Modeling and location of urban hotel construction with emphasis on investment risk in Tehran metropolis

Abstract

Given the significant contribution of the tourism industry to the economy, any effort to build new hotels needs meticulous planning to ensure they will be well-positioned to deliver economic payoffs in addition to achieving their customer satisfaction objectives. In the last three decades, the growth of tourist accommodation services, especially hotels, has been in such a way that the atmosphere of the big cities has been affected by extensive geographical and spatial competition issues, and the competition of capitalists in choosing the location of hotels brings spatial challenges. For this purpose, this article examines the factors affecting the location of urban hotels and their spatial reflections using GIS-MCDA combination, emphasizing the risk in investment. Mapping was performed using spatial data in three categories of socio-cultural, environmental, and economic criteria. Analytic Hierarchy Process (AHP) was used for criteria weighting and Ordered Weighted Averaging (OWA) was used to introduce a risk attitude (level of aversion to investment risk) to mapping. The results showed that among the examined criteria, the most important for this mapping are "distance from existing hotels" (socio-cultural) "distance from roads" (economic), and "distance from polluting industries" (environmental), respectively. In the maps incorporating risk attitude, the study area was classified into five zones representing different levels of suitability for hotel construction: highly unsuitable, unsuitable, neutral, suitable, and highly suitable. At the lowest risk aversion level (ORness=1), 34.8% of the study area was classified as "highly suitable" for hotel construction, but at the highest risk aversion level (ORness=0), only 1.4 % of the entire area fell in this zone.

Keywords: Site selection, Hotel, GIS, OWA-AHP, Tehran metropolis.

Introduction

Tourism is one of the world's largest industries, constituting a major part of the global economy in the 21st century (WTO, 1999). In recent decades, the world has seen a steady increase in the number of tourists as well as foreign exchange earnings from tourism (Thomas et al., 2005).

How tourists perceive their travel comfort highly depends on the location of hotels. Indeed, the location of hotels has long been one of the major determinants of tourists' satisfaction with destinations (Lee et al., 2010).

Hotels also play an important role in tourism as the origin and destination of daily trips. The location and spatial distribution of hotels in a city can change the service space as well as the behavior of tourists. The longer the distance between the hotel and the city center and tourist attractions, the higher the cost will be for the visiting tourists. Hence, hotels have a major impact on the economy of the tourism industry (Law Christopher, 1996).

Determining the right location for the construction of new hotels is a critical part of sustainable tourism planning (Yang et al., 2014).

Unlike the construction industry, the hotel industry is essentially a service industry with heavy reliance on the choice of location so as to succeed in the fierce competition to attract tourists (Yang et al., 2018).

How well hotels are located also affects their job creation capacity as well as revenue and profitability (Sim et al., 2006).

Since tourists who stay in well-positioned hotels tend to be more satisfied, in-depth analyses are needed to determine the factors affecting the choice of hotel location (Yang et al., 2012).

In addition to having the necessary infrastructure in terms of transport, water, and electricity, the ideal location for building a hotel should be near historical monuments, parks, recreation centers, and other tourist attractions that tend to be appealing to tourists (Popovic et al., 2019).

Choosing the location of a new hotel is a costly and time-consuming task that must be accomplished well before the hotel can be purchased or built. While performing this task, it is also necessary to estimate the appropriate specifications and capacity for facilities. In this endeavor, hotel owners (decision-makers) need to choose the location such that the venture is not only profitable in the current conditions but also remains profitable with changes in environmental, population, and market factors over time (Chou et al, 2008).

Thus, choosing the right location for a hotel is a difficult task requiring hotel owners (decision-makers) to predict future events. This decision is made even more difficult by the fact that it can be impacted by a variety of complex multivariate factors that can be hard to evaluate and measure (Roginsky, 1995).

In order to find a suitable location for building a hotel, hotel owners (decision-makers) must perform a comprehensive analysis of all environmental, economic, social, cultural, and political factors that may affect the performance of the hotel, as this performance can be impacted by changing market conditions in various dimensions. There are still some gaps in the literature on the hotel site selection problem, particularly since most studies in this field have been focused on theoretical aspects of location rather than empirical evidence (Adam and Amuquandoh, 2013).

Research background

Life in cities is increasingly dependent on a vast network of services, a trend that can be attributed to the complex spatial-physical structure of economic activities and social events, increased division and specialization of social and economic work, and growing cultural, leisure, and social needs of citizens (Pilehvar, 2020). Over the years, the hotel location problem has been the subject of numerous studies using a variety of different analysis methods. In a study by Shoval et al. (2011) on the location of hotels and tourism activities in urban areas, this subject was explored both theoretically and empirically by analyzing the time-space activity of tourists in four hotels in different parts of Hong Kong and GPS records of daily movements of 557 tourists. According to this study, the location of hotels has a great impact on tourism movements, and a large portion of tourists' total budget is spent in the vicinity of the hotel. This study also showed how tourism movements are impacted by geomorphic barriers.

In a study by Adam and Amuquandoh (2014), where they examined how much different factors are considered in the choice of location of hotels in Ghana, it was concluded that spatial factors such as economic characteristics, neighborhood characteristics, physical characteristics, socio-cultural factors, transportation, and access to attractions and recreational spaces all affect the hotel location decision.

A study by Li et al. (2015) on the subject of hotel location using geographic information system (GIS) and logistic regression in Hong Kong reported that the choice of location is influenced by nearby transportation facilities, indicated by the number of urban public transport stations and the traffic size. These researchers stated that given the inconsistency of findings, further research should be conducted on the impact of transportation and tourist attractions on hotel location.

Marco (2016) studied the role of hotel location in the tourism economy in Spain. This study reported that choosing the right location for hotels has a profound impact on their profitability, with a U-shaped relationship between the two variables. In this study, cost, rather than revenue, was recognized as the main factor in how much a hotel profits from its convenient location.

In a study by Yang et al. (2018) on the determinants of the satisfaction of tourists with the location of urban hotels in Los Angeles, the results showed that this satisfaction is strongly influenced by access to tourist attractions, airports, universities, public transportation, green spaces, and parking spaces.

Popovic et al. (2019) developed a multi-criteria decision-making (MCDM) model for the hotel location problem, stating that MCDM methods are proficient in solving problems where a set of options must be compared according to a set of conflicting criteria. They also illustrated the performance of the developed model by an example where six mountains in Serbia were considered as potential locations for building hotels.

In a descriptive-analytical research by Ebrahimzadeh et al. (2012) on the subject of optimal planning and location of urban tourism facilities and infrastructure using GIS, the results showed the lack of proper planning to attract tourists in the studied area (Semnan), reflected in the poor management and distribution of tourism resources, facilities, and services, poor advertisement, and low public knowledge of the area's tourist attractions and tourism potentials.

With the growth of the tourism industry worldwide, urban tourism is becoming a major branch of tourism, which is why many cities are housing a growing number of hotels providing accommodation to an increasing number of visitors from home and abroad (Fazli & Samadi, 2021). As mentioned, there is a gap in the literature in relation to the use of new approaches in the field of spatial analysis and location of hotels; approaches that incorporate hotel location criteria in economic, socio-cultural, and environmental dimensions.

The adoption of a sustainable tourism approach in hotel location in metropolitan areas can help achieve the goals of sustainable development in these areas.

Scientific site location is an important topic in urban planning, which needs to be done before building any new service facility such as a landfill, school, hospital, or fire station. This is also true for hotels, as these facilities also need to be located for an appropriate level of comfort, efficiency, and security.

Site location can be performed with the help of multi-criteria decision analysis (MCDA) methods. In general, the purpose of MCDA methods is to assist decision-makers in determining the best choice from among a variety of options (Qureshi et al., 2021). In the context of site location, these techniques are often used to compare and rank a number of alternatives using a combination of spatial data, for example from GIS, according to certain decision rules determined by decision makers' preferences (Nadizadeh Shorabeh et al., 2019). The main rationale for the integration of MCDA and GIS is that these two distinct scientific fields can complement each other (Boloorani et al., 2021 et al., 2021; Malczewski, 2006; Firozjaei et al., 2019). Indeed, the unique capabilities of GIS in terms of storing, manipulating, analyzing, and presenting geographic information are a good match for MCDA methods as a rich set of structured methods and algorithms for decision making, planning, evaluation, and ranking of alternatives (Shorabeh et al., 2019).

The good performance of integrated GIS-MCDA methods in the field of site location has been demonstrated in many studies for example on ecotourism (Ambecha et al., 2020; Çakır & Ulukan, 2019; Aneseyee et al., 2022; Rezvani et al., 2022), renewables energies (Shorabeh et al., 2021; Zambrano-Asanza et al., 2021; Genç et al., 2021), waste management (Ali et al., 2021; Sisay et al., 2021; Majid & Mir, 2021), hospital location (Boyacı & Şişman, 2022; Tripathi et al., 2021; Rezayee, 2020), school location (Ahmad et al., 2021; Asadpour et al., 2022; Prasetyo et al., 2018), and bus stop location (Ghorbanzadeh et al. al., 2020; Guler & Yomralioglu, 2020; Guler & Yomralioglu, 2021). In this study, this approach has been used to determine suitable locations for building new hotels in Tehran metropolitan area with an emphasis on investment risk. The innovation of this study is the combined use of the Analytic Hierarchy Process (AHP) and Ordered Weighted Averaging (OWA) with GIS to determine which locations in the study area would be more suitable for building new hotels if the goal is to minimize investment risk.

Materials and methods

Study area and data

Tehran metropolis is located in coordinates 51°17′-51°33′E and 35°36′-35°44′N (Figure 1). While the city had a population of only 0.21 million people in 1921 (Roshan et al., 2009), according to the latest official census (2016), it now has a population of over 8.5 million people, which makes it the most populous city in Iran (Hasanlou & Mostofi, 2015). Tehran is also the political and economic capital of Iran and has immense cultural significance for the country. Tehran has significant potential for attracting tourists and becoming an economic tourism hub. Every year, a large number of tourists visit this city because of its economic attractions and natural-tourism potentials. However, the city can benefit from more well-located hotel and accommodation services to ensure a memorable tourism experience.

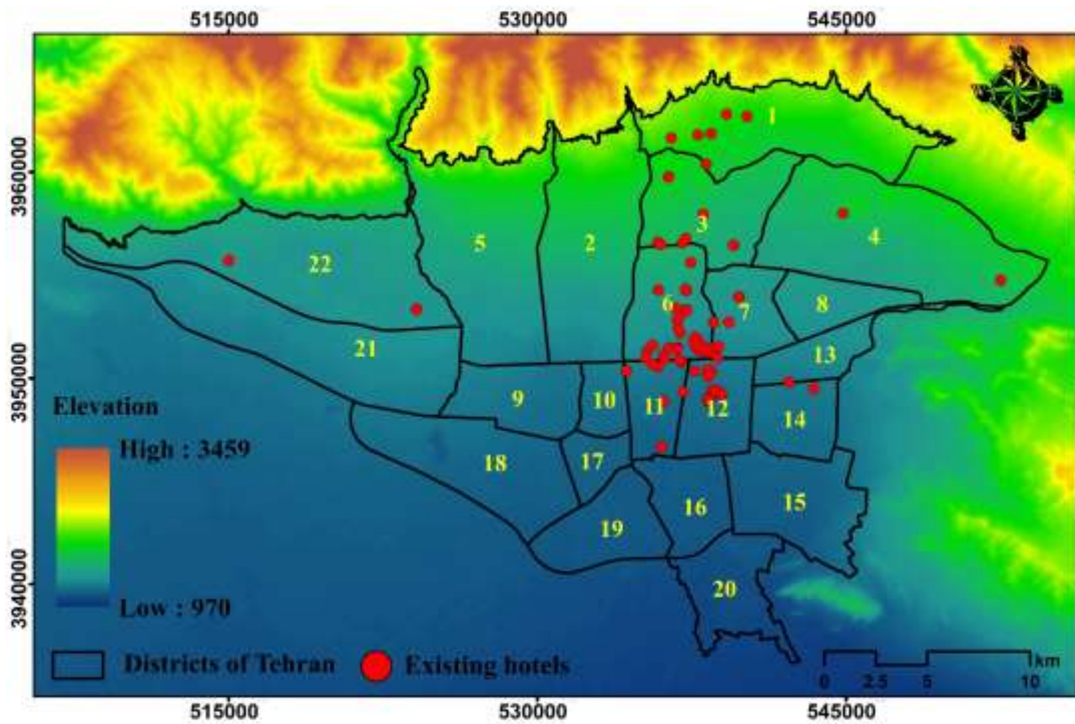


Figure (1). Geographic location of the study area

In this study, raster and vector spatial datasets were used as inputs to generate a map of suitable locations for building new hotels in Tehran. Spatial data in three categories of socio-cultural (distance from existing hotels, distance from museums, distance from markets, distance from stadiums, distance from fire stations, and distance from movie theaters), economic (distance from terminals, distance from metro stations, distance from roads, distance from airports, and distance from bus stops) and environmental factors (distance from orchards, distance from parks, distance from water streams, distance from polluting industries, distance from faults, slope, and elevation) were used in the mapping.

Research method

The study was designed as an applied descriptive-analytical research. First, the criteria that could be important for mapping were identified through consultation with experts. The consulted experts were then asked to rate these criteria in terms of how important they are for hotel location. Next, the spatial analysis tools provided in ArcGIS were used to generate a map of the study area in terms of each criterion. After criteria weighting using the AHP method, the OWA method was used to merge the data layers in order to generate multiple suitability maps for different risk levels. The main stages of this study are outlined in Figure (2).

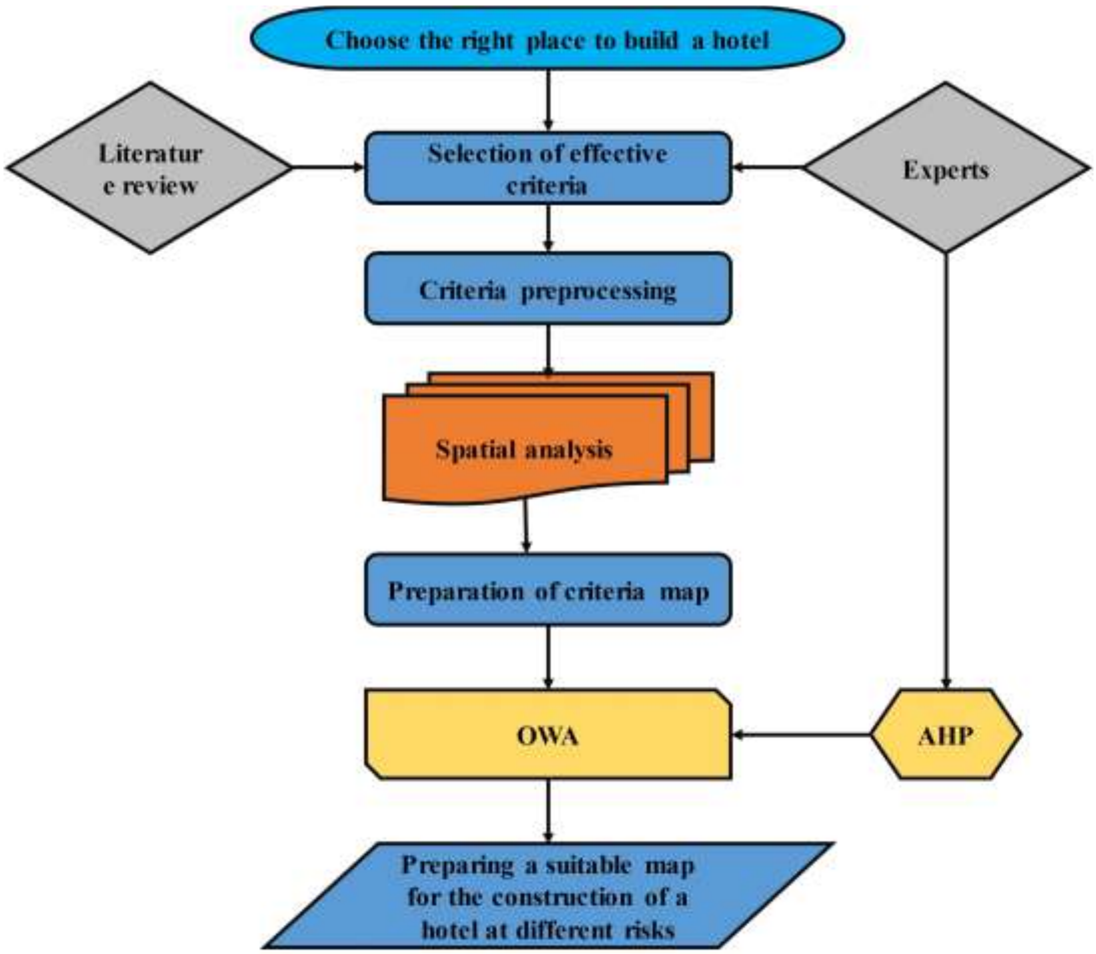


Figure (2). Main stages of the study

Nearest neighbor ratio (RN)

The method is the nearest neighbor ratio (RN) adjacent method in evaluating the pattern of urban use. This method is used to show scattering phenomena that are spatially defined in a range. This method produces an index called RN, which ranges from zero to 2.15. The value of this index shows the pattern in which the desired factors or elements are distributed in the study area.

This method includes four steps as follows:

1. According to the map of the study area, the distance of each user from the same user is measured without considering the spatial order.
2. All distances are added and the total sum is divided by the number of measurements to obtain the observed value, equation (1).

$$\bar{D}_{obs} = \frac{\text{Total distances}}{\text{Number of measurements}} \qquad (1).$$

3. The average value for DRan random distribution is calculated using equation (2):
where in:

$$\mathbf{D_{Ran}} = \mathbf{0.5}\left(\sqrt{\frac{\mathbf{A}}{\mathbf{N}}}\right) \quad (2).$$

A: is the area of the region in square kilometers
N: number of supplied uses
4- Calculation of the RN coefficient (nearest neighbor method) is obtained by applying equation (3).

$$\mathbf{RN} = \frac{\mathbf{\bar{D}_{obs}}}{\mathbf{D_{Ran}}} \quad (3).$$

Identification of appropriate hotel location criteria

The choice of hotel location is an important part of tourism destination management strategies. Identifying the criteria that might influence this choice is essential for ensuring coherent spatial planning in tourist destinations. The criteria used or cited in the literature for the location of hotels, resorts, and tourist accommodations are listed in Table 1.

Table 1: Location criteria for hotels, resorts, and tourist accommodations

Source	Criteria
Firoozi, (2019)	Proximity to attractions, access to second-order main roads, suitability-unsuitability for hotel construction, physical infrastructure, population
Heidary Soreshjani and Dehghan Jazi (2019)	Distance from historical attractions, distance from recreational attractions, distance from public parking, distance from fire stations, distance from urban parks, distance from police stations, distance from metro stations, distance from existing tourist accommodations, distance from banks
Chaves et al (2012)	Proximity to the city center, proximity to public transportation, proximity to tourist attractions, neighborhood conditions
Ren et al (2016)	Proximity to transportation facilities, parks, shopping centers, and cultural heritage attractions
Adam and Amuquandoh (2014)	Transportation, access to tourist attractions and recreational spaces
Yang et al (2018)	Tourist attractions, public transport, green spaces, parking
Lu and Stepchenkova (2012) Li et al. (2013)	Easy transportation, easy access to tourist destinations
Zhou et al. (2014)	Proximity to tourist attractions, proximity to the city center, proximity to public transport, access to metro, bus and taxi stations
Balaguer and Pernías (2013)	Tourism, land use, roads, slope, access to tourist attractions
Yang et al. (2012)	Access to public transport
Samuelson, (1954)	Service-amenity facilities, roads, accommodation centers, distance from service centers
Rigall-I-Torrent et al. (2011)	Green spaces, roads, hotels, tourist attractions, industrial centers, land use, sports, higher education
Park and Kim (2012)	Accessibility, natural attractions, historical attractions, natural features,

Arbel and Pizam (1977) Ashworth et al. (1989)	municipal services, hotel, fire station, police station, terminal, gas station, airport

Analytic Hierarchy Process

Analytic Hierarchy Process (AHP) is an extensively used MCDA method (Saaty, 2004) that allows us to formulate complex problems into a hierarchical structure where the variety of quantitative and qualitative criteria that could be associated with the problem can be considered (Saaty, 2013). When using AHP for criteria weighting, the highest weight is assigned to the factor that has the greatest impact on the subject of interest. In other words, criteria are weighted based on how important of a role they play within the context of the decision at hand (Al-Harbi, 2001). According to Saaty and Vargas (2006), the relative importance of two factors can be expressed with a numerical value ranging from 1 to 9, with 1 indicating equal importance and 9 indicating the extremely higher importance of one factor than the other (Table 2).

Table (2). Importance values for pairwise comparisons (Saaty, 2004)

Importance of one factor relative to the other	Equal importance	Moderate importance	High importance	Very high importance	Extremely high importance	Intermediate values between adjacent judgments
Numerical value	1	3	5	7	9	2-4-6-8

The process of using AHP for criteria weighting consists of four steps (Nadizadeh Shorabeh et al., 2017):

1- Building the hierarchical structure: This is the most important stage of AHP and involves decomposing the complex problem into simpler sub-problems that can be more easily comprehended by humans. The resulting hierarchy is a graphical representation of the complex problem, which cascades from the ultimate goal at the top of the hierarchy down to criteria, sub-criteria, and alternatives at the bottom.

2- Pairwise comparisons: The basis of AHP is the pairwise comparison of factors to determine their relative importance with respect to each other. The output of this step for n factors is an n×n pairwise comparison matrix (Equation 4):

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \qquad (4)$$

Where the element a_{ij} denotes the importance of factor i relative to factor j. Thus, all elements on the main diagonal of this matrix are 1, and the matrix is symmetrical across its main diagonal.

3- Matrix normalization and averaging: In this step, first, the pairwise comparison matrix is normalized by dividing each element by the sum of all elements in the same column (Equation 5).

$$Aw = \begin{pmatrix} \frac{a_{11}}{\sum a_{i1}} & \frac{a_{12}}{\sum a_{i2}} & \cdots & \frac{a_{1n}}{\sum a_{in}} \\ \frac{a_{21}}{\sum a_{i1}} & \frac{a_{22}}{\sum a_{i2}} & \cdots & \frac{a_{2n}}{\sum a_{in}} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \frac{a_{n1}}{\sum a_{i1}} & \frac{a_{n2}}{\sum a_{i2}} & \cdots & \frac{a_{nn}}{\sum a_{in}} \end{pmatrix} \quad (5)$$

Then, all elements of each row of the normalized matrix are averaged to obtain a weight vector (Equation 6):

$$C = \begin{bmatrix} C_1 \\ C_2 \\ C_3 \\ \cdots \\ \cdots \\ \cdots \\ \cdots \\ \cdots \\ \cdots \\ C_n \end{bmatrix} = \begin{pmatrix} \frac{\frac{a_{11}}{\sum a_{i1}}}{n} & \frac{\frac{a_{12}}{\sum a_{i2}}}{n} & \cdots & \frac{\frac{a_{1n}}{\sum a_{in}}}{n} \\ \frac{\frac{a_{21}}{\sum a_{i1}}}{n} & \frac{\frac{a_{22}}{\sum a_{i2}}}{n} & \cdots & \frac{\frac{a_{2n}}{\sum a_{in}}}{n} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \frac{\frac{a_{n1}}{\sum a_{i1}}}{n} & \frac{\frac{a_{n2}}{\sum a_{i2}}}{n} & \cdots & \frac{\frac{a_{nn}}{\sum a_{in}}}{n} \end{pmatrix} \quad (6)$$

4- Consistency and inconsistency ratios: To calculate the consistency ratio, first, the w21`pairwise comparison matrix (A) is multiplied by the weight vector (C) to obtain a good estimate of $\boldsymbol{\lambda}$max (Equation 7):

$$A \times C = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \times \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ \cdots \\ \cdots \\ c_n \end{bmatrix} = \begin{bmatrix} \chi_1 \\ \chi_2 \\ \chi_3 \\ \cdots \\ \cdots \\ \chi_n \end{bmatrix} \quad (7)$$

Then, the consistency index (CI) is calculated by Equation (8):

$$CI = \frac{\lambda max - n}{n-1} \quad (8)$$

where n is the number of criteria or dimensions of matrix A and $\boldsymbol{\lambda}$max is the largest eigenvalue of this matrix. Having CI, the consistency ratio (CR) is then obtained from Equation (9):

$$CR = \frac{CI}{RI} \quad (9)$$

A CR≤0.1 indicates acceptable consistency; otherwise, decision-makers must reconsider their judgments (Saaty, 2004). The random consistency index (RI) can take a range of different values depending on the n-value (Table 3).

Table (3). Values of RI

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
IR	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Ordered Weighted Averaging

Any given decision problem can be solved by taking a risk-taking approach focusing on the good features of alternatives or a risk-averse approach emphasizing the bad features of alternatives. The aggregation of evaluations and judgments can greatly enhance multi-criteria decision-making. The Ordered Weighted Averaging (OWA) operator can be used to incorporate the decision-maker's risk-taking or risk-aversion attitude into the ranking of alternatives. This

operator was first introduced by Yager in 1988 (Yager, 1988) as a tool to aggregate criteria in multi-criteria decision-making. As the term "ordered" in the name implies, this operator computes a nonlinear aggregate of a series of inputs in a particular order. The aggregation of evaluations by OWA generally consists of three steps: 1) sorting the input variables; 2) determining the weights to be used in OWA using an appropriate method; and 3) using OWA to aggregate ordered inputs (Malczewski, 2006).
In OWA, a concept called the degree of ORness (or ANDness) is used to modify how much the operator behaves like the OR operator (maximization) or the AND operator (minimization). This degree reflects the degree of emphasis on the best or worst values of a criterion or the decision-maker's risk-taking or risk-aversion attitude. The degree of ORness is calculated by Equation (10).

$$ORness = \frac{1}{n-1}\sum_{i=1}^{n}(n-i)\,v_i, \qquad 0 \le ORness \le 1 \tag{10}$$

A higher degree of ORness indicates a more risk-taking attitude, and a lower degree of ORness signifies a more risk-averse attitude. One advantage of OWA is that it allows researchers to generate a wide range of maps and solutions and prediction scenarios by reordering and changing criteria parameters (Rinner & Malczewski, 2002).

Result and Desiccation

Figure 3 shows that hotels in Tehran are distributed in a clustered pattern and this shows that there is no spatial justice in the distribution of hotels.

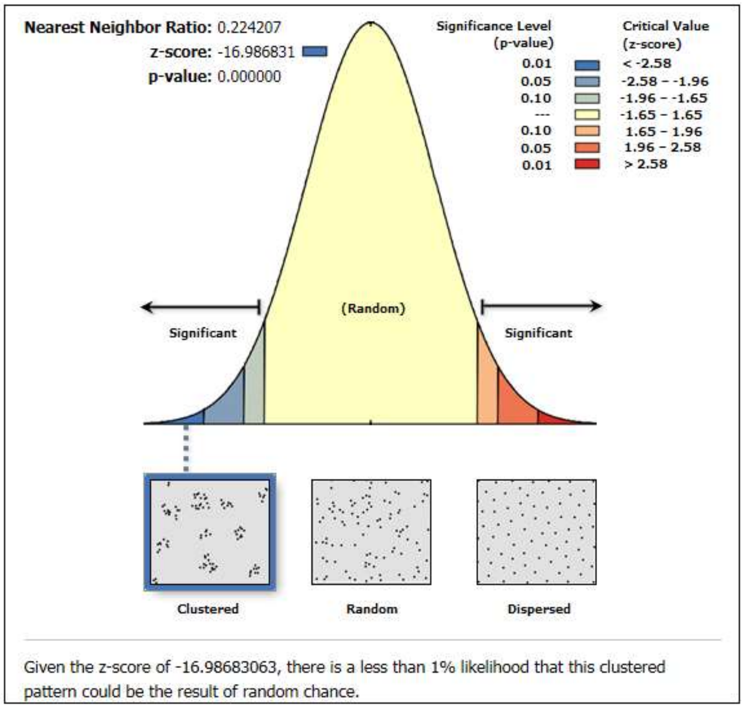
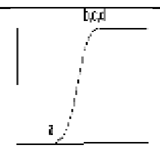
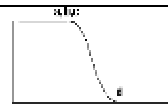
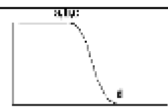
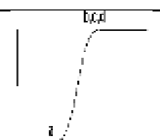
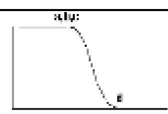
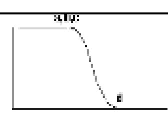
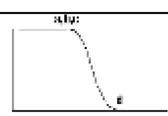
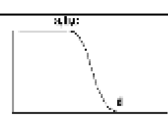
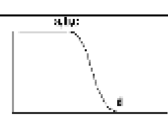
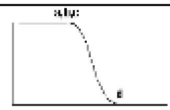
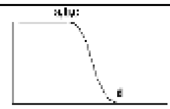
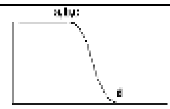
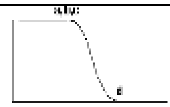
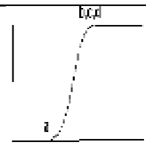
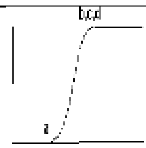
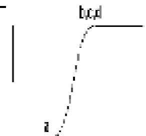
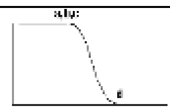
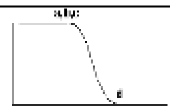


Figure 3: Spatial autocorrelation analysis for hotels in Tehran

Criteria weights were determined using the AHP method based on the opinions of 30 experts (with expertise in urban management, GIS and hotel management). Among the criteria chosen for hotel location suitability mapping, "distance from existing economic criteria category, and “distance from polluting industries” from the environmental criteria hotels" from the socio-cultural criteria category, “distance from roads” from the category earned the highest importance weights (Table 4). The weights of socio-cultural, economic, and environmental criteria categories were found to be 0.273, 0.412, and 0.315, respectively. The consistency rate calculated for criteria and sub-criteria weights based on expert opinions was less than 0.1, indicating the acceptable consistency of expert judgments.

Table (4). Criteria weights used in mapping

CR	Weight	Function type	Sub-criteria	CR	Weight	Criteria
0.001	0.236		Distance from existing hotels	0.002	0.273	Socio-cultural
	0.198		Distance from museums			
	0.215		Distance from markets			
	0.133		Distance from stadiums			
	0.053		Distance from fire stations			
	0.165		Distance from movie theaters			
0.003	0.084		Distance from terminals		0.412	Economic
	0.266		Distance from metro stations			
	0.302		Distance from roads			

	0.220		Distance from airports			
	0.128		Distance from bus stops			
0.001	0.150		Distance from orchards		0.315	Environmental
	0.201		Distance from parks			
	0.076		Distance from water streams			
	0.225		Distance from polluting industries			
	0.056		Distance from faults			
	0.179		Slope			
	0.113		Elevation			

The maps of socio-cultural, economic, and environmental sub-criteria are displayed in Figures (4), (5) and (6), respectively. The values of all criteria were normalized to [0, 1], with 0 indicating the poorest status (least desirable) and 1 indicating the best status (most desirable). For example, for elevation and slope, lower values are more desirable because it is significantly more expensive to construct in sloping areas and at higher altitudes. For distance from faults, however, higher values are more desirable as they mean a lower likelihood of damage from ground motions and landslides. For access criteria like distance from roads, distance from metro stations, and distance from bus stops, lower values are more desirable as they indicate higher economic value. Also, access to green spaces and natural and touristic attractions creates suitable views and views of the hotel rooms and has a significant impact on the value of the hotel.

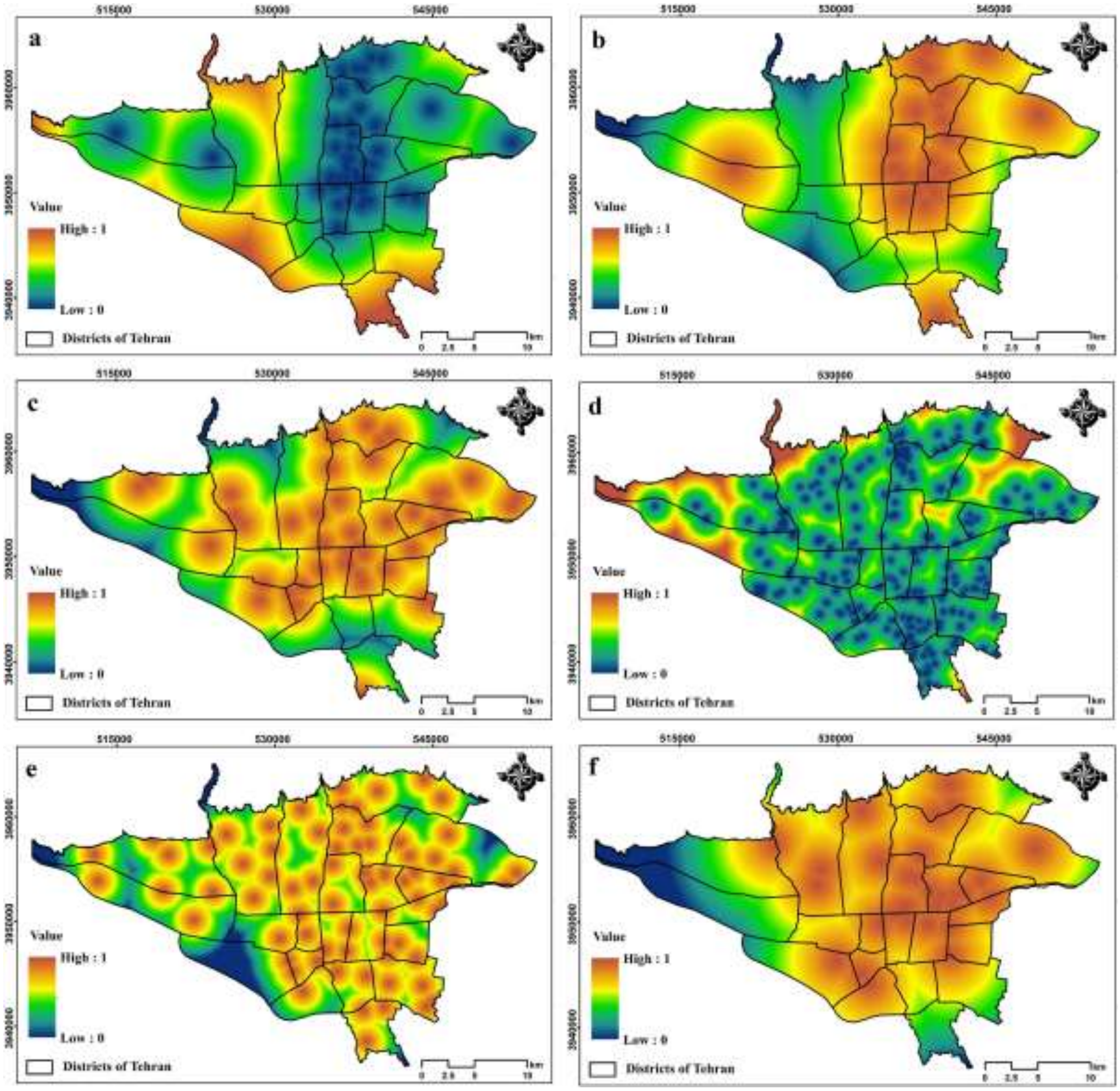


Figure (4). maps of socio-cultural sub-criteria; a) distance from existing hotels, b) distance from museums, c) distance from markets, d) distance from stadiums, e) distance from fire stations, and f) distance from movie theaters

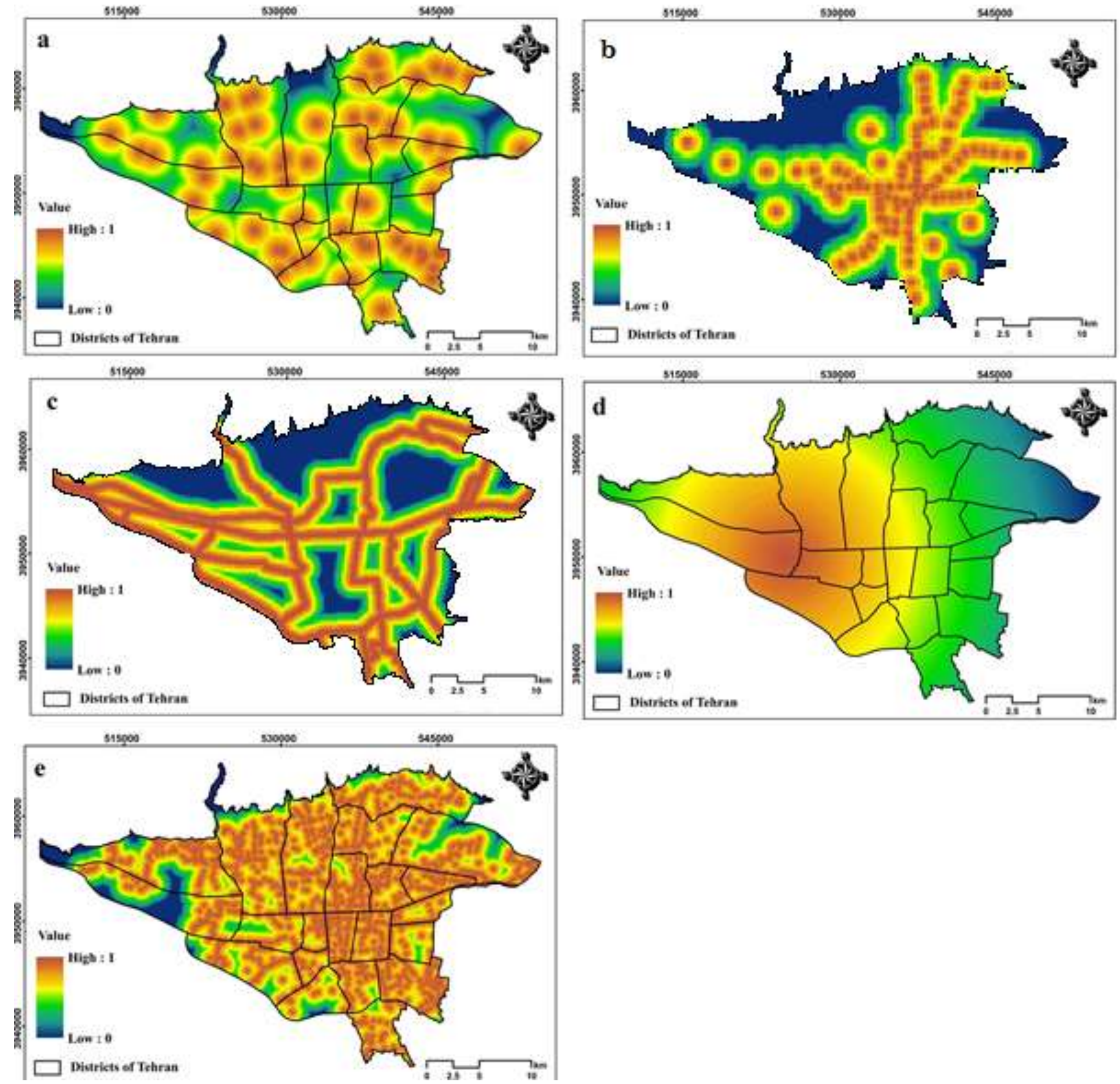


Figure (5). maps of economic sub-criteria; a) distance from terminals, b) distance from metro stations, c) distance from roads, d) distance from airports, and e) distance from bus stops

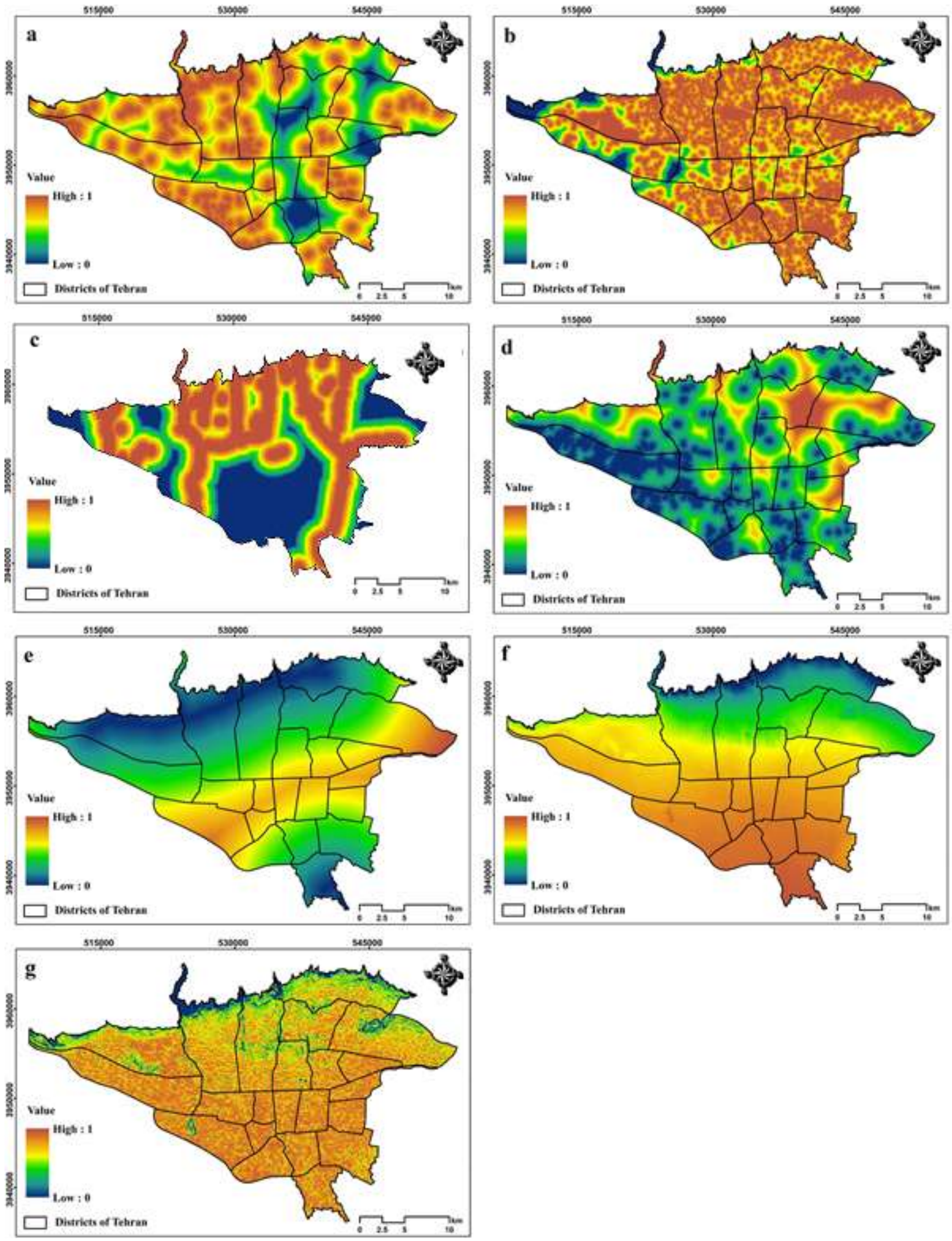


Figure (6). maps of environmental sub-criteria; a) distance from orchards, b) distance from parks, c) distance from water streams, d) distance from polluting industries, e) distance from faults, f) slope, and g) elevation

Having the criteria weights and normalized criteria values, OWA was applied to these inputs with various degrees of ORness from 0 (risk-averse or pessimistic attitude) to 1 (risk-taker or optimistic attitude) to generate a set of hotel location suitability maps reflecting the attitude to investment risk. It should be noted that the same criteria weights were used for all degrees of ORness. In the maps generated from different degrees of ORness, the study area was classified into five zones representing different levels of suitability for building a new hotel: highly unsuitable (0-0.2), unsuitable (0.2-0.5), neutral (0.4-0.6), suitable (0.6-0.8) and highly suitable (0.8-1) (Figure 7).

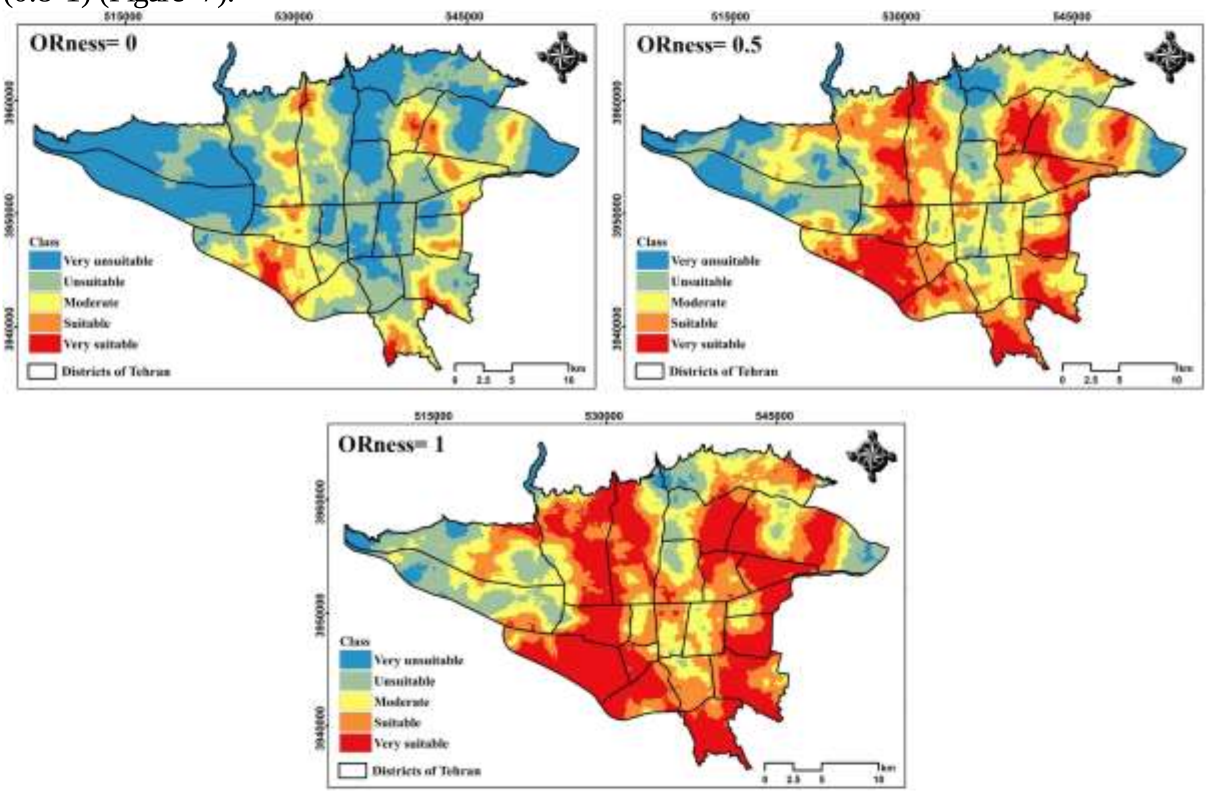
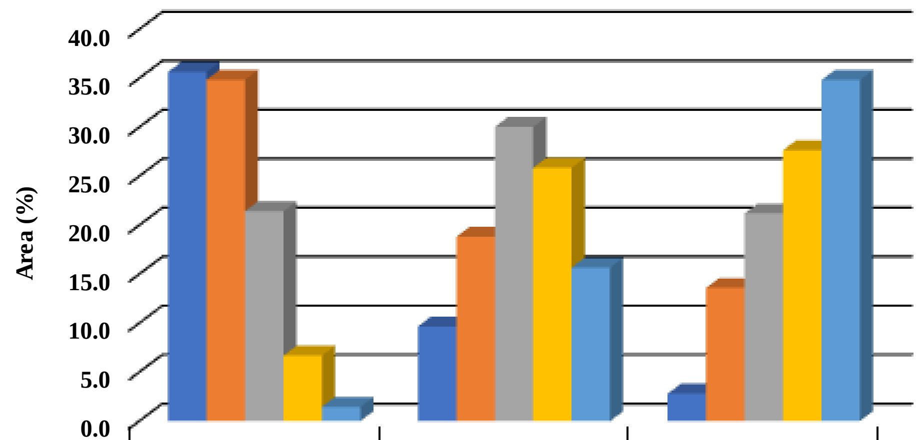


Figure (7). Hotel location suitability maps for the selected degrees of ORness

Figure (8) shows the area of different suitability zones in the maps generated from different degrees of ORness. It can be seen that in the map with the risk-averse altitude (ORness=0), most of the study area is either “highly unsuitable” or “unsuitable” and only a small portion of the area classifies as “highly suitable”. Conversely, in the map with the risk-taker altitude (Orness=1), “suitable” and “highly suitable” are the largest zones. In other words, as we increased the degree of risk-taking, the area of regions classified as “highly unsuitable” and “unsuitable” decreased and the area of regions classified as “highly suitable” and “suitable” increased. In (ORness = 0), the strategy is extremely pessimistic and more than half of the city (70.4 percent) is placed in the very unsuitable and unsuitable classes, and only a small percentage of the city (8.1 percent) is placed in the very suitable and suitable class. It has little risk for investment. With the increase of ORness, the investment risk has increased so that (ORness = 1) 62.4% of the city has been placed in the very suitable category.



	ORness=0	ORness=0.5	ORness=1
Very unsuitable	35.6	9.7	2.8
Unsuitable	34.8	18.8	13.6
Moderate	21.4	30.0	21.2
Suitable	6.7	25.8	27.6
Very suitable	1.4	15.7	34.8

Figure (8). Area distribution of suitability zones in the maps with different degrees of ORness

Conclusion

The optimal distribution of service facilities and land uses is a matter of great interest to urban planners as they contend with the deteriorating spatial distribution of these urban elements due to rapid urban population growth and physical expansion. Given the inherent importance of accommodation facilities and the efforts made in Iran, as well as many other countries, to make the tourism industry a sustainable source of revenue through investment, there is a growing need in the country for better location schemes for findings suitable sites for building new hotels. In order to successfully compete in attracting tourists, hotels must be located such that visitors can enjoy a healthy, safe, and pleasurable environment with easy access to novel attractions and up-to-date services. Given the ability of GIS to store, overlay, and analyze many layers of geographical information, which could be particularly massive for large cities, it can serve as a powerful tool to achieve equitable service distribution in large metropolitan areas. In this article, the nearest neighbor model was used to show how the hotel patterns are. The average of the nearest neighbor was 0.22, which shows an inappropriate cluster pattern for the distribution of hotels.

Spatial data in three categories of socio-cultural, environmental, and economic factors were used to generate a set of hotel location suitability maps for the city of Tehran using the combined OWA-AHP method. In this method, AHP was used for criteria weighting and OWA was used to introduce a risk attitude to location suitability mapping. The results showed that among the considered socio-cultural, economic, and environmental criteria, the most important criteria for this mapping are “distance from existing hotels”, “distance from roads”, and “distance from polluting industries”, respectively. As the degree of risk-aversion increased, the total area of regions classified as suitable or better decreased and the total area of regions classified as unsuitable or worse increased. Investors tend to make their investment decisions based on how much risk and payoff they anticipate in the opportunity. While many investors are risk-averse, some are risk-takers and many others try to strike a balance in this regard. In the context of hotel location and construction, risk-averse investors will focus on areas that are desirable in terms of all criteria. These are the areas where the project is more likely to generate the expected payoff, because the criteria are at their best possible conditions. Indeed, this is the most sensible approach to choosing the location of a new hotel so long as the project is not limited in terms of finance.

At Orness=0 (highest level of risk aversion), only 8.1% of the study area was recognized as suitable and over 70% of it was classified as unsuitable.

Reference

Adam, I., & Amuquandoh, F. (2013). Dimensions of hotel location in the Kumasi Metropolis, Ghana. Tourism Management Perspectives, 8(-), 1–8.

Adam, I., & Amuquandoh, F. E. (2014). Hotel characteristics and location decisions in Kumasi Metropolis, Ghana. Tourism Geographies, 16(4), 653-668.

Chou, T. Y., Hsu, C. L., & Chen, M. C. (2007). A fuzzy multi-criteria decision model for international tourist hotels location selection. International Journal of Hospitality Management, 27(2), 293–301.

Gabrijela, P., Dragisa, S., Miodrag, B., and Darjan, K., 2019, A Multiple-Criteria Decision-Making Model for the Selection of a Hotel Location, L and Use Policy, No. 84, PP. 49–58.

Law Christopher, M.1996. Urban Tourism attraction visitors to large cities, Mansell, Publishing Limited, London.

Lee, K. W., Hong Bumm, K., Hak Seon, K., and Dongsoo, L., 2010, The Determinants of Factors in FIT Guests' Perception of Hotel Location, Journal of Hospitality and Tourism Management, Vol. 17, No. 1, PP. 167–74.

Li, M., Fang, L., Huang, X., & Goh, C. (2015). A spatial–temporal analysis of hotels in urban tourism destination. International Journal of Hospitality Management, 45, 34-43.

Pigozzi B & Thomas R & Sam brook R.2005. Tourism Carrying Capacity Measures: Crowding Syndrome in the Caribbean, The Professional Geographer, Vol, 57, No.1.

Roginsky, R. J. (1995). A critical analysis of hotel impact issues. Cornell Hotel and Administration Quarterly, 13(-), 12–19.

Roginsky, R. J. (1995). A critical analysis of hotel impact issues. Cornell Hotel and Administration Quarterly, 13(-), 12–19.

Shoval, N. McKercher Erica Ng, B. Birenboim, A.2011,Hotel Location And Tourist Activity In Cities,Annals of Tourism Research.

Sim, J., Mak, B., and Jones, D., 2006, A Model of Customer Satisfaction and Retention for Hotels, Journal of Quality Assurance in Hospitality and Tourism, Vol. 7, No. 3, PP. 1–23

World Tourist Organization .1999. Tourism highlights 1999. WTO Publications Unit. World Tourism Organization, Madrid, Spain.

Yang, Y., Wong, K. K. F., and Wang, T., 2012, How Do Hotels Choose Their Location? Evidence From Hotels in Beijing, International Journal of Hospitality Management, Vol. 31, No. 3, PP. 675–685.

Yang, Y., Zhenxing, M., and Jingyin, T., 2017, Understanding Guest Satisfaction with Urban Hotel Location, Journal of Travel Research, 57(2), PP. 243-259.Yang, Y., Hao, L., and Rob, L., 2014, Theoretical, Empirical, and Operational Models in Hotel Location Research, IJHM, No. 36, PP. 209–220.

Yang,Y. Lui, H. and Law, R., (2014): Theoretical Empirical, and Operational Models in Hotel Location Research. International Journal of Hospitality Management, 36,(-), 209-220.