 9 neighborhoods (16.36 percent) including neighborhood 1 from zone 2, neighborhoods 1, 2, 3, 5, 8 and 10 from zone 5, having a score more than 0.54 are in the first rank and considered as developed ones. 42 neighborhoods (76.36 percent) are in the second rank and considered as semi-developed and finally 4 neighborhoods (7.28 percent) including neighborhood 11 from zone 3 and neighborhoods 1, 2 and 4from zone 4 with lower scores than 0.38 are in the lowest rank and are considered as undeveloped.

For a more efficient spatial analysis, the map of neighborhood ranking (classifying) of Zahedan has been provided and indicated in figure 3. As it can be observed from the map, the developed neighborhoods are mostly in central parts of the city and the semi-developed ones are on the suburbs of the city. The undeveloped neighborhoods are located on north and North West of the city.

Table 2. Neighborhood ranking of Zahedan in integrated indices using TOPSIS model.

| Neighborhood name	Zone	TOPSIS value	Rank	Spatial development value	Neighborhood name	Zone	TOPSIS value	Rank	Spatial development value
10	5	.62	1		6	2	.45	14	
3	5	.61	2		1	1	.45	14	
1	2	.61	2		3	4	.45	14	
1	5	.60	3		9	1	.44	15	
8	5	.58	4	developed	5	3	.43	16	
5	4	.58	4		5	2	.43	16	
5	5	.56	5		5	1	.43	16	
2	5	.54	6		9	3	.42	17	
8	4	.54	6		3	1	.42	17	
4	1	.53	7		1	3	.41	18	
11	5	.52	8		11	4	.40	19	
7	1	.52	8		2	2	.40	19	
7	5	.52	8		2	1	.40	19	semi-developed
4	5	.51	9		7	3	.40	19	
10	1	.49	10		10	3	.40	19	
8	1	.49	10		2	3	.40	19	
7	4	.48	11		9	2	.40	19	
11	1	.48	11		8	3	.39	20	
4	3	.48	11	semi-developed	3	3	.39	20	
6	5	.48	11		9	5	.39	20	
3	2	.48	12		6	1	.38	21	
10	2	.48	13		4	2	.38	21	
6	4	.48	13		6	3	.38	21	
9	4	.48	13		1	4	.37	22	
10	4	.46	13		11	3	.36	23	undeveloped
11	2	.46	13		4	4	.32	24	
7	2	.46	13		2	4	.22	25	
8	2	.46	13		St.D: 0.08		Mean: 0.46		

Source: Author's calculations.
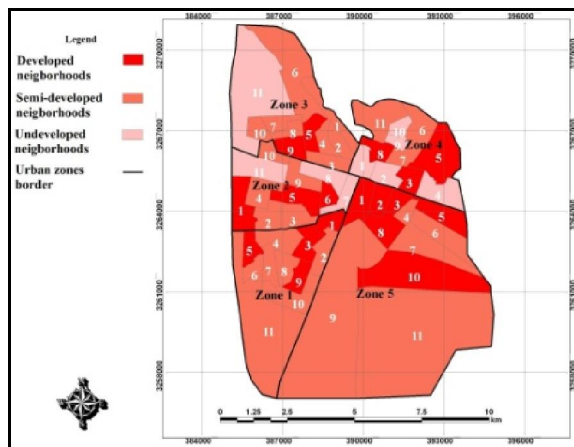
Figure 3. Spatial distribution of spatial development ranking of neighborhoods of Zahedan based on integrated indices.
Source: Author's.

Comparative analysis of neighbors in Zahedan indicates that because of having development indices, a kind of heterogeneity and divergence is dominated in neighborhoods so that from 55 neighborhoods, in integrated indices of 9 neighborhoods as developed neighborhoods, 42 neighborhoods semi-developed neighborhoods and 4 neighborhoods are considered undeveloped. While in the other indices especially physical, relations and infrastructures, economic and environmental ones a kind of homogeneity and convergence in having the mentioned indices between the neighborhoods could be observed. Based on the above indices, 7 neighborhoods are considered as developed ones, while the numbers of the semi-developed neighborhoods in each mentioned indices are 43, 44, 40, and 38 respectively. The numbers of undeveloped neighborhoods in the mentioned indices are 5, 4, 8 and 10 neighborhoods respectively (Table 3).

Table 3. Comparative analysis of spatial development levels of neighborhoods in Zahedan with distinction of development indices

Development level Indices	Developed		Semi- developed		Undeveloped		Total	
	Numbers	%	Numbers	%	Numbers	%	Numbers	%
Social	5	9.1	42	76.36	8	14.54	55	100
Physical	7	12.72	43	78.18	5	9.1	55	100
Educational and cultural	4	7.27	14	25.45	37	67.28	55	100
relations and infrastructures	7	12.72	44	80	4	7.28	55	100
Economical	7	12.72	40	72.74	8	14.54	55	100
Bioenvironmental	7	12.72	38	69.1	10	18.18	55	100
Integrated indices	9	16.37	42	76.36	4	7.27	55	100

Source: Author's calculations.

According o the above Table, the social, educational and cultural indices indicate a kind of heterogeneity and divergence with the other indices. Based on the social indices, 42 neighborhoods are considered as developed neighborhoods and based on the educational and cultural ones, 37 neighborhoods as undeveloped ones.

4. Discussion and Conclusion

The present study was an attempt to rank and classify neighborhoods of Zahedan from the viewpoint of having spatial development indices using TOPSIS model. According to the accomplished ranking with TOPSIS model, each neighborhood of Zahedan has a different ranking in the componential indices. This problem implies that this inequality and difference between neighborhoods of Zahedan is because of having development indices. Based on the carried out calculations, neighborhood 10 from zone 5 with the TOPSIS score of 0.62 is in first rank and neighborhood 2 from zone 4 with the TOPSIS score of 0.22 is in the last rank. In Zahedan, these two neighborhoods are the two very developed and undeveloped opposite poles.

According to the accomplished ranking, 16.37 percent of the neighborhoods in Zahedan are in developed level, 76.36 percent semi-developed, and 7.27 percent are in undeveloped level. In order to decrease the inequalities between the neighborhoods of Zahedan, the social justice instructs that in the short-term program (annual) the undeveloped neighborhoods, in the medium-term program the semi-developed and undeveloped neighborhoods and in the long-term program the developed neighborhoods along with other neighborhoods should be taken into account. Therefore, the neighborhoods of Zahedan would be directed towards equality and balance and the inequalities between the neighborhoods in long-term programs will be decreased.

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