Routledge
Taylor & Francis Group

INTERNATIONAL JOURNAL OF STRATEGIC PROPERTY MANAGEMENT
ISSN 1648-715X / eISSN 1648-9179

2017 Volume 21(4): 371–383
doi:10.3846/1648715X.2016.1262473

AN ANALYSIS ON THE ROLE OF URBAN LAND MARKET IN SPATIAL DEVELOPMENT OF CITIES: A CASE STUDY OF MASHHAD, IRAN

Jafar MIRKATOULI [a,*], Reza SAMADI [b]

[a] *Department of Geography and Urban Planning, University of Golestan, Gorgan, Iran*
[b] *Department of Geography and Urban Planning, Ferdowsi University of Mashhad, Mashhad, Iran*

Received 22 September 2015; accepted 15 April 2016

ABSTRACT. The purpose of this paper was to study the role of the urban land market in the spatial development of Mashhad. In this study, factors such as the status of buying and selling land, standard deviation of habitants' income, changes in green space, land-use realization rate, and building violation formed the indicators for appraising the land market. The MORRIS model was used to evaluate the rate of development of this case study in three general groups, namely economical, social-cultural, and spatial-physical. The TOPSIS model was also used in classifying the development of each urban district. The effect of each development indicator on the general development was attained by using multivariate regression. The results showed that the economical development indicator has the highest effect on total development of the district. Pearson's correlation coefficient was used to study the relationship between each indicator of the urban land market and the development of neighborhoods in this district. The sale indicator for the effect of the urban land market on urban district development was evaluated by the causal modeling method, which has the highest influence on the spatial development in Mashhad. In fact, owing to the price of land in some neighborhoods, selling and buying of land increased – it resulted in land speculation, development of some parts of the district, and reduction of spatial equality among neighborhoods. It is suggested that introducing a more accurate tax system can reduce urban land speculation.

KEYWORDS: Urban land market; Spatial development; Neighborhoods development; TOPSIS; Mashhad

1. INTRODUCTION

In recent decades, fast growth of urban population has caused a downward spiral environmentally, as can be observed in many of the cities in developing countries. An urban development policy, therefore, becomes a crucial and serious responsibility. Such a policy with the organized guidance of a constructive process should remove the disorders as well as prevent the appearance of disorders, especially in social and physical dimensions (El Araby 2003). The rapid growth of cities have caused social, economical, and physical problems such as rising poverty, housing problems, failure in urban services, illegal settlements, social crime, air pollution, and dwindling green spaces, among others problems (Wagrowski, Hites 1996). Urban planning is looking for some goals such as decreasing urban density (Naess 2001), distribution of the population all around the area (Clarke *et al.* 1997), controlled exploitation of natural resources (Hall 1988), provision of housing (Linneman 1980), and balance in urban networks (Cullen, Godson 1975)

Land is the basic element shaping the development and expansion of cities (Van der Molen 2002). Therefore, land offering quality and quantity for developing and expanding the city plays a key role in developing both urban normality and abnormality. The first and most important economical theory, which serves as the base of many other theories, is the supply and demand theory. In the market of land supply and demand, it is supposed that land as a supply object is limited because it cannot be manufactured. Limited supply of land, which is the determining factor of its price and value, coupled with high demand for it, has made the land issue one of the necessities of planning in cities.Thus, the land market is not an ordinary market because it cannot be compared with the demand (Glaeser *et al.* 2005). Since the additional value of land is higher than other objects,

* Corresponding author. E-mail: g_katouli@yahoo.com

land value is the basic factor for the development of urban areas. In other words, land as an object for offering in the market is very important in determining the value and cost (Bao 2004).

For the study of urban land, it is important to explore legal, political, economical, investment, physical and spatial, technical, social, and environmental topics (El Araby 2003). It has been said that land as a whole is completely sourced from nature. Generally, land demand depends on factors such as population, size, uniqueness, visual form, household members, history, culture, and social relations (Hardie *et al.* 2000).

Iranian cities like Mashhad are confronted with many problems like dense population, high price of land and housing, and high rentals in some urban areas – these not only cause difficulty for medium- and low- income people, but also for new constructions in and around the city, affecting the spatial-physical growth. The land market has influenced the spatial development of these cities. In recent years, population and land market growth has severely changed the spatial structure of these cities. High-rise residential buildings are mainly built in areas where the price of land is high and therefore the main purpose of this research is to analyze the role of the urban land market in the spatial development of District three of Mashhad.

2. A REVIEW OF THE LITERATURE

The development of a city is a dynamic and continuous process, in which the property of the city and its physical space in horizontal and vertical directions increase in terms of quantity and quality (Balta *et al.* 2012), and if this process is quick and unplanned, space and physical features of the city will face problems and undergo harmful consequences (Jaeger *et al.* 2010). Therefore, urban development should be based on a plan so that on one hand, it gives importance to creating balance and equality between quality and quantity of that which is built in a city and, on the other hand, it considers the size of the urban population. Furthermore, in urban development, importance should be given to the urban environment and welfare of citizens as these are the most important objectives of urban planning (Gómez *et al.* 2010; Wallbaum *et al.* 2010).

The concept of urban space refers to the place of a metropolitan area, properties in that location and spatial organization in this whole (Hutchison 2009). Castells (2010) notes that space is a material production associated with other material factors. Among other factors, there is the human who gives credit for space, form and function within particular social relations.

A city is a spatial phenomenon formed by different layers: the morphological, economical, political, and socio-cultural. This phenomenon has grown and evolved over times (El Makhloufi 2012). Furthermore, in each historical period, its quantitative characteristics have changed to qualitative attributes required for that specific era.

Urban spatial development can be explained in the forms of urban unsustainable development and urban sustainable development. Urban unsustainable development is the result of increased migration from rural to urban areas and expansion of cities towards the slums which form informal settlement (Bolay 2006; Fox 2014; Uzun *et al.* 2010). Contrary to urban unsustainable development, there is urban sustainable development which nowadays is regarded as one of the most important management guidelines. Sustainable urban development is a form of urban development which not only pays attention to the protection of ecological resource (Yong *et al.* 2010), conditions of urban environment, and cultural and historical values but also to the changes in agricultural landuse and density levels for the prediction of present and future needs of the citizens. Therefore, that city is environmentally habitable and livable over time (Hosseini *et al.* 2016; Wheeler, Beatley 2014). Sustainable development places great emphasis on improvement of life quality. In other words, consideration of social indicators and providing social welfare and justice for everyone are its main goals (Deakin, Reid 2014; Fischer, Amekudzi 2011). Furthermore, equitable access to land and its efficient use is one of the major components of sustainable development.

The spatial growth of each city is divided into two categories of sprawl and compact. Each of these methods creates a separate and different framework. Physical development appears in the form of increasing the city limit or sprawl expansion, while vertical development appears as increasing the endogenous urban population and compact growth patterns (Burton *et al.* 2003; Dieleman, Wegener 2004).

Sprawl expansion of a city means rapid and fragmented growth of metropolitan areas and even small towns which is extended to rural areas in some cases. Urban sprawl on surrounding vacant land in the path of the transport network and along low-density exchange roads will cause environmental problems, unsustainable development, and formation of informal settlements on these

pieces of land (Burgess, Jenks 2002; Mirkatouli *et al.* 2015; Zhang 2000).

A lot of effort has been made to provide an accurate definition for a compact city. Burton (2000) defined it as a city with high density and combined land use which has a good transportation system and encourages walking and cycling. In other definitions, the emphasis is put on the growth of existent urban centers and recycled land, and at the same time, on avoiding the scattering and expanding of cities proper. A compact city has always been considered as a way for achieving urban sustainable form (Holden, Norland 2005). Rapid expansion of cities and their dispersal trigger undesirable effects on the natural, social, and cultural environment of the societies. A lot of effort has been made to reduce the negative effects of urban irrational growth, which is a smart growth approach (Katz *et al.*1994) and new urbanism (Steuteville 2000). In fact, the above-stated approaches are considered as substitution for the dispersal.

3. RESEARCH METHODS

The research method is descriptive-nominative and its type is practical-extension. The statistical society of this study was carried out in the third municipal district of Mashhad. The research tool was via the questionnaire method which consisted of two questionnaires, one is related to estate services and the other was administered to heads of households, distributed as per the systematic random method. After information collection, it was recorded using the geographical information system (GIS) and depicted on the map of Mashhad. Following the evaluation of the third district neighborhoods' development existing in three general groups namely: economical, social-cultural and spatial-physical, using the MORRIS model, the development classification of each neighborhood and discrepancy of each neighborhood from the least to the most was also averaged using TOPSIS model. To study the relationship between the different development indicators in the third municipality district of Mashhad, the Pearson model was used. In addition, the effect of each development indicator on total development was attained by Multivariate Enter Regression. Finally, to study the relationship between land market revenue with the neighborhood's development of this case study the Pearson correlation was used. The effect of urban land marketing indicators on development indicators is attained by Causal modeling method or structural equations model which is the most prominent analysis method in intricate data structures using the AMOS (Table 1). Collecting information from all around the district requires time and effort in the studied area. With attention to the high volume of statistical society, time limitation and financial sources, this research was done among 76804 household in statistical society. In order to obtain the required data from cities, we have made use of field survey technique; based on Cochran formula (Eq. (1)) a total of 382 questionnaires were distributed among the households as the unit of analysis of the third district of Mashhad. Then Cronbach alpha was used to analyze the perpetuity of the research questionnaire, this is a common method. According to the use of the household questionnaire, the perpetuity of this questionnaire is 0.763:

$$n = \frac{\frac{t^2 pq}{d^2}}{1 + \frac{1}{N}\left(\frac{t^2 pq}{d^2} - 1\right)}, \tag{1}$$

where: n – the sample size; N – population of city; p – percentage of people who have the specific attribute in the city; q – percentage of people who do not have that the specific attribute in the city; t – constant coefficients; d – acceptable margin of error for proportion of population having the specific attribute.

Table 1. Analytic relation between measurable variants in a studied confine

Variant type	Variant	Level of development	Statistics		
Dependent	Spatial development	– Very low – Low – Medium – High – Very high	Development evaluation with MORRIS Classification with TOPSIS Effect of development index on total with R-Enter	Pearson correlation coefficient	Structural equations analysis with Amos
Independent	Urban land market revenue	– Land purchase and sale – Habitant income digression – Change use of green places – Range of achievable usage – Building violations			

In this study p = 50%, q = 50%, t = 1.96 (95% level) and d = 0.05%:

$$n = \frac{\frac{1.96^2 \cdot 0.5 \cdot 0.5}{0.05^2}}{1 + \frac{1}{76804}\left(\frac{1.96^2 \cdot 0.5 \cdot 0.5}{0.05^2} - 1\right)} = 382.$$

4. CASE STUDY

Mashhad city is located at 36.20° N latitude and 59.35° E longitude. Its elevation is 970 meters and its atmospheric distance from Tehran is 750 km. The area of Mashhad was about 30000 acres in the year 2015 (Fig. 1). Being home to the holy shrine of Imam Reza which is one of the most important Shiite shrines, Mashhad welcomes more than 17 million pilgrims annually from all around Iran and other Muslim countries. The district three of Mashhad is one of its thirteen districts with the area of 26.32 km^2 (8.8% of city's area) and its population was estimated as about 303915 people (14.06% of the city's population) in the year 2011 (Statistical Center of Iran 2011). This district runs from the center of Mashhad to the northern part.

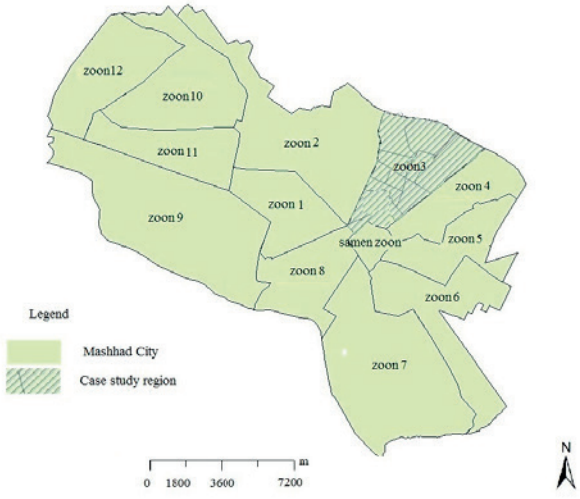

Fig. 1. The districts of Mashhad

5. RESULTS

This paper used indicators for land market performance and spatial-physical development which will be analyzed as follows:

Efficiency: The managing system of the land market promotes fast development and transactions of land. According to the above definition, the rate of urban land purchased and sold in each of the neighborhoods shows the efficiency of that neighborhood. To attain this rate, some questionnaires were completed in real estate.

Equality: The managing system of the land market provides the possibility of reasonable access to different-income groups. To attain equality at society level, which is one of the criteria of land market performance evaluation, standard deviation of habitants' income was used as its criteria.

Compatibility with the environment: The managing system of the land market guarantees land sustainability for current generation and will consider the sustainability for users of next generation. To evaluate this indicator after assembling layers of agricultural land-use in 1996 and 2006, the amount of green land destruction is determined, and urban development indicator on green spaces is calculated.

Harmonization: The managing system of land market should be coordinated with other rules and regulations such as planning and taxes. Therefore, two indicators of land-use realization – educational land-use was studied here – and the rate of building violations were studied as an evaluator for the urban land market.

In conclusion, indicators below were used to assess the land market performance in the evaluation of spatial-physical development of neighborhoods in district three of Mashhad (Fig. 2).

5.1. Urban land price

Based on the obtained information, the price of land in the third municipal district of Mashhad was valued as 330 USD per square meter. The average price per square meter of land with the separation of existent neighborhoods and related information to each of the variants in the studied confine is shown in Table 2 and Figure 3.

5.2. Spatial development

At first, total indicators for determining the level of development are chosen and then sub-indicators of each indicator are determined. After classification, the indicators were placed in three general groups of economical, social-cultural, and spatial-physical, thus 21 indicators were totally used with eight indicators for determining the level of social-cultural development, five indicators for evaluating the extent of economical development and eight indicators for evaluating the extent of spatial-physical development as shown in Figure 2.

The United Nations Development Programme (UNDP) used a famous pattern named MORRIS to grade districts in terms of development, this is the newest official pattern used at a universal level and is applicable to planned places with different and vari-

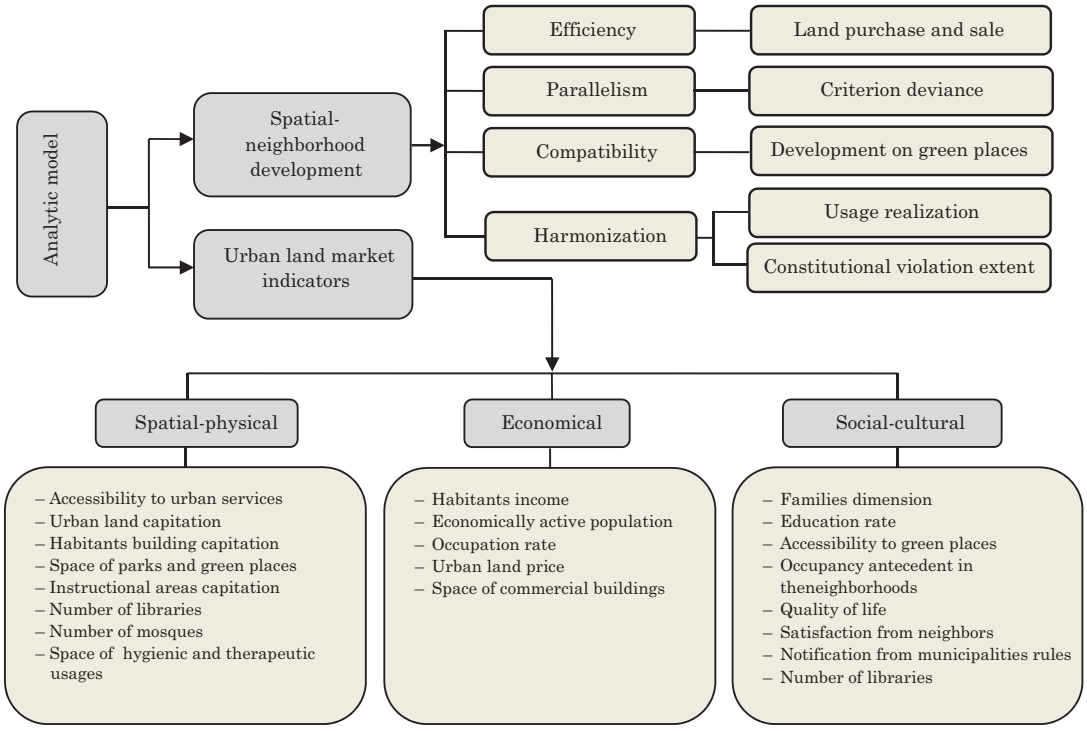

Fig. 2. The analytic model of urban land market role in spatial development of the city

Table 2. Status of land price and indicator of urban land market in the third district of Mashhad

Neighborhoods	Land price (IRR)*	Extent of purchase and sale	Habitant income deviance (IRR)*	Change in usages of green places (meter)	Usage realization (percent)	Constitutional violations
Hashemi Nejad	18457230	4	61719	0	16.8	39
Rah Ahan	17417422	4	85759	0	23	35
Sheikh Sadugh	12265341	3	81185.5	0	35	30
Fatemiyeh	12451014	3	88140	0	0	25
Resalat	12154312	2	121722.7	5610	4	52
Gaze Aval	11533072	3	118578	0	0	25
Gaze Dovom	8979613	2	55639	0	50	18
Northern Tabarsi	5338365	1	173744	437400	100	40
Darvi	6463034	1	152580	90901	0	24
Balal	8383757	2	142427.5	2174	21	28
Sis Abad	1192020	1	164222	61502	0	5
Khaje Rabi	5892215	1	164222	76630	16.8	15

* On average, in 2015: 1000 Rial (IRR) = 0.034 USD.

able scales. This pattern is one of the most effective methods in the context of reasonable combination of indicators assessing development of districts. In general, this indicator is calculated as shown in Eq. (2):

$$Y_{ij} = \frac{x_{ij} - x_i Min}{x_i Max - x_i Min}. \quad (2)$$

In this formula Y_{ij} is the MORRIS discordant indicator for the (i) variant in (j) unit; $x_i Min$ is the minimum extent of the (i) variant and $x_i Max$ is the maximum of the (i) variant.

At first, data related to each of these variables were collected from the studied districts, and evaluation of development for three general indicators in each of the neighborhoods in district three of Mashhad was conducted using the MORRIS model. From the total scores attained from all existent indicators, it was found that Hashemi Nejad, Rah-Ahan and Fatemiyeh neighborhoods have a higher development level than other neighborhoods of this district, and Sis Abad, Khaje Rabi and Tabarsi neighborhoods have a lower development level

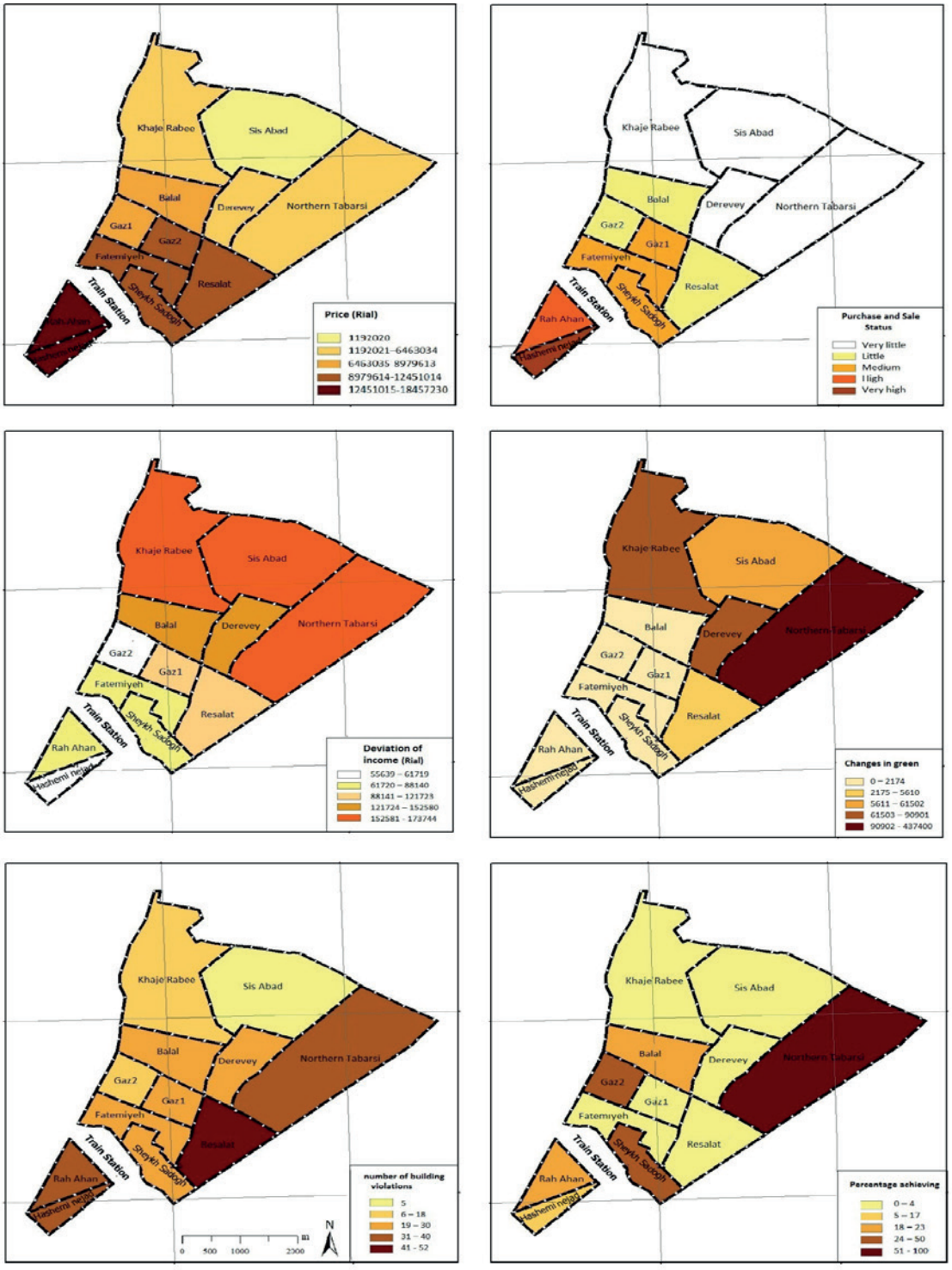

Fig. 3. Land price and urban land market indicator in third district of Mashhad

than other neighborhoods and need greater attention of the authorities (Table 3).

5.3. Rating and evaluating final development of neighborhoods with TOPSIS model

A multiple criterion decision making (MCDM) problem is characterized by the ratings of each alternative with respect to each criterion and the weights given to each criterion (Xiao *et al.* 2012). Due to the complexity and uncertainty involved in real world decision problems, it is sometimes unrealistic or even impossible to create exact judgments. It is therefore more natural or realistic that a decision maker (DM) is allowed to provide judgments instead of precise comparisons (Peng, Tzeng 2013; Pourahmad *et al.* 2015; Zavadskas *et al.* 2014; Faraji Sabokbar *et al.* 2016).

Table 3. Nomination of neighborhood developmentlevel in district three of Mashhad with the MORRIS model

Neighborhoods	Social-cultural	Economical	Spatial-physical	Final average
Hashemi Nejad	0.73	0.93	0.5	0.72
Rah Ahan	0.85	0.79	0.45	0.7
Sheikh Sadugh	0.54	0.5	0.51	0.52
Fatemiyeh	0.82	0.47	0.35	0.54
Resalat	0.41	0.43	0.44	0.42
Gaze Aval	0.51	0.41	0.33	0.42
Gaze Dovom	0.24	0.48	0.33	0.35
Northern Tabarsi	0.42	0.24	0.37	0.34
Darvi	0.5	0.31	0.41	0.41
Balal	0.43	0.38	0.35	0.39
Sis Abad	0.15	0.36	0.13	0.21
Khaje Rabi	0.17	0.21	0.34	0.24

TOPSIS (Techniques for Order of Preference by Similarity to Ideal Solution) model is used for rating each neighborhood in terms of development as well as the difference of each neighborhood from minimum and maximum average. The TOPSIS model proposed by Hwang and Yoon (1981) is a method for selecting the better choice based on the minimum and maximum distance from the ideal solution (Zhu, Buchmann 2002). In this method, different choices are evaluated based on their distance from the positive ideal solution and negative ideal solution accordingly. Analytical subjects in MCDM are considered as a geometric system in which m choice with n criterion are evaluated. These choices are like *m* spot in *n* dimension space, in which the best choice is the nearest spot to ideal response and furthest choice is the worst response (Behzadian *et al.* 2012; Kahraman *et al.* 2016; Sabokbar *et al.* 2016).

Step 1. To attain decision matrix and normalize it from this Eq. (3):

$$r_{ij} = x \Big/ \sqrt{\sum_{i:1}^{n} x_{ij}^2} \quad . \tag{3}$$

Step 2. To give burden to the normalized decision matrix.

Step 3. To assign positive and negative ideal solutions from Eq. (4):

$$A^+ = \left\{\left(\left(\max_i v_{ij}\right) | j \in J\right), \left(\left(\min_i v_{ij}\right) | j \in J\right) | i : 1,2,3,\ldots,m\right\} = \left\{v_1^+, v_1^+, \ldots, v_n^+\right\};$$

$$A^- = \left\{\left(\left(\min_i v_{ij}\right) | j \in J\right), \left(\left(\max_i v_{ij}\right) | j \in J\right) | i : 1,2,3,\ldots,m\right\} = \left\{v_1^-, v_1^-, \ldots, v_n^-\right\}. \tag{4}$$

Step 4. To calculate distance limit with positive and negative ideal by Eq. (5).

$$S_i^{max} = \sqrt{\sum_{j:1}^{n} \left(v_{ij} + v_j^{max}\right)^2} \, . \tag{5}$$

Table 4. Rating and determining of final development level neighborhoods with TOPSIS

Neighborhoods	Distance from the least extent	Distance from the most extent	Relative proximity	Rank
Hashemi Nejad	0.07	0.59	0.90	1
Rah-Ahan	0.09	0.56	0.86	2
Sheikh Sadugh	0.30	0.39	0.57	4
Fatemiyeh	0.29	0.43	0.59	3
Resalat	0.38	0.30	0.44	5
Gaze Aval	0.38	0.27	0.42	6
Gaze Dovom	0.44	0.22	0.33	9
Northern Tabarsi	0.47	0.23	0.31	10
Darvi	0.41	0.29	0.41	7
Balal	0.41	0.24	0.37	8
Sis Abad	0.58	0.09	0.13	12
Khaje Rabi	0.57	0.16	0.22	11

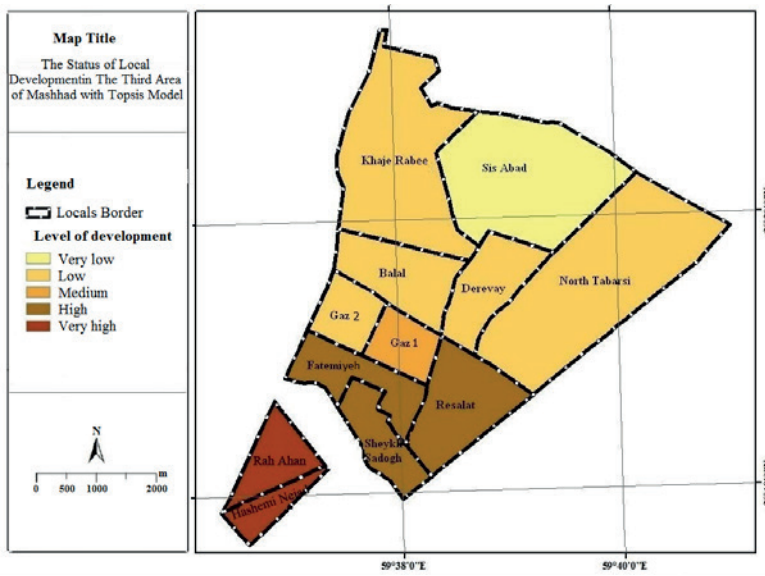

Fig. 4. Total rating of neighborhood development in district three of Mashhad with TOPSIS

Step 5. To calculate comparative proximity by Eq. (6):

$$C_{ij} = S_i^{min} \Big/ S_i^{max} + S_i^{min}. \quad (6)$$

The results of steps 4 and 5 shown in Figure 4 and Table 4.

5.4. Relationship between development indicators

Pearson correlation was used to estimate the relationship between different development indicators and total indicators in district three of Mashhad. Social-cultural development indicator had the higher correlation with total indicator (TOPSIS) followed by spatial-physical development indicator with greater difference than aforementioned indicators (Table 5).

5.5. The effect of each indicator on total development

Multi-regression analysis was used to evaluate the effect of each economical, social-cultural and spatial-physical indicator on the total development indicator.

In multi-regression analysis method, all independent variables enter simultaneously into analysis, and then effects of all independent variables on dependent variables are studied. In the first step, to use this model, it is necessary to study the effect of independent variables on the dependent variables.

In this study, the regression results show that the highest coefficient of Beta (ß) is for economical variables with the coefficient of 0.481 followed by social-cultural and spatial-physical indicators. Furthermore, this test was significant at the level of 99%; the regression results are presented in Tables 6 and 7.

Analysis of the above multivariate regression results for each variant through standard and mathematical way is as shown in Eq. (7):

$$Y = b0 + X1b1 + X2b2 + X3b3 + \ldots + Xnbn. \quad (7)$$

In this formula,the dependent variant (*Y*) shows the extent of districtdevelopment.

Table 6. Regression analysis and model nomination coefficient

Model	Regression	Nomination coefficient	Coefficient balanced nomination
1	0.998	0.995	0.993

Table 5. Correlation of each development indicator with the total indicator (TOPSIS)

Indicator	Social-cultural	Economical	Spatial-physical	TOPSIS
Social-cultural	1	0.682	0.612	0.902
Economical	0.682	1	0.512	0.895
Spatial-physical	0.612	0.512	1	0.748
TOPSIS	0.902	0.895	0.748	1

Table 7. Regressionanalysis statistics of the neighborhoods development indicators

Coefficient	Standard coefficient	Unstandardized coefficient		t	Sig
Indicators	Beta coefficient	Error of criterion deviance	B		
Constant		0.022	–0.194	–8.686	0.000
Social-cultural (X1)	0.427	0.37	0.428	11.540	0.000
Economical (X2)	0.481	0.38	0.532	14.097	0.000
Spatial-physical (X3)	0.240	0.73	0.554	7.604	0.000

Dependent variants = $X1, X2, \ldots b0(i = 0, 1, 2, \ldots n)$ stable coefficient.

Therefore, the regression formula is as shown in Eq. (8):

$$Y = -0.194 + (x1 \cdot 0.427) + (x2 \cdot 0.481) + (x3 \cdot 0.240). \quad (8)$$

5.6. Correlation analysis between development level and urban land market performance

Correlation is used to study the relationship between indicators of land market performance and development level of neighborhoods of this district. The correlation was taken between the rate of buying and selling urban land, standard deviation of habitants' income, urban development in existent green spaces, achievement of land uses and building violation rate, and the extent of neighborhoods' development. The below results are obtained.

In Table 8, the correlation coefficient (0.898) between buying and selling land and neighborhoods' development of this district shows a direct relation at the level of 99%, suggesting that a neighborhood with higher development level has higher amount of buying and selling land. Moreover, there is a direct relationship between building violation and development level of neighborhoods in district three of Mashhad; building violation is committed mainly in a neighborhood with higher level of development. The correlation coefficient (–0.707) between standard deviation of habitants' income and neighborhoods' development level shows that there is a reverse relation between these two variables; suggesting that the higher difference between habitants' income prevents the development of that district and vice-versa. Lack of significant difference between realization of land-use and neighborhoods' development indicates lack of relationship between these indicators; in fact, there is no relationships between land-use realization and neighborhood development. Furthermore, relation between urban development in green spaces and neighborhoods' development confirms the lack of significance of test between these two indicators. In fact, there is no relationship between these two indicators.

Table 8. Correlation relation between neighborhoods development with the indicators of land market revenue

Variants	Statistical test	Neighborhoods development
Land purchase and sale	Pearson correlation coefficient	0.898
	Sense level	0.000**
Building violations	Pearson correlation coefficient	0.604
	Sense level	0.027*
Usages realization	Pearson correlation coefficient	–0.395
	Sense level	0.258 ^{ns}
Criterion deviance of habitants income	Pearson correlation coefficient	–0.707
	Sense level	0.010*
Urban development on green places	Pearson correlation coefficient	–0.413
	Sense level	0.182 ^{ns}

** Making sense of 99%; * Making sense of 95%; ^{ns} Lack of sense.

5.7. Study the effect of urban land market on development level of neighborhoods

Since there are several independent variables in the present research, their effects on dependent variables should be studied, using structural equations. The AMOS was used to explain the relation between efficiency indicators of urban land market and neighborhoods' development. In the above model, seven indicators were defined which are shown in Table 9.

Table 9. Research types of variables (efficiency of land market)

Variant type	Number
Total variants of the model	7
Observed variants	6
Non observed variants	1
External variants	6
Internal variants	1

The status of indicators in the total performance of measurement model shows that the covered statistic level of x^2 was at 99%, this means that the obtained data which is related to variables show an appropriate performance of neighborhoods' development level in this district. Since the amount of error in this model was obtained as 2.4%, the performance of the model is good. Other indicators related to the performance of this model show suitable status as well (Fig. 5).

Assessing of the graphical output of the regression model using the AMOS shows that the rate of purchase and sale of land has a direct and significant effect on the neighborhood's development in district three of Mashhad. In this test, land purchase and sale (0.64) showed the highest influence on development level. Furthermore, land-use realization and building violations are considered as related subjects (although, violation causes lack of coordination). In this study, the coefficient of land-use realization (0.33) shows a reverse effect on the neighborhoods development level. In fact, if the land uses were achieved ten years ago accurately and were put in effect, neighborhood development would decrease by the same amount. Expansion of green spaces with the amount of 0.33 is an important component compatible with environment. Standard deviation of income (–0.27), which has been a component of equality in studying the efficiency of land market, has a role to play in the development of neighborhoods. The diagram below shows the relations between variables using the AMOS.

In addition to the indicators of model total performance, indicators of model minor performance are studied in structural equations modeling. In indicators of minor performance, the significance of all relations defined in the model is tested. Table 10 shows the status of indicators of the model minor performance. The covered statistic level in the column of standard deviation of habitants' income is 0.027% which shows that the test was significant at 95%, and in other columns, three stars represent that the significant level is at more than 99%.

Thus, the price of urban land has a critical role in spatial development of this urban district. In fact, high price of urban land and high levels of development (economical, social-cultural, and spa-

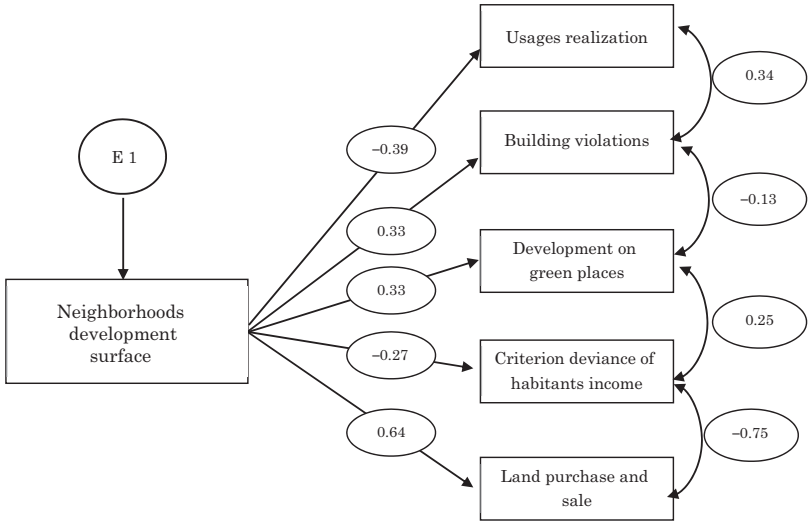

Fig. 5. Structural equations graphical analysis of urban land performance on neighborhoods development level with the AMOS model

Table 10. Indicators of minor performance of structural development equations in the district three of Mashhad

Dependent variants	Independent variants	Estimation	Sense
Neighborhoods development	Urban land purchase and sale	0.086	0.000**
	Usages realization	–0.002	0.000**
	Urban development on existent green places	0.000	0.000**
	Criterion deviance of habitant income	0.000	0.027*
	Extent of constitutional violation	0.004	0.000**

** Making Sense in 99%; * Making Sense in 95%.

tial-physical) in some districts including Hashemi Nejad and Rah-Ahan led to an increase in the rates of buying and selling land. Following the increase in buying and selling of land which somehow results in land speculation, high-income people seek building violations at high levels in such neighborhoods. Of the most important violations is changing land-use and extra density which leads to high-rise construction with high density. Increase in the level of spatial development has resulted in higher settlement of people in such neighborhoods, and provision of urban services and facilities in such neighborhoods increases proportionally. Therefore, increase in construction and population, and existence of urban facilities and utilities are the most important causes of spatial development in this metropolitan area which makes some neighborhoods different from other neighborhoods.

6. CONCLUSION

The results of this study showed that the average price per square meter of land in district three of Mashhad is equivalent to 330 USD, with Hashemi Nejad and Sis Abad neighborhoods having the highest and lowest price with an average price of 600 USD and 40 USD per square meter, respectively. Moreover, using TOPSIS model, overall criteria of development was evaluated by measuring three overall variables of economical, socio-cultural and physical which included 28 sub criteria. The results show that Hashemi Nejad and Rah-Ahan neighborhoods have the highest level of spatial development compared to other neighborhoods of this metropolitan area due to economic reasons such as high income of households and other factors such as having urban facilities, utilities, and proximity to the holy shrine of Imam Reza.

Furthermore, the effects of urban land market on spatial development of this district using AMOS were assessed so that purchase and sale of land with 0.64% and building violations with 0.33% had the greatest impact on spatial development of district three of Mashhad. In fact, because of the proximity of Imam Reza shrine to Hashemi Nejad and Rah-Ahan neighborhoods, the land of these areas had greater value leading to oversselling and overbuying of land. With increase in buying and selling of land, speculators of land and housing increase leading to land speculation in this district. Land speculation, building violations and change of green space land-use are the most important factors leading to higher construction with higher density in this district. Moreover, the city officials provide the major utilities in areas with high prices of land, pay less attention to other areas, and refrain from giving services to deprived neighborhoods. Spatial development in Hashemi Nejad and Rah-Ahan neighborhoods, low level of development in neighborhoods such as Sis Abad and Khajeh Rabih and lack of investment in such neighborhoods caused spatial equality to suffer in this district.

Based on the above-mentioned points, steps should be taken to prevent land speculation in these neighborhoods. It is proposed that higher tax and further fines should be imposed on buying and selling land, and on building violations and land-use changes, respectively. Moreover, according to the surveys and information obtained in this study, lack of balanced use of urban facilities is clearly pronounced between the neighborhoods of this area, thereby leading to a big difference between the prices of urban land in this district, an issue which is not in accordance with civil justice. It is also proposed that urban facilities and services are distributed equally among residents of this district in order to prevent the increase of land prices in some districts.

ACKNOWLEDGEMENTS

The authors would like to express their sincere thanks to the anonymous reviewers for their constructive comments, which have been very helpful in improving the paper.

REFERENCES

Balta, M. Ö.; Tekel, A.; Tekel, H. I. 2012. Urban development process of built environments in metropolitan areas in Turkey: case study of Angora settlement, Ankara, *Journal of Urban Planning and Development* 138(1): 70–77. https://doi.org/10.1061/(ASCE)UP.1943–5444.0000101

Bao, Z. H. 2004. How to look on housing price in our country, *China Real Estate* 1: 18–19.

Behzadian, M.; Otaghsara, S. K.; Yazdani, M.; Ignatius, J. 2012. A state-of the-art survey of TOPSIS applications, *Expert Systems with Applications* 39(17): 13051–13069. https://doi.org/10.1016/j.eswa.2012.05.056

Bolay, J.-C. 2006. Slums and urban development: questions on society and globalisation, *European Journal of Development Research* 18(2): 284–298. https://doi.org/10.1080/09578810600709492

Burgess, R.; Jenks, M. 2002. *Compact cities: sustainable urban forms for developing countries*. Routledge.

Burton, E. 2000. The compact city: just or just compact? A preliminary analysis, *Urban Studies* 37(11): 1969–2006. https://doi.org/10.1080/00420980050162184

Burton, E.; Jenks, M.; Williams, K. 2003. *The compact city: a sustainable urban form?* Routledge.

Castells, M. 2010. *The rise of the network society – The information age: economy, society, and culture*. John Wiley & Sons.

Clarke, K. C.; Hoppen, S.; Gaydos, L. 1997. A self-modifying cellular automaton model of historical urbanization in the San Francisco Bay area, *Environment and Planning B-Planning & Design* 24(2): 247–261. https://doi.org/10.1068/b240247

Cullen, I.; Godson, V. 1975. Urban networks: the structure of activity patterns, *Progress in Planning* 4: 1–96. https://doi.org/10.1016/0305–9006(75)90006–9

Deakin, M.; Reid, A. 2014. Sustainable urban development: use of the environmental assessment methods, *Sustainable Cities and Society* 10: 39–48. https://doi.org/10.1016/j.scs.2013.04.002

Dieleman, F.; Wegener, M. 2004. Compact city and urban sprawl, *Built Environment* 30(4): 308–323. https://doi.org/10.2148/benv.30.4.308.57151

El Araby, M. M. 2003. The role of the state in managing urban land supply and prices in Egypt, *Habitat International* 27(3): 429–458. https://doi.org/10.1016/S0197–3975(02)00068–1

El Makhloufi, A. 2012. *Spatial-economic metamorphosis of a Nebula City: Schiphol and the Schiphol region during the 20th Century*. Routledge.

Faraji Sabokbar, H.; Ayashi, A.; Hosseini, A.; Banaitis, A.; Banaitienė, N.; Ayashi, R. 2016. Risk assessment in tourism system using a fuzzy set and dominance-based rough set, *Technological and Economic Development of Economy* 22(4): 554–573. http://dx.doi.org/10.3846/20294913.2016.1198840

Fischer, J. M.; Amekudzi, A. 2011. Quality of life, sustainable civil infrastructure, and sustainable development: strategically expanding choice, *Journal of Urban Planning and Development* 137(1): 39–48. https://doi.org/10.1061/(ASCE)UP.1943–5444.0000039

Fox, S. 2014. The political economy of slums: theory and evidence from Sub-Saharan Africa, *World Development* 54: 191–203. https://doi.org/10.1016/j.worlddev.2013.08.005

Gómez, F.; Jabaloyes, J.; Montero, L.; De Vicente, V.; Valcuende, M. 2010. Green areas, the most significant indicator of the sustainability of cities: research on their utility for urban planning, *Journal of Urban Planning and Development* 137(3): 311–328. https://doi.org/10.1061/(ASCE)UP.1943–5444.0000060

Glaeser, E. L.; Gyourko, J.; Saks, R. E. 2005. Why have housingprices gone up?, *American Economic Review* 95(2): 329–333. https://doi.org/10.1257/000282805774669961

Hall, P. 1988. *Cities of tomorrow*. Blackwell Publishers.

Hardie, I.; Parks, P.; Gottleib, P.; Wear, D. 2000. Responsiveness of rural and urban land uses to land rent determinants in the U.S. South, *Land Economics* 76(4): 659–673 https://doi.org/10.2307/3146958

Holden, E.; Norland, I. T. 2005. Three challenges for the compact city as a sustainable urban form: household consumption of energy and transport in eight residential areas in the greater Oslo region, *Urban Studies* 42(12): 2145–2166. https://doi.org/10.1080/00420980500332064

Hosseini, A.; Pourahmad, A.; Pajoohan, M. 2016. Assessment of institutions in sustainable urban-management effects on sustainable development of Tehran: learning from a developing country, *Journal of Urban Planning and Development* 142(2): 05015009. https://doi.org/10.1061/(ASCE)UP.1943–5444.0000301

Hutchison, R. 2009. *Encyclopedia of urban studies*. Sage Publications.

Hwang, C.-L.; Yoon, K. 1981. *Multiple attribute decision making: methods and applications*. Springer. https://doi.org/10.1007/978–3-642–48318–9

Jaeger, J. A.; Bertiller, R.; Schwick, C.; Kienast, F. 2010. Suitability criteria for measures of urban sprawl, *Ecological Indicators* 10(2): 397–406. https://doi.org/10.1016/j.ecolind.2009.07.007

Kahraman, C.; Suder, A.; Bekar, E. T. 2016. Fuzzy multiattribute consumer choice among health insurance options, *Technological and Economic Development of Economy* 22(1): 1–20. https://doi.org/10.3846/20294913.2014.984252

Katz, P.; Scully, V. J.; Bressi, T. W. 1994. *The new urbanism: toward an architecture of community*. McGraw-Hill.

Linneman, P. 1980. Some empirical results on the nature of the hedonic price function for the urban housing market, *Journal of Urban Economics* 8(1): 47–68. https://doi.org/10.1016/0094–1190(80)90055–8

Mirkatouli, J.; Hosseini, A.; Neshat, A. 2015. Analysis of land use and land cover spatial pattern based on Markov chains modelling, *City, Territory and Architecture* 2(1): 1–9.

Naess, P. 2001. Urban planning and sustainable development, *European Planning Studies* 9(4): 503–524. https://doi.org/10.1080/09654310120049871

Peng, K.-H.; Tzeng, G.-H. 2013. A hybrid dynamic MADM model for problem-improvement in economics and business, *Technological and Economic Development of Economy* 19(4): 638–660. https://doi.org/10.3846/20294913.2013.837114

Pourahmad, A.; Hosseini, A.; Banaitis, A.; Nasiri, H.; Banaitienė, N.; Tzeng, G.-H. 2015. Combination of fuzzy-AHP and DEMATEL-ANP with GIS in a new hybrid MCDM model used for the selection of the best space for leisure in a blighted urban site, *Technological and Economic Development of Economy* 21(5): 773–796. https://doi.org/10.3846/20294913.2015.1056279

Sabokbar, H. F.; Hosseini, A.; Banaitis, A.; Banaitiene, N. 2016. A novel sorting method TOPSIS-sort: an application for Tehran environmental quality evaluation, *E&M Ekonomie a Management* 19(2): 87–104. https://doi.org/10.15240/tul/001/2016–2-006

Statistical Center of Iran. 2011. *Yearbook of Mashhad*. Mashhad.

Steuteville, R. 2000. The new urbanism: an alternative to modern, automobile-oriented planning and development, *New Urban News*, 1–6.

Uzun, B.; Çete, M.; Palancıoğlu, H. M. 2010. Legalizing and upgrading illegal settlements in Turkey, *Habitat International* 34(2): 204–209. https://doi.org/10.1016/j.habitatint.2009.09.004

Van der Molen, P. 2002. The dynamic aspect of land administration: an often-forgotten component in

system design, *Computers, Environment and Urban Systems* 26(5): 361–381. https://doi.org/10.1016/S0198–9715(02)00009–1

Wagrowski, D. M.; Hites, R. A. 1996. Polycyclic aromatic hydrocarbon accumulation in urban, suburban, and rural vegetation, *Environmental Science & Technology* 31(1): 279–282. https://doi.org/10.1021/es960419i

Wallbaum, H.; Krank, S.; Teloh, R. 2010. Prioritizing sustainability criteria in urban planning processes: methodology application, *Journal of Urban Planning and Development* 137(1): 20–28.

Wheeler, S. M.; Beatley, T. 2014. *Sustainable urban development reader*. Routledge.

Xiao, Z.; Xia, S.; Gong, K.; Li, D. 2012. The trapezoidal fuzzy soft set and its application in MCDM, *Applied Mathematical Modelling* 36(12): 5844–5855. https://doi.org/10.1016/j.apm.2012.01.036

Yong, Y.; Zhang, H.; Wang, X.-R.; Schubert, U. 2010. Urban land-use zoning based on ecological evaluation for large conurbations in less developed regions: case study in Foshan, China, *Journal of Urban Planning and Development* 136(2): 116–124. https://doi.org/10.1061/(ASCE)0733–9488(2010)136:2(116)

Zavadskas, E. K.; Turskis, Z.; Kildienė, S. 2014. State of art surveys of overviews on MCDM/MADM methods, *Technological and Economic Development of Economy* 20(1): 165–179. https://doi.org/10.3846/20294913.2014.892037

Zhang, T. 2000. Land market forces and government's role in sprawl: the case of China, *Cities* 17(2): 123–135. https://doi.org/10.1016/S0264–2751(00)00007-X

Zhu, Y.; Buchmann, A. 2002. Evaluating and selecting web sources as external information resources of a data warehouse, in *Proceedings of the 3rd International Conference on Web Information Systems Engineering WISE 2002*, 12–14 December 2002, Singapore, 149–160.