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Redevelopment of Endowed Infill in the City of Mashhad*

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ABSTRACT

Amongst the essential challenges of urban planning is the shortage of land for developing and supplying the urban regions' needs, especially in large cities like Mashhad. Under the land shortage conditions, the development of the underdeveloped lands should be sought in line with taking advantage of all the internal urban competencies within the framework of infill development. Endowed urban lands are amongst the underdeveloped lands and spaces. Mashhad is amongst the cities wherein the endowed ownership plays an important role in urban development and management. Particularly, District 6 of Mashhad's municipality about 80% of the lands of which are under-endowed ownership by Astan-e-Quds-e-Razavi and faces a shortage of land, inefficiency, and lack of dynamicity in its internal textures. The shortage of land for development and supply of the urban regions' needs, especially in large cities like Mashhad, are amongst the essential challenges of urban planning. Under such circumstances, the development of underdeveloped lands should be sought for taking advantage of all the internal capabilities of the city within the framework of infill development. In this article, the possibility of redeveloping the endowed properties in this region within the format of infill capacity assessment has been investigated. In order to accomplish this goal, the infill capacity assessment indices of endowed lands were identified and investigated for District Six and use was made of geographical information system (GIS) and Analytic Hierarchy Process (AHP) for determining their overlaps and prioritizing the development-prone land parcels . The results indicated that the scale "familiarity with the endowment requirements", with a significance coefficient of 0.154, is the most important factor and the scale "upstream criteria", with a significance coefficient of 0.021, is the weakest factor for assessing the capacity of endowed urban lands redevelopment.

Keywords: Endowed Land Redevelopment, Infill Development, Redevelopment Capacity Assessment, District 6 of Mashhad's Municipality.

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1. INTRODUCTION

The endowment tradition is amongst the religious ideological and religious values and plays a very effective role in the formation of the spatial construct of the Islamic era's cities, especially in Iranian cities. However, endowment does not always bring about development in the cities; in other words, there are cases in which endowment of the urban lands impedes and bars public and private investment in these lands. These problems are more frequently encountered in cities like Mashhad for the majority of the urban domain's lands are endowed lands. During the recent decades, many of the city's endowed lands have been left unused and undeveloped and this has resulted in the emergence of problems in the city and for the citizens in macro-scale (intensification of the city's scattered development) as well as in micro-scale (social problems like crimes and transgressions, economic problems resulting from non-optimal use of land and physical problems like activity inconsistency as well as environmental problems like destruction of the agricultural lands in the periphery of the city and so forth). District Six of Mashhad is amongst the regions having a lot of endowed land ownerships with about 80% of its lands being endowed. Many of the region's endowed lands are informally occupied or in worn-out urban texture or in parts left undeveloped in the past so they lack the proper land use and the required dynamicity and efficiency are missing in them. The current article tries to explain a new type of attitude towards urban development for confronting these problems in such a way that the development is brought about not beyond the city borders but in the internal limits of the city through the optimal application of the existing resources. This attitude that is termed infill development includes the intra-city redevelopment of the land parcels lagged from others in the development process. Endowed lands are amongst the underdeveloped land pieces that are the main subject of the current research paper. Considering this issue and the above-presented materials, the article has been structured and oriented towards finding an answer to the following two questions:

1) Why is the endowed lands' redevelopment necessary in the urban regions?

2) What are the most important scales and indices influencing the capacity assessment in the endowed urban lands?

To do so, the theoretical texts are seminally reviewed and the necessity of the endowed lands' redevelopment is secondarily investigated followed by the identification of the scales and indices influencing the assessment of the region's endowed lands capacity; in the end, analytic hierarchy process (AHP) in GIS software was used to investigate and assess the intended indices.

2. STUDY BACKGROUND

The adoption of urban infill development approach dates back to two executive and research experiences: in the area of the executive experiences, the global experiences in the capital city of Fresno in California State (City of Fresno, 2012), Dania Beach in Florida State (Florida department of community affairs, 2003), Portland in Oregon State (Otak, 1999), Portsmouth in Virginia (Northeast-Midwest, 2001), Imperial Harbor in the western region of New York (Listokin, Walker, Ewing, Cuddy, & Cander, 2006), San Francisco (Wheeler, 2002), Likud in Colorado State (Iams & Kaplan, 2006) and capital city of Liverpool (European Union, 2006) can be pointed out that have implemented in various levels including the urban worn-out texture, transportation corridors' area, industrial lands and deserted and barren lands. As an example, the method of capacity-building in Oregon has been in the way that indices from the physical domain (investigation of the land segment's dimensions, soil, distance to services and absence of pollution), criteria and regulation's domain (level of occupation, building density, minimum dimensions, zoning rules), administrative domain (flexibility of the regulations and plan revision procedures) and economic domain (land price, land tax, owners' willingness, land's enjoyment of certain privileges) have been taken into account for evaluating the development capability and possibility (Otak, 1999). In the aforementioned cases, infill development projects have successfully accomplished measures in line with the identification of the development-prone zones and offering infill planning and designing strategies.

Although Iran has so far had no executive experience, notable studies have been undertaken in the area of infill development with subjects predominantly pivoting about the identification and capacity assessment of the development-prone zones (Tabibian & Ghani, 2016; Dadashpour, Taghva'ei, & Ghane, 2014; Saeedi Rezvani, Daoudpour, Fadavi, & Server, 2013; Rafi'eiyan, Barati, & Aram, 2011; Sangi & Rafi'eiyan, 2013; Barakpour & Bahrami, 2011; Mirmoghtada'ei, Rafi'eiyan, & Sangi, 2011). As an example, in an article called "assessing the capacity of unused spaces' development in the center of Qazvin with an emphasis on the infill development approach", Rafi'eiyan et al (2010) have dealt with assessing the infill development capacity in 25 pieces of land in the old area of the city based on the six indices of zoning criteria and regulations, physical conditions, access to supportive services, access to the connective networks, land's readiness extent and economic factors; their results indicated that the highest development capability goes to the regions with the highest economic, social, physical and environmental problems (Rafi'eiyan, Barati, & Aram, 2011).

In an article named "contemplation over the concept of 'infill development' and its necessity in urban neighborhoods", Mirmoghtada'ei, Rafi'eiyan and Sangi (2010) investigated the practical topics and important indicators of infill development and explored its necessity in the neighborhoods and cities and realized infill development as a solution parallel to the development of urban visage and life environment, chance for the individual's acquiring of a house of their own and attraction and preservation of the individuals with different income levels (Mirmoghtada'ei, Rafi'eiyan, & Sangi, 2011). In an article titled "investigation of the infill development capacity in the endowed urban spaces (case study: district 3 of the region 2 in Yazd)", Dadashpour et al. (2014) applied a descriptive-analytical method to assess the capacity of endowed lands' development in Yazd based on physical, economic, social and managerial scales and the results indicated that managerial factors have the greatest effect on determining the development capacity in the endowed lands of the district; they also placed the lands in four priority sets (Dadashpour, Taghva'ei, & Ghane'e, 2014). In an article under the title of "assessing the redevelopment capability in the inefficient urban textures (case study: Anbar-e-Naft neighborhood in Tehran's region 11)", Barakpour and Bahrami pointed to the objectives of redevelopment, including enhancing the quality of life and participation and so forth, and enumerated such an approach amongst the effective methods for organizing the worn-out texture; after determining the proper weights and sites in ArcGIS software based on AHP method, they assessed the redevelopment possibility in the region 11 of Tehran's municipality according to such indices as consistency with the adjacent activities, not being in the polluted regions, not being in zones with high risk, access to the passageways, access to the neighborhood centers, land price and population density (Barakpour & Bahrami, 2011).

There are many foreign research cases that have also dealt with introducing infill development and offering indices regarding the method of assessing the infill levels' capacity followed by expressing the principles and standards of designing and programming successful infill development as well as the related executive criteria in various grounds in details (Listokin, Walker, Ewing, Cuddy, & Cander, 2006; Aly & Attwa, 2013; Allan, 2001; EPA, 2015). For example, the case studied by David Listoki et al. (2006) in a study called "standards and guides of infill development policies" firstly defines and offers the advantages and challenges in the face of infill development and smart growth and subsequently deals with the standards and scales of infill development, including designing, zoning, predicting the financial issues, designing details and so on, and eventually suggests policies for meeting the aforesaid scales (Listokin, Walker, Ewing, Cuddy, & Cander, 2006). In an article named "infill development, an approach for Improving the compression of the urban form", Attwa and Aly (2013) introduced the designing principles of a successful infill development and compare the three case studies (Vancouver, Cairo and Beirut) to come up with the conclusion that infill development overcomes the scattered development problems via filling the empty lands inside the cities and improves the urban communities accordingly (Aly & Attwa, 2013).

Study and exploration of the executive experiences and the domestic and foreign researches indicate that no research has been so far carried out regarding the assessment of endowed urban lands' capacity of development based on the infill development approach except the one conducted by Dadashpour et al. (2014). In the aforesaid research, a few numbers of indices have been codified regarding the capacity assessment for endowed lands' development in district 3 of the region 2, in Yazd, by not proving the necessity of endowed urban lands' redevelopment, offering imperfect theoretical foundations, giving uncertain resources for the extracted indices, making no use of the experts' ideas for nationalizing, matching and finalizing the indices and presenting vague data analysis methods. The present article tries to overcome the aforesaid shortcomings. Besides these results, the investigation of the study background shows that infill development is the most important approach for redeveloping the underdeveloped lands.

3. STUDY THEORETICAL FOUNDATIONS

In line with achieving the study goal, the necessity for the redevelopment of the endowed lands is seminally expressed; then, the literature on the infill development as the most comprehensive approach towards urban redevelopment is investigated and the indices related to the assessment of the capacity of infill development in the endowed urban lands are extracted. Eventually, the extracted indices are nationalized and finalized to be used as the assessment criteria. The forthcoming sections investigate the aforementioned cases.

3.1. The Necessity of Endowed Lands' Redevelopment

Land shortage, new needs and inefficiency of the existent spaces cause the paying a lot of attention to the underdeveloped lands parallel to the development in the filled urban textures. Endowed lands can be considered as sorts of worn-out and economically, socially and physically inefficient lands that are lagged behind the development cycle. The endowed spaces are amongst the most important capabilities inside the cities for creating or developing the required urban functions. The lands with ownership issues and problems and, especially, the endowed lands in cities like Mashhad, Isfahan, Yazd, and others set the ground for the rapid growth in the regions in the periphery of these metropolises followed by the intensification of the scattered urban development in macro-scale and

also inconsistency with the peripheral environment, occasionally environmental pollutions and other issues and problems in micro-scale. Endowed lands' redevelopment is a solution that can be taken into consideration for fighting such a phenomenon as urban scattering in many of the countries and cities engaged with the endowment. Endowed lands' redevelopment can be considered as a strategy in compliance with the sustainable development in land use in such a way that the urban governments and, atop of them, the urban management in cooperation and participation with the non -profit organizations and all of the interested groups consider the abandoned or unused regions and, generally, the underdeveloped zones as valuable lands that can be targetted by redevelopment so that they can be utilized for future urban developments. Thus, the redevelopment is the intervention or process in which an endowed land is transformed into land at the service of the optimal urban development and elimination of site issues via improvement of the conditions. Thus, endowed lands' redevelopment is an effort for responding to the land use problems, controlling the urban scattering, improvement of social coherence and creation of proper conditions for developing the local and national economy (Fig. 1).

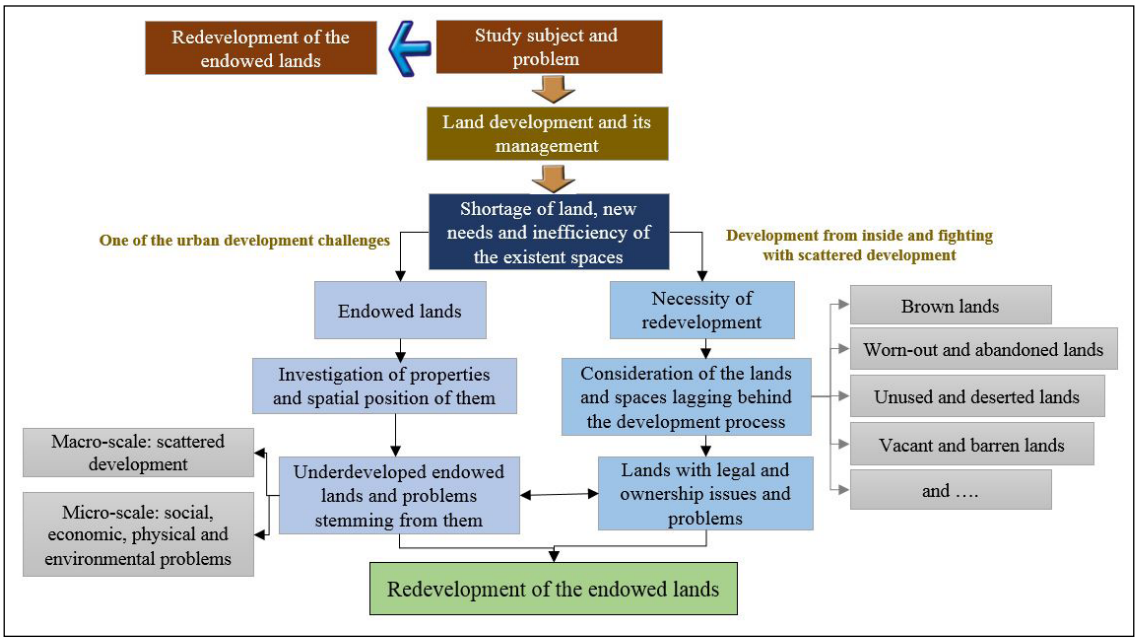


Fig. 1. The Necessity for Endowed Lands' Redevelopment in Urban Regions

3.2. Infill Development

Infill development occurs in a constructed adjacent unit and the vacant lands or existent properties are often used. Infill development can be accompanied by a lot of advantages, including financial reserve for the municipalities, the increase in the value of the assets for residential and business properties, easier traveling and the creation of more reliable economic entities in cooperation with the other communities (EPA, 2015, p. 1).

Infill development would lead to the better and more effective use of the facilities and services extant in the target zones and it is most often found resulting in an increase in the value of the ownerships and reducing the costs of public services like water, sewage, walksides as well as enhancing the supply of public security. It can also help the communities achieve their required population threshold for supplying such needs as green spaces and parks and services of the like (Comprehensive Infill Guideline, 2015, p. 1).

The most common definition of infill development includes the type of development that occurs in the less developed or unused lands and parcels in developed or urban regions. Two terms are of great importance in this definition: one is the phrase "less developed or unused" which means at least part of the intended parcel or region is not developed. This parcel can be generally vacant or part of it could have been developed. The second term is "urbanized" meaning that the intended region is amongst the previously developed adjacency units. Therefore, infill development fills the underdeveloped parts of the communities (McConnell & Wiley, 2010, p. 7). What can be extracted from the above definition is that the urban infill development seeks to prevent urban sprawl, enhancing the compressed urban development patterns, protection of open and green spaces in the periphery of the cities and paying attention to lands, spaces and inefficient and urban worn-out textures with the growth and development occurring in the vacant, abandoned and less frequently used segments of urban lands enjoying various infrastructural services like access to water, electricity and so on. Therefore, as it is shown in Figure (2), it can be stated that infill

development is to be conducted based on principles of residential development, mixed development, transportation-oriented development and compressed development with its objective being redevelopment of the underdeveloped lands, spaces and textures inside, outside, in the suburb and in the core and center of the cities. Infill development can incorporate various levels like brown, vacant and unused, abandoned and deserted lands as well as the worn-out textures that are undergoing demolition, transportation corridors and lands and spaces with ownership problems like endowed lands.

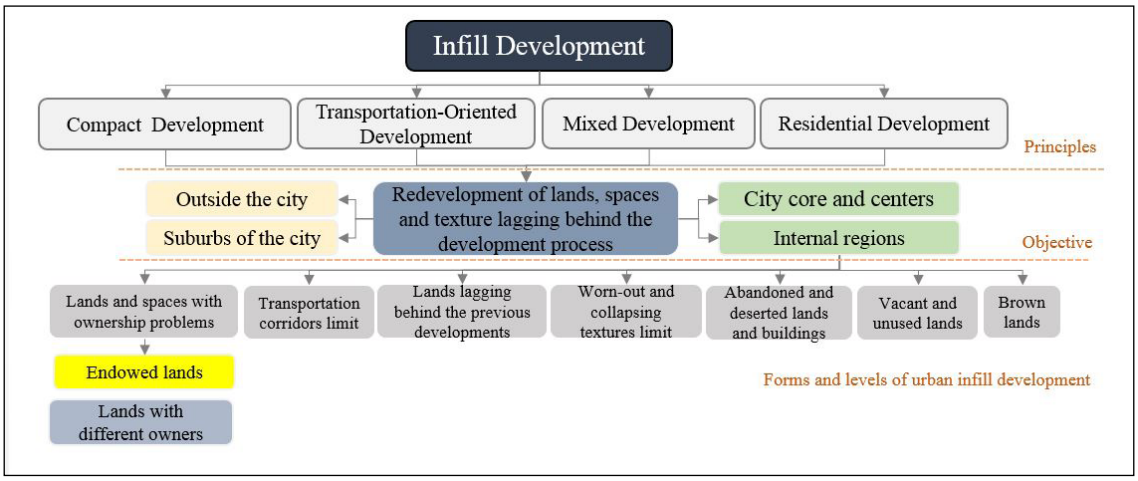


Fig. 2. Conceptualizing the Infill Development

Based thereon, infill development follows certain principles and properties as posited in the various texts like what has been presented below:

1) The attention of comprehensive plan and high-level documents to the infill development and vice versa: In the explanation of infill development principles, it is highly important to underline it in the comprehensive and zoning plan (Mirmoghtada'ei, Rafi'eiyan, & Sangi, 2011, p.48). On the other hand, many of the issues related to land use like mixing the land uses and development scale of them have been determined in the comprehensive plans, zoning projects and documents related to the land use as well as the other instructions and guidelines pertinent to the infill development and these documents should be taken into account (Listokin, Walker, Ewing, Cuddy, & Cander, 2006, p.76).

2) Analysis of the facilities and constraints of the site before project implementation: When a site is selected for infill development, the first step is the evaluation of the environmental and developed properties and limitations of the site (Listokin, Walker, Ewing, Cuddy, & Cander, 2006, p. 76).

3) Facilitation of the criteria and licenses: The legal changes should be made in such a way that they can ease the supplying of the infill development needs and requirements and reducing of the barriers and challenges and providing the stimuli required for doing so (Sa'eidi Rezvani, Daoudpour, Fadavi, & Server, 2013, p. 164). Flexible codes include buildings, zoning and other criteria of development that provide the developers with more freedom of action in their accomplishing of a project to respond better to the current and variable economic conditions (EPA, 2015, p. 22).

4) Consistency and contextualism in the infill development: Precise evaluation should be carried out regarding the context in the periphery of the intended project site and the relationship between the natural environment and the constructed environment with the investigated site and its personality should be determined (New Port City Council, 2009, p. 18).

5) Access to public transportation and passageways: Infill development should create connectivity between the transportation systems, local sidewalks and open spaces inside and outside the neighborhoods. Public access should not be limited and consistencies should not be eliminated (Mirmoghtada'ei, Rafi'eiyan, & Sangi, 2011, p. 48).

6) Encouraging the Local Community's Participation and Involvement: The local residents' non-participation is amongst the hindrances to the infill development. In endogenous development, the neighborhood residents should be encouraged to participate in the course of infill development planning process before certain projects are suggested due to the fact that it occurs in the existing communities. Access to the cooperation and trust of society is of great importance (Aly & Attwa, 2013, p. 458).

7) Presence and Public Facilities: Endogenous development should be provided with open public spaces unless the project is found connected or within a distance of a quarter of mile (400 meters) to a public park with continuous public routes in which case it is given the privileges of the open space (Allan, 2001, p. 2).

8) Land use: A combination of the business, residential and other land uses draws the people during various times and with various goals to the infill development region and this contributes to the creation of vitality,

absorption of economic activities and offering an exciting and pleasant walking experience; therefore, those types of development are encouraged that cause amalgamation of the land uses in infill development (Listokin, Walker, Ewing, Cuddy, & Cander, 2006, p. 82).

The set of scales and indices of infill development most underlined in the area of macro-level urban (physical, social, economic, environmental and managerial) planning were selected in a review of the theoretical and empirical literature related to the subject mentioned above. Then, the extracted indices were nationalized and rendered more exact and complete according to the conditions of the study region and its endowment background based on personal deep interviews with the urban specialists and elites the results of which are presented in Table (1). It is worth mentioning that some of the spatial indices are basic and some others are more general (other than the basic place) that can be recognized from one another. For instance, the people's attitudes and customs in the use of endowed lands are considered as a general index and it equally influences all of the lands; these indices have been designated in Table (1) by asterisk (*) sign.

Table 1. Scales and Indices Influencing the Capacity Assessment for Endowed Lands' Infill Development

Scales	Research Indices (Matching with Iran's Conditions)	Source
Land's Physical Quality	Quality of buildings	(Northeast-Midwest, 2001; City-Parish Planning Commission, 2004; City of Fresno, 2012; Banihashem, Server, & Ziary, 2014)
	Age of buildings	
	Masonry of the buildings	
	Number of floors	
Activity System	The status quo of the land uses	(McConnell & Wiley, 2010; EPA, 2015)
	Activity inconsistencies	(Caves, 2005, Al-Attar, 2011, Banihashem, Server, & Ziary, 2014)
Texture Development Pattern	Context and form of texture	(New Port City Council, 2009; Listokin, Walker, Ewing, Cuddy, & Candder, 2006)
	Texture's permeability	(Banihashem, Server and Ziary, 2014 and Enger, 1997)
	Geographical position	(Listokin, Walker, Ewing, Cuddy, & Candder, 2006; Otak, 1999)
Public Services and Facilities	Access to educational, treatment, sport and cultural centers as well as green spaces	(Northeast-Midwest, 2001; City-Parish Planning Commission, 2004; City of Fresno, 2012)
Access to the Urban Infrastructures	Access to urban installations	(Northeast-Midwest, 2001; Enger, 1997, Florida department of community affairs, 2003; Aly & Attwa, 2013; Allan, 2001, Enger, 1997; Comprehensive Infill Guideline, 2015)
	Access to public transportation stations	
	Access to main streets	
Risk Acceptance	Natural dangers	(Listokin, Walker, Ewing, Cuddy, & Candder, 2006; RERC, 1982)
Population Acceptance	Population density	(Aurecon, 2009)
People's Religious Status	Society's norms and people's attitudes in using the endowed lands*	(Enger, 1997)
Acceptance of Presence and Population	Sense of attachment to the living place	(Northeast-Midwest, 2001; Enger, 1997)
	Social interactions and adjacency relationships	(Northeast-Midwest, 2001; Wheeler, 2002)
	Social security	(Northeast-Midwest, 2001; CLEE, 2014)
	The tendency towards the residents' participation	(Northeast-Midwest, 2001; Aly & Attwa, 2013)
Costs and Financial Loads of the Development Plan	Costs of designing and construction	(Otak, 1999; Connie, Lora, & Randy, 2005)
	Level of land segment	(Otak, 1999, Northeast-Midwest, 2001)
	Land price	(Otak, 1999; Northeast-Midwest, 2001)
	Costs and incomes of urban management and Astan-e-Quds-e-Razavi*	(Otak, 1999)
	Conflict of interests between municipality and Astan-e-Quds-e-Razavi*	(Wallis, 2008)
	Financial supports and investment*	(Otak, 1999; Connie, Lora, & Randy, 2005; Kaplan, 2006)

Participatory Management	Paying attention to the integration of duties and cooperation between the corresponding institutions*	(Enger, 1997; Northeast-Midwest, 2001; Iams & Kaplan, 2006)
	Paying attention to the participation in the society in practice *	(Aly & Attwa, 2013; CLEE, 2014; Northeast-Midwest, 2001; European Union, 2011)
Familiarity with the Requirements of the Endowment	Types and uses of endowment*	(Saeedi Rezvani, Daoudpour, Fadavi, & Server, 2013; Enger, 1997; DRCOG, 2006; Allan, 2001; EPA, 2015)
	Cooperation by the canonical rulers in correcting or changing the endowment verdicts*	
	Urban managers' familiarity with endowment*	
	Inflexible regulations related to endowment*	
	Astan-e-Quds-e-Razavi's paying of attention to the urban needs and criteria*	
Criteria and Regulations of the Upstream Plans	Zoning of the suggested activities	(Aly & Attwa, 2013; CLEE, 2014; Allan, 2001; European Union, 2011)
	Density zoning	(Otak, 1999; city of Fresno, 2012; EPA, 2015)
	Worn-out texture	(Otak, 1999; Wallis, 2008)

4. STUDY METHOD

At first, the necessity of redeveloping the endowed urban lands was obtained in a review of the literature and theoretical foundations related to the study subject based on a descriptive-analytical method. Then, the important scales and indices were identified in the various theories and resources in the macro-level areas of urban planning using a descriptive-comparative method. In the end, in order to nationalize and match the existent grounds, deep interviews were made with the experts and specialists of urban affairs and endowment. These experts have been selected based on a purposive sampling method. Ten specialists were selected for the interview. The results obtained in the interviews were applied in rendering exact and complete and nationalizing the intended scales and indices. Then, according to Table (1), the indices and scales of capacity assessment for urban endowed lands' development were finalized and they will be subsequently evaluated in the study area. This way, in the first step, information was collected according to the nature of indices through documentary research (a detailed plan of the Mideastern and Northeastern areas) and survey study (interview with the officials of urban management and Astan-e-Quds-e-Razavi and use of people-oriented questionnaires and analysis of them in SPSS). In arranging the questionnaire, the indices related to the scale "presence" and "social participation" were set considering their nature in the form of items that were scored based on Likert's five-point scale following which the people's ideas were gathered. To do so, all of the residential parcels or every plate in the neighborhood was considered as the target population. In the survey, 460 questionnaires were distributed amongst the neighborhoods based on Cochran's method at a 95% probability level but some of them were left uncompleted for a reason or another and 400 questionnaires were used in the analyses. It is worth mentioning that the reliability of the questionnaires was found 0.83 based on Cronbach's alpha and the study sample volume was selected based on the randomized regular or systematic method for questionnaire distribution. All of the parcels were numbered in ArcGIS software and the target segments were randomly specified for distribution of the questionnaires in the blocks of every neighborhood. After investigating the indices, the information layers of the base place's indices were prepared in GIS environment. In the second step, in order to determine the weights and importance of the scales and indices, 32 expert questionnaires were administered to the specialists (road and city construction office of Khorasan-e-Razavi Province, Mashhad's municipality, Astan-e-Quds-e-Razavi, the organization for endowments and charity affairs and university professors). Then, their related weights were calculated based on the AHP method using the Expert Choice Software and entered into GIS and the final weight of the option (parcel) was obtained. In the next step, in order to prioritize the endowed lands for development capacity assessment, the aforementioned layers were juxtaposed and the result was drawn in the form of maps of indices pertinent to the corresponding scale. In the end, the map of each scale was computed through exerting the related weights and the final map was produced using the weighted overlap index (WOI),

juxtaposition and final map indicating the development capacity of the endowed lands and prioritization of development in them. Based thereon, the lands were categorized into three sets of the 1st, 2nd, and 3rd priorities.

5. INTRODUCING THE STUDY CASE

Mashhad is the second religious metropolis of the world after Mecca and it is the second metropolis of the country reaching 3057679 people in the population and 35147 hectares in the area according to the census performed in 2016. The existence of the holy shrine of Imam Reza (PBUH) and its role in the city's development has caused the majority of the land ownership to be in possession of Astan-e-Quds-e-Razavi and endowment organization and these lands are amongst the most important factors influencing and intensifying the scattered expansion of Mashhad, as well. Based on the information obtained from Astan-e-Quds-e-Razavi Organization and general endowment office of Mashhad, more than 50% (50.12%) are included as the holy shrine's lands and 10.45% is comprised of endowed lands out of the total area of the city. This way, 60.57% of the city's area is composed of the lands belonging to Astan-e-Quds and endowment organization. Amongst the regions in Mashhad, District 6 consisting of three areas and 14 neighborhoods, accounts for the largest share of the endowed lands belonging to Astan-e-Quds-e-Razavi in such a way that more than 80% of the lands of the region belongs to Astan-e-Quds-e-Razavi and the rest is owned by other types of ownership (less than 20%) (Figure 3). According to the census in 2016, District 6 accommodates a population of 232616 people and reaches 1869 hectares in the area. Based on Table (2), the endowed lands of the District 6 account for 4.25% of the total city area and 7.02% of the total area of Mashhad's endowed lands. The pure urban lands account for about 69% of the area of the region's endowed lands out of which residential land use, with an area of about 240 hectares and a quotient of about 23%, is at the highest level in comparison to the other existent land uses. On the other hand, about 31% of the region's endowed area, as well, has been occupied by the non-pure urban lands (agricultural, barren, ruins and so forth) and this is well indicative of the redevelopment capacity, especially in terms of infill development in the endowed lands (Fig. 4).

Table 2. Area of the Endowed Lands and Share of Each of Them in Mashhad

	Area (Hectare)	Relative Share (%) in General
Mashhad	35147	100.0
Total endowed lands	21.290	60.57
District 6 of municipality	1869	5.31
Endowed lands of municipality's District 6	1495	4.25

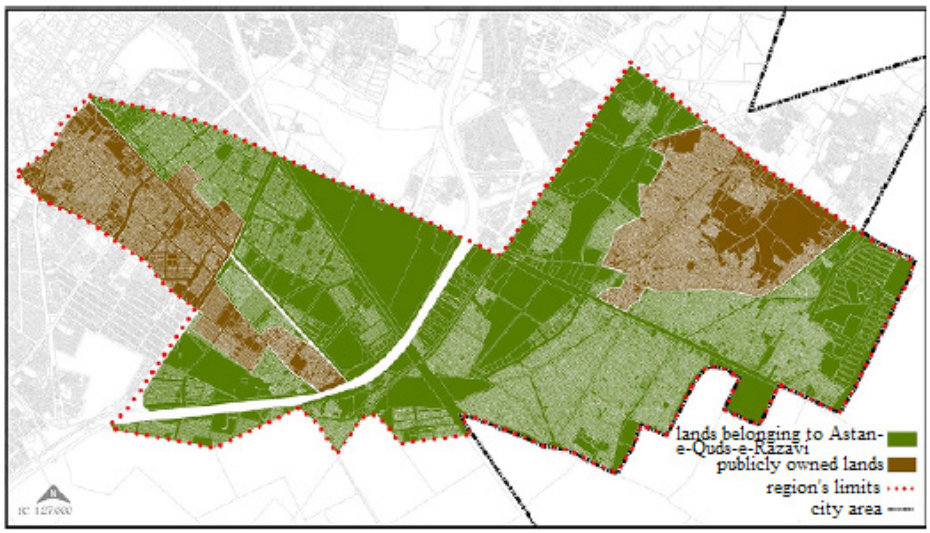
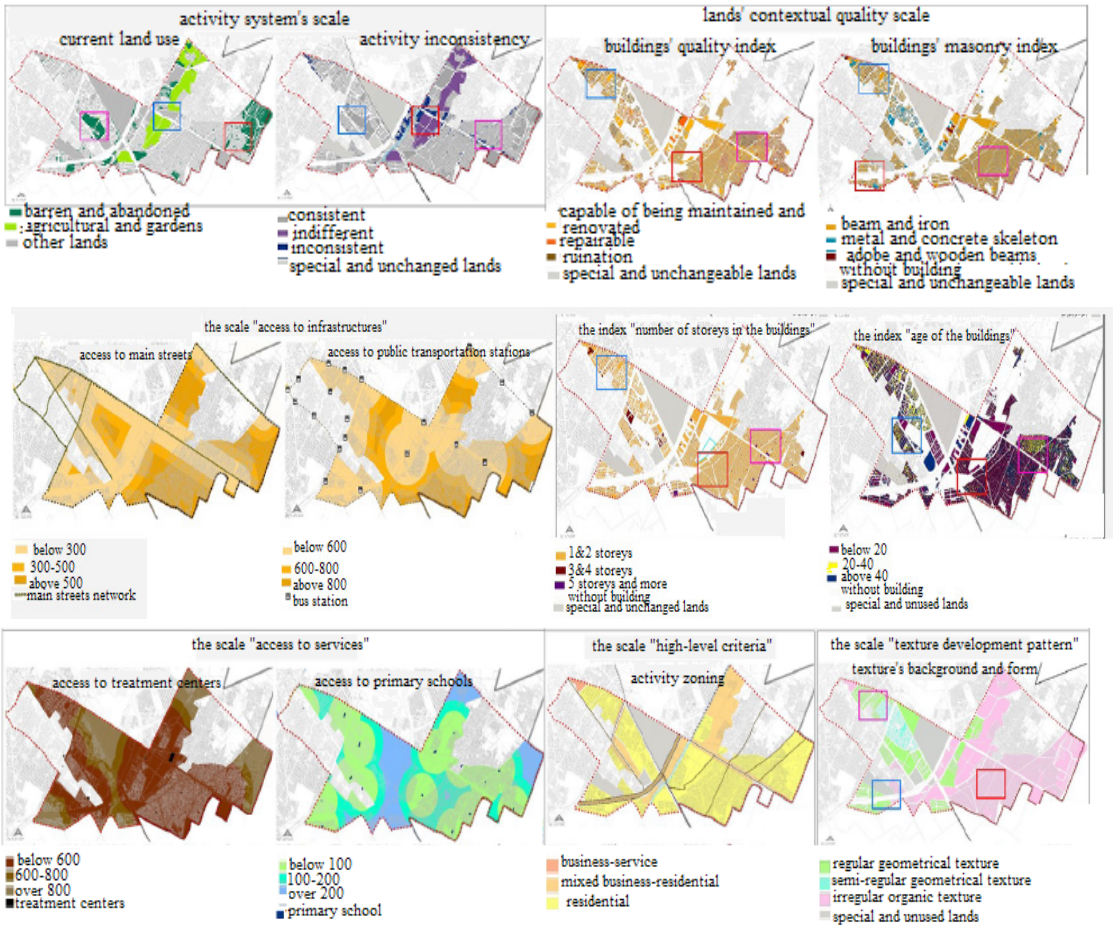


Fig. 3. Ownership of the Lands in District 6 of Mashhad's Municipality

Fig. 4. Endowed Land uses Cases in District 6 of Mashhad's Municipality

6. STUDY FINDINGS

After collecting the information required for each of the study indices and obtaining the information related to upstream plans and so forth by means of the people-oriented questionnaire and in order to evaluate them, the geographical information system (GIS) was used to identify and examine the infill development opportunities in land segment's scale. To do so, the output of the base indices layer that could be used for map preparation was produced in GIS in classifications corresponding to the standards and theoretical foundations of the subject (Fig. 5). In evaluating District 6 of Mashhad's municipality, some of the index and special land uses like Beheshti Estate, Mashhad's power generation plant and Hafiz and Mosalla dried nuts market were discarded from the capacity assessment process due to their essential roles in the city and region's spatial structure and their current land uses were stabilized.



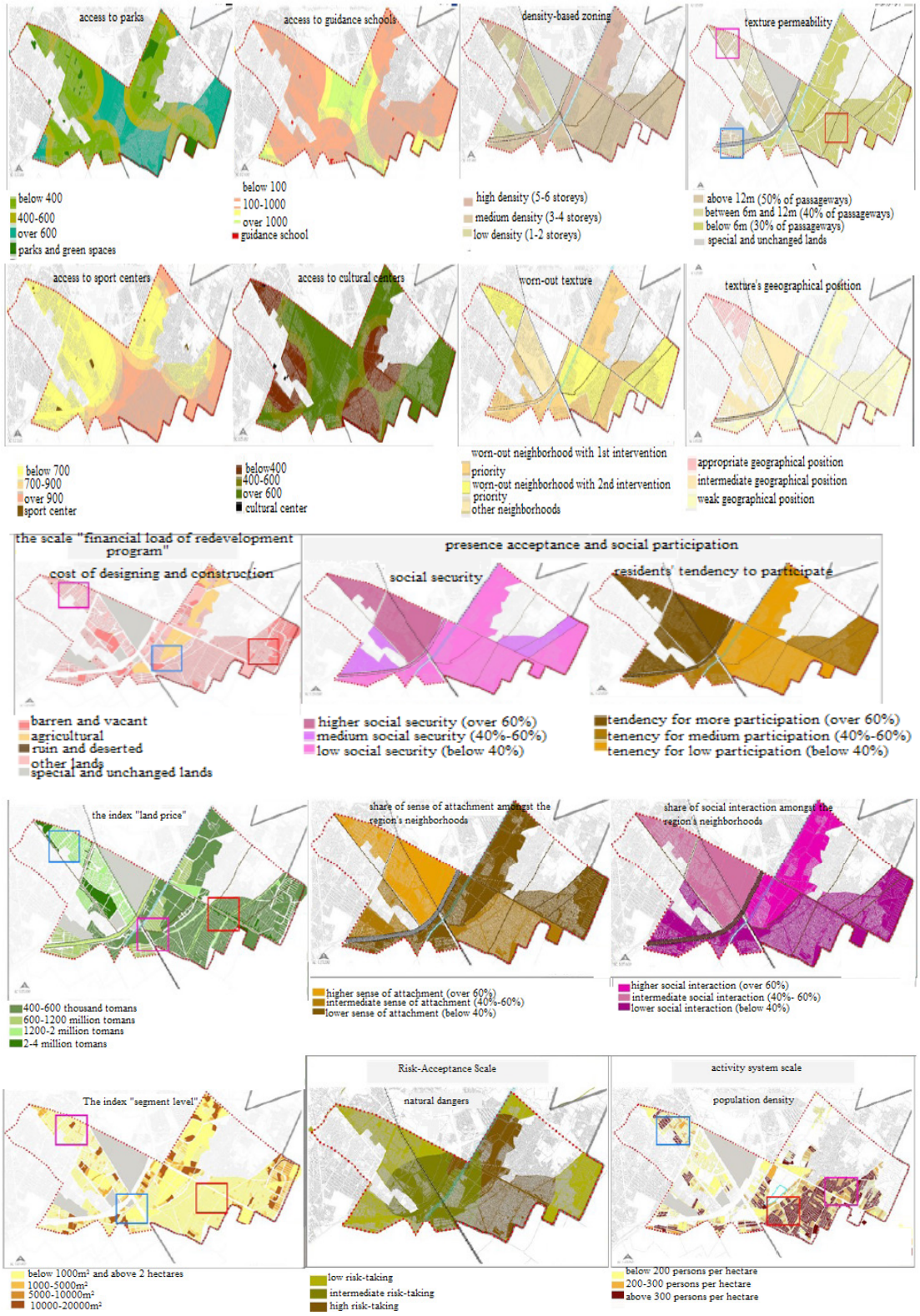


Fig. 5. Classification of the Base Place's Indices Based on the Study Criteria in GIS Environment

After preparing the topical maps of the indices, to weight them, it is necessary to use the AHP method in the first step of which the goal, scale, and index are determined as shown in Figure (6).

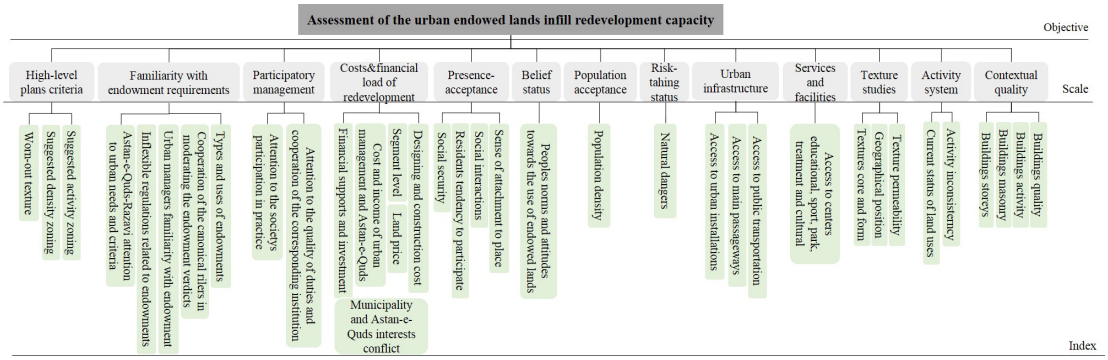
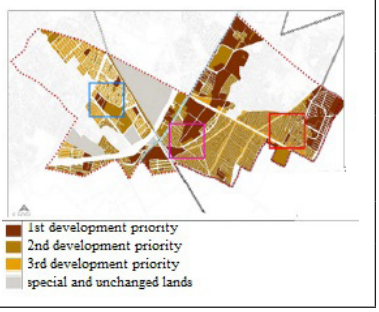


Fig. 6. Analytic Hierarchy Process (AHP) of the Goal, Scales And Subscales

In the following, pairwise comparison of the scales and subscales was carried out by 32 specialists (from road and city construction office of Khorasan-e-Razavi office, Mashhad's municipality, Astan-e-Quds-e-Razavi organization, the organization for endowments and charitable affairs and university professors). Afterward, the weights related to the scales and indices of the spaces other than basic place were calculated as presented in Table (3); the weights of the scales and indices pertinent to basic place were computed using Expert Choice Program as illustrated in Figure (7) and they were subsequently inserted into GIS for obtaining the final weight of the option (parcel). Then, the information layers were juxtaposed in GIS environment and Arch Map program based on the each scale's indices, corresponding to the basic place, that were obtained in the previous stage (Figure 5) through being assigned with their determined weights and the result was the map related to the corresponding scale (Fig. 7). In the end, the maps of the lands' physical quality scales (with a weight of 0.143), access to the urban infrastructures (with a weight of 0.105), access to the services (with a weight of 0.101), lands' activity system (with a weight of 0.094), texture development pattern (with a weight of 0.086), familiarity with endowment requirements (with a weight of 0.154), financial load and costs of the redevelopment program (with a weight of 0.073), people's religious status (with a weight of 0.063), presence acceptance and social participation (with a weight of 0.050), risk acceptance (with a weight of 0.050), population acceptance (with a weight of 0.037), participatory management (with a weight of 0.023) and high-level criteria and regulations (with a weight of 0.021)were juxtaposed through being assigned with their corresponding weights using WOI and the final map (Fig. 8) that shows the lands with the first to the third development priorities was prepared.

Table 3. Final Weights of the General and Non-basic Place Indices and Scales Based on AHP Method

Scales	Significance Coefficient	Consistency of Judgment	Indices	Significance Coefficient	Consistency of Judgments
People's religious status	0.063	0.01	Society's norms and people's attitudes in using endowed lands	1	0.01
Participatory management	0.023		Attention to the society's participation in practice	0.500	0.01
			Intra-organizational cooperation and integration	0.0500	
Familiarity with endowment requirements	0.154		Types and uses of endowed properties	0.496	0.03
			Inflexible endowment regulations	0.257	
			Cooperation between the canonical rulers	0.121	
			The familiarity of the urban managements with the endowment verdicts	0.063	
			Attentions by Astan-e-Quds to the urban needs	0.063	

Scales	Significance Coefficients	Judgments' Consistency	Indices	Significance Coefficients	Judgments' Consistency	Map
Access to Urban Infrastructures	0.105	0.01	Access to Urban Installations	0.570	0.02	
			Access to public transportation stations	0.333		
			Access to main streets	0.097		
Risk acceptance	0.050		Natural disasters	1	0.03	
Population acceptance	0.037		Population density	1	0.01	
Presence and social participation	0.050		Social security	0.313	0.01	
			Social interactions	0.305		
			Sense of place attachment	0.279		
			Tendency to participation	0.103		
Financial load and costs	0.073		Interest conflict	0.292	0.02	
			Land price	0.230		
			Investment	0.225		
			Land parcel area	0.116		
			Designing cost	0.092		
			Cost and income	0.045		

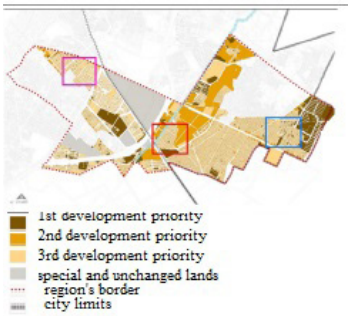
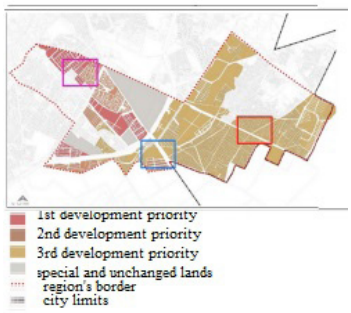
Criteria and regulations of high-level plans	0.021	0.01	Activity zoning	0.542	0.01	
			Density zoning	0.293		
			Worn-out texture	0.165		
physical quality of the lands	0.143		Building's quality	0.598	0.02	
			Buildings' age	0.229		
			Buildings' masonry	0.116		
			Number of floors	0.057		
Activity system	0.094	0.01	Current status of land use	0.667	0.01	
			Activity inconsistency	0.333		
Texture development pattern	0.086		Texture's background and form	0.637	0.03	
			Texture's permeability	0.258		
			Geographical position	0.105		
Public services and facilities	0.101		Access to the education centers	0.466	0.03	
			Access to treatment centers	0.195		
			Access to parks	0.144		
			Access to sport centers	0.106		
			Access to cultural centers	0.099		

Fig. 7. Final Weights of the Basic Place's Indices in Extracting the Endowed Land Parcels Suitable for Infill Development Based on AHP Method

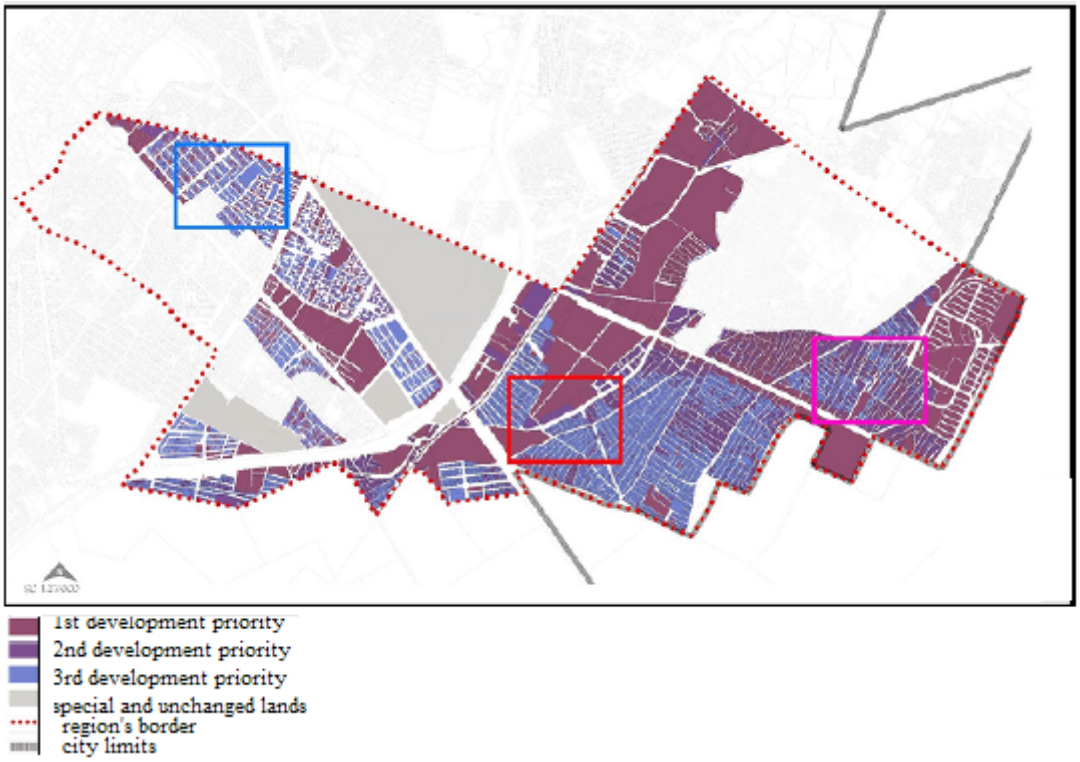


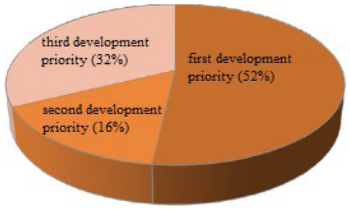
Fig. 8. Final Prioritization of the Endowed Land Parcels Suitable for Infill Redevelopment in District 6 of Mashhad's Municipality

According to Figure (8), the lands are categorized in three sets, namely the lands with high development capacity (1st), lands with intermediate development capacity (2nd) and lands with low development capacity (3rd). The results obtained from the endowed lands' redevelopment capacity in District 6 of municipality are summarized in Table (4) and show that the land parcels with high development capacity account for 3088 hectares equivalent to 51.8% of the total endowed area and are usually found located in district 3 of the region (Amir Abad, Poursina, Mow'oud, Arvand, Ansar and Shirin Neighborhoods) as well as the second Employee Neighborhood in district 2. The lands with high development capacity constitute nearly half of the region's area. One of the most important reasons is the frequency of the barren, agricultural, industrial and workshop lands and ruined and collapsed buildings in this region and this is indicative of the area's high capability for being loaded with infill development. The majority of the parcels have proper access to various land uses, installations, public transportation stations, and main passageways and they are in a good situation in terms of permeability (passageways more than 12m in width), background(regular geometry) and geographical position. The majority of the parcels are inflicted with contextual worn-out in such a way that the buildings are found with ruined quality, ages above 40 years and wooden beam and adobe constructional materials in 1-2 storeys. The prices of most of them range from 400 to 1200 million tomans. The designing and construction costs of most of them are very low according to the estimations and their area (0.5-3 hectares) is largely suitable for development. The amounts of sense of attachment, social interactions, social security and tendency to participation (over 60%) are favorable in the neighborhoods constituting this region. Activity zoning (mixed business-service) and the suggested density (5-6 storeys) are also relatively appropriate for the upstream plans in many of these segments. The segments with intermediate development capacity account for 94.7 hectares, equivalent to 15.9%, of the endowed lands' area in the region. About 25% of these segments have agricultural land uses, barren lands and the rest have business, residential and other land uses. The majority of the parcels have nearly proper access to various kinds of land uses, installations, main passageways, and public transportations and they are found in a relatively auspicious situation in terms of background (semi-regular geometry), permeability (passageways with widths between 6m and 12 m) and geographical position. Most of the parcels are in a relatively appropriate situation in terms of the physical quality in such a way that the quality of the building is repairable, the buildings' age is in a range from 30 to 40 years, the materials of the buildings is brick and iron and they are built usually in 3 to 4 storeys. The price of most of the parcels ranges between 1.2 to 2 million tomans and the construction and designing cost of most of them is relatively low and the area of most of the parcels is

in a relatively proper range (0.1 to 0.5 hectares). The amount of sense of attachment, social interactions, social security and tendency to participation (40% to 60%) is relatively appropriate in neighborhoods that many of these parcels have been situated. Activity zoning (mixed business-residential) and the density (3 to 4 storeys) suggested in upstream plans for many of these parcels is also relatively suitable for development. The parcels with low development capacity account for about 192.3 hectares, 32.3%, of the total endowed lands' area in the region. 68% of these lands are residential and the rest have public land uses like religious, educational, treatment and others. The physical quality is appropriate in most of the parcels but the participation, security, sense of belonging and interactions are low and there is not suggested proper land use and density in the upstream plans for development. Most of the parcels are in an inappropriate situation in terms of geographical position, textural context (organic) and permeability (below 6 meters). These parcels can be transformed into intermediately and highly developable lands through correct planning and mangement and their capacities and potentials can be employed more than it is currently being applied.

According to the results of the researches that have been conducted so far regarding infill buildings, most of the people prefer to see the infill buildings be the repetition of the peripheral constructions and this is in conflict with the architects' attitudes towards the infill buildings and it can be accompanied by unfavorable consequences like reduction in the people's participation and satisfaction in the urban spaces so the specialists and experts are required to pay a greater deal of attention to this issue.

Table 4. Area and Percentage Related to the Endowed Lands in Each Set

Final Prioritization of the Lands	Number	Area (Hectare)	Percentage of the Area	Significance Coefficient
1st development priority (high development capacity)	5845	3088	51.8	
2nd development priority (intermediate development capacity)	8259	947	15.9	
3rd development priority (low development capacity)	13878	1923	32.3	
Sum	27982	5858	100	

7. CONCLUSION

The city areas have had scattered and sprawl (disfigured) growth due to the rapid growth in population and immigration during the recent decades and also because of severe inclinations towards urbanization followed by the increase in the need for residence. Accordingly, many lands, including the endowed ones, are lagged behind their internal capacities and reuse. Although endowed lands have had an essential role in the formation of Mashhad in such a way that they account for 60% of the city's area, they have caused many problems in macro- and micro-levels during the recent decades due to the ownership problems and lack of investments with many of them being informally owned, in worn-out textures and underdeveloped regions in the past periods and they generally do not possess proper land use and require efficiency and dynamicity. Amongst the regions with many of their lands being under-endowed ownership is the District six in Mashhad that about 80% of its lands are endowed and have the aforementioned problems. Therefore, it seems that mixing of the endowed urban lands' organization topics within the framework of urban infill development under the conditions that we are faced with shortage of development space in the cities, especially in the metropolis of Mashhad, in line with fighting the endowed lands' underdevelopment problems can be a notable method for supplying the development space in adherence to the economic, social and environmental expediencies as well as for solving the underdevelopment problem of the endowed lands. Thus, unlike the majority of the researches that have evaluated the worn-out, abandoned, ruined and deserted lands and performed infill development capacity assessments, the present study is the first research that, based on the completed process, has endeavored to prove the necessity of endowed lands' redevelopment necessity in District 6 of Mashhad based on infill development indices extracted from the theoretical and empirical literature so as to figure out and locate the most proper endowed lands for redevelopment. To do so, AHP method and GIS software were used. The results indicated the followings:

- Under land shortage conditions and in order to fight with the macro- and micro-level economic problems, the necessity for endowed lands' redevelopment in line with urban stability became vivid and, subsequently, the most appropriate redevelopment approach, i.e. urban infill development, was selected. That is because such a type of development is in a direct relationship with redevelopment in contrast to the other methods with its

objective being redevelopment of the lands, spaces and areas lagging behind in development (endowed lands as parts of the spaces lagging behind the development pace) and also because it seeks enhancement of internal development to the maximum possible extent.

- Amongst the scales of endowed urban lands' development capacity assessment, scales like familiarity with endowment requirements (with a weight of 0.154), physical quality of the lands (with a weight of 0.143) and access to the urban infrastructures (with a weight of 0.101) account for the highest weights (figure 8). As viewed by the experts, the most important barrier in endowed lands' redevelopment is the criteria, regulatory, legal and sometimes norm-related constraints of the endowment. The reduction of these limitations and paying necessary and enough attention to such a topic as endowment when preparing the plans are amongst the cases that can lead to the improvement of the current conditions. Therefore, it is expected that such familiarization can increase the urban managers' awareness of the endowment criteria and simultaneously result in the identification and reduction of these lands' development restrictions thereby to encourage more efforts parallel to the endowed lands' redevelopment. Moreover, the investigation and capacity assessment of the endowed lands in the District six, as well, shows that the region's endowed lands infill capacity is high and that these endowed lands account for 51% of the total area of the region with the vast part of them being barren, agricultural, workshop, ruined and abandoned lands. Based on the properties of this set, the appropriateness of the texture development pattern, favorable access to the urban infrastructures, high level of social participation and presence acceptance and suitability of the suggestions made in the high-level plans can be pointed out. On the other hand, about 16% and 32% of the endowed lands' area in this region feature intermediate and low development capacity, respectively, but, using proper planning and management, they can be transformed into segments with high development capacity so that their capacities and potentials can be exploited more than now.

Comparison of the present study's findings with the results obtained in the other studies indicate the necessity of paying attention to the redevelopment of the endowed urban lands and their capacity assessment within the framework of urban infill development; this is an issue that has been left neglected in the domestic and foreign researches except in one research. It can be stated based on the results' comparison that although the endowed lands are amongst the most important factors of the formation of Islamic cities like Mashhad, they are presently lagged behind the development process and have caused a lot of problems that entail redevelopment. Furthermore, it was observed that infill development, as proposed in many of the foreign studies, is the most important approach towards the redevelopment of the underdeveloped lands. hectares, the present study intends to utilize a vast spectrum of scales and indices that have been nationalized and finalized and used as a basis of action by the experts for assessing the capacity of endowed lands' development based on the theoretical and empirical literature. Meanwhile, the factor "familiarity with the endowment requirements" can be pointed out as one of the most important factors for redeveloping the endowed lands. Since the majority of the country's cities like Mashhad are currently engaged with such a subject as endowment, the underdevelopment of the endowed lands and emergence of urban instability is an inevitable issue. Such underdevelopment can pave the way for the immethodical expansion of the city, destruction of valuable environmental resources, the emergence of social harms, fading out the citizens' individual identity and slackening of the economic growth and these issues bar the actualization of sustainable development in practice. Due to the same reason and in line with guiding the urban development and wise management of it, the urban managers are required to use endowed lands but the issue has to be extensively investigated in relation to the cities in Iran. As for Mashhad, it can be stated that the city's endowed lands and spaces have more capacity than what is currently being exploited. Therefore, it is via getting aware of and paying attention to the physical, social, economic and managerial conditions governing endowment that such a blessing (high development capacity of endowed lands) can be maximally employed parallel to the solving of the problems and issues in favor of the best interests of Mashhad's citizens. To do so, the barriers and constraints of endowed lands' redevelopment should be identified and overcome so that their opportunities and potentials can be maximally utilized. Based thereon, according to Table (5), the solutions and suggestions for the redevelopment of the endowed lands in District 6 of Mashhad's municipality are presented in a classified manner and in regard to the municipalities and other organizations' duty scoops.

Table 5. Solution and Suggestions for the Endowed Urban Lands' Infill Redevelopment

Grounds	Solutions	Corresponding Organization
Physical	Change of the use case of the large lands with uni-functional land uses and their transformation into multifunctional land uses	Municipality and city council
	Utilization of the endowed barren lands for supplying cheap housing	Municipality, road and city construction, Astan-e-Quds-e-Razavi and corresponding charity and endowment offices
	Use of endowed barren lands for improving the level and per capita of public land uses (such as educational green space, treatment land uses)	Municipality and road and city construction office
Social	Promoting the proper culture amongst the people for using the endowments through educational interventions, holding meetings, conference, and seminars	Municipality, Astan-e-Quds-e-Razavi and endowment organization
	Establishing the facilitation offices and local councils for informing the owners and proctors of endowment about the city's daily needs and benefits and advantages of the endowment	Municipality
Economical	Formation of a committee as a supporter of endowment in the offices related to the city for coordination with endowment office	Endowment organization and Astan-e-Quds-e-Razavi
	Consideration of development encouragements for endowed lands (like rewarding building floor densities and taxing discounts)	Municipality and road and city construction office
Managerial	Managerial integration through creating coordination between various institutions (like municipality, endowment and charity organization and road and city construction office)	Municipality and provincial governorship
	Taking advantage of the academic environments' notions about endowments	Municipality and road and city construction office
	Codification of the proper criteria and regulations for development in endowed lands	Municipality and road and city construction office
	Preparation of a proper information bank for the endowed zones in the region	Municipality and road and city construction office

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