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Original Research

Investigation of Sports Spaces with Passive Defense Approach in Ardabil City

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ABSTRACT

Sports spaces are part of public spaces that have been considered as a need due to population growth and a high percentage of leisure time in society. The construction of sports spaces and places requires a lot of money and it is necessary to determine their optimal location in a way that all citizens can use them effectively and safely. By understanding this importance and getting to know more about passive defense and its factors and components, as well as its impact on the security of spaces, it is possible to identify ways to reduce damages, wastes, and losses. Therefore, the present study was conducted to study sports spaces with a passive defense approach with the case of Ardabil city. This study was a descriptive and field study. The statistical population of this study consists of 68 parcels with sports use in Ardabil, all of which were included in the study using the census method. In the framework of the discussion of optimal criteria in locating urban functions with the passive defense approach, 30 indexes in the form of 6 components of compatibility, comfort, desirability, efficiency, health, and safety and passive defense standards were prepared. The scattering pattern of sports spaces was evaluated using the nearest neighborhood average method. Also, the collected data were weighed in Super Decision software, then mapped in GIS, and finally, zoning was done using the TOPSIS technique. The results obtained from the studies show that the pattern of scattering of sports spaces in Ardabil is appropriate. In addition, six suitable locations for the establishment of sports centers with a passive defense approach in the city of Ardabil were identified that the location of sports facilities in urban areas can be analyzed in the scientific method and get good results. It is suggested that the managers of the General Department of Sports and Youth of Ardabil Province use the areas prioritized in this research to create a sports site in order to meet the goals of passive defense.

Keywords: Sports Spaces, Locating, Passive defense, Ardabil.

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INTRODUCTION

Urban development and sustainable cities is one of the most important challenges facing societies in the 21st century, as cities may suffer great damage in times of crisis. Therefore, paying attention to passive defense can significantly reduce the amount of damage caused by accidents (1). The distribution of sports spaces in the city and its different regions can have a direct impact on the desired pattern and functional efficiency of the city. On the other hand, the appropriate and complete diversity and distribution of sports spaces use can increase authority and power for the selection of sports facilities and the desirability of living in the city. Therefore, sports spaces should be properly located in the city (2). Due to some reasons such as high population density, irregularities in land uses locating, and lack of attention to the implementation of the accessibility, demographic, and security threshold, public spaces in many cities are not able to provide proper services to citizens. This is more pronounced in large cities and especially in the spaces that are associated with the ever-increasing demands. Meanwhile, sports spaces that are a type of social residential spaces (3) are one of the important public areas for the health of a society that has more considerable importance compared to other urban services, through activities such as the simultaneous presence of a dense crowd of people, mobility, leisure and recreation of the residents of large cities and metropolises, face-to-face relationships, sports competitions and matches between population groups, holding night meetings and non-sporting events with social and sometimes political purposes (4). Construction of new sports spaces needs scientifically valid studies to determine the location and neglecting this issue leads to the inefficiency of constructed spaces as well as wasting money, time, and energy and most importantly has a direct impact on future performance, especially negative impact on the quality of sports and healthy recreational programs (5). Today, due to the economic problems and the importance of paying attention to the more productivity and efficiency of such places, key factors like criteria for the construction, layout and locating and neighborhoods must be considered to achieve the desired goals and the spatial distribution of these spaces must be based on the determined standards and conformed with the existing regulations like any other places (6). The optimal locating tries to regulate the indexes and factors affecting the decision-making and provide reasonable solutions to help decision-makers and planners in the selection of suitable sites for the activities (7).

Several studies have been done to study and evaluate the situation of location selection of sports spaces in the country and the world, but little research has been done on the issue of sports spaces locating with a passive defense approach. Passive defense is a set of unarmed actions that increase deterrence, reduce vulnerability, continue essential activities, promote national stability, and facilitate crisis management, and ultimately, make national security (8) and reduce the vulnerability of manpower, buildings, facilities, document equipment, and arteries of the country against crises with natural causes (drought, earthquake and drift, landslides, storms, etc.) and the human factor (war, internal riots, sanctions, etc). In other words, passive defense invests in the capability of human agency and human category (9). Applying passive defense measures and considerations, in addition to drastically reducing costs, will greatly increase the defense efficiency of plans, objectives, and projects in times of crisis. Passive defense plans are prepared before a crisis occurs and in a time of calm, and include a design for all crisis management steps.

Iran is known as a land that is always exposed to various natural and unnatural hazards. Numerous factors such as the special geopolitical and geostrategic position of Iran, the existence of numerous underground resources, and the formation of a government with a religious democracy approach have caused the country to be exposed to various foreign threats and conflicts with neighbors and non-neighbors (10). Regarding, economic and infrastructure projects and facilities have been constructed or developed without observing or interfering with defense and security considerations, and are available for the enemy and the invading countries as a potential naked and at the same time significant target.

The city of Ardabil has been no exception to this rule. Due to its location in the northwest of the country and its special strategic position, this city can be considered as one of the major centers of danger and risk in the event of threats. Whereas passive defense, in addition to its deterrent role, prevents financial damage to critical and sensitive military and civilian equipment and facilities and human casualties; therefore, this principle has led to the study and recognition of vulnerable factors and elements of Ardabil city, considering the role and position of this city (the capital of the province) to study its current situation from the perspective of passive defense. Therefore, the purpose of this study was to investigate sports spaces with a passive defense approach, which has been done in the framework of the general policies of the system regarding passive defense, approved by the Expediency Council.Yazdani and Seyedin (2016) evaluated the spatial vulnerability of Ardabil city infrastructure from the perspective of passive defense. The results obtained from the studies of spatial distribution patterns, vulnerability zoning, and SMOT model for Ardabil city showed that the spatial distribution of Ardabil city infrastructure is cluster type and this deployment pattern with a total of 17% of the total urban land uses are among the areas with very high vulnerability, contrary to the principles and regulations of passive defense, and create a high vulnerability to threats (11). For the southern and northern areas of Ardabil, in proportion to the population, it is necessary to plan and locate new sports centers so that the residents of these areas have access to sports facilities at the lowest cost and time (12).

White et al. (2014) in a study entitled "Computational Model of Asset Vulnerability for Strategic Protection of Critical Infrastructure" presented a model for assessing asset vulnerability along with a scale of strategic risk and the probability of asset failure against attack suicides using game theory (13). Roeda and Calle (2017) in a study entitled “Using interdependency matrices to mitigate targeted attacks on interdependent networks” investigated targeted attacks to a telecommunication network node that is directly connected to a power grid node and vice versa (14). According to the researches, it is observed that a few pieces of research in the field of sports spaces have been done and planned with a passive defense approach. Previous studies and related sources have shown that no such research has been conducted about Ardabil. Therefore, the present study has investigated sports spaces with a passive defense approach in Ardabil.

MATERIAL AND METHODS

The present study was conducted to study sports spaces with a passive defense approach with the case of Ardabil city. This study was a descriptive and field study. The population consisted of all sporting places in Ardabil (68 parcels with sports use) and the sample size was calculated as a whole. The method of data gathering is documentary, library, and field survey. To analyze data and information the nearest neighbor mean the test was used to analyze the pattern of sports space dispersion, Arc GIS 10.4 software was used to import, store and manage, process, and analyze data, Super Decision software was used to weigh the layers, and TOPSIS technique was used to analyze the spatial priority of the zones.

After identifying the basic threats of Ardabil city, in the section of standardization and weighting of data, this stage was conducted through surveys and interviews, in the formats specified by relevant experts and using the technique of network analysis process (Super Decision). ANP method was used in the present project to weigh and apply the coefficients of the importance of the criteria for zoning the site of sports centers in the Arc GIS environment. Figure 1 shows the process and the different stages of research.

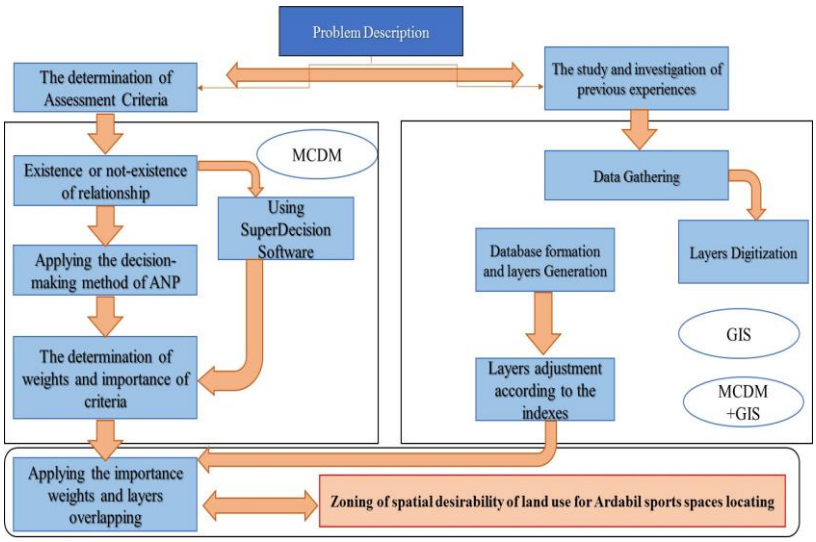

Figure 1. Research process and its different stages

RESULTS

Findings are separately presented in four: evaluation of spatial distribution patterns of sports centers, the weighting of criteria and sub-criteria, review of the status of criteria and indexes in the study area and their evaluation method, and finally ranking of suitable zones for optimal sports sites establishment.

Evaluation of spatial distribution patterns of sports centers of Ardabil with passive defense approach: Understanding patterns and discovering trends in spatial data is very important in managerial and planning research, and in many cases, researchers want to know how the phenomena or cases they study (the dispersion of sports spaces in this study) are distributed in space and if their distribution in space follow a certain pattern or rule or not. The fact is that the study of the pattern of distribution of urban facilities and equipment, including sports venues in space through statistical and spatial tests helps us to better understand these elements and their vulnerabilities. Spatial statistics are very effective in identifying patterns and trends in infrastructure elements and discovering their causes. The average of the nearest neighborhood is one of the spatial tests that has been used to identify the pattern of the spatial distribution of sports centers in Ardabil and line with the purpose of the study. In this regard, the output of the nearest neighborhood means the test is presented in Figure 2.

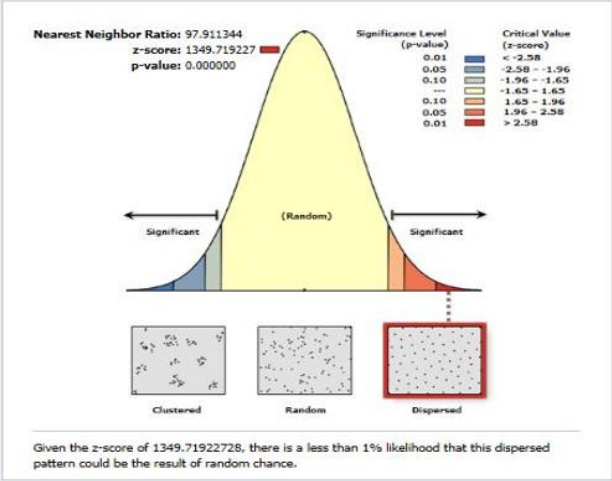

Figure 2. The results of the average of the nearest neighborhood test of Ardabil sports site

The investigation of Figure 2 shows that the values of standardized Z and P-Value are sensitive to changes in the study area and other parameters. In addition, the average observed distance is 522.2708, while the value of the expected average distance is calculated to be 5.3341, and the ratio of the nearest neighborhood is 97.91. Since this ratio is more than one, we conclude that the sports centers of Ardabil are not distributed and scattered in clusters and are scattered. Also, the calculated standard score is equal to 1349.71, according to the P-Value, we conclude that this spatial distribution of sports centers in Ardabil is not statistically meaningful. In general, by performing this test and analysis, we can confirm with more confidence that the distribution is not clustered and the location of sports centers in Ardabil is random. This randomness (scattered distribution of sports sites) is desirable concerning passive defense view due to the area and the amount of this land-use.

Optimal criteria in locating urban functions include compatibility, comfort, desirability, efficiency, health, and safety, which are shown in Table 1. In this table, the classification of criteria and indexes are presented to evaluate and zoning of land use spatial desirability for Ardabil sports centers locating.

Table 1. List of 30 indexes extracted from layers and their grouping

Criteria grouping	Sub-criterion
Compatibility	Park and Green spaces
	Therapeutic centers
	Cultural and artistic centers
	Religious
	Disciplinary
	Educational
Comfort	Density of Buildings
	Population density
	The passages having access and transportation role
	Sports Spaces (distance)
	Administrative centers
	Historical and ancient monuments (distance)
Desirability	Existence of barren lands
	Passages' width
	Distance from the worn-out urban fabric
Efficiency	Land price
	In the direction of the urban physical growth
Health	Red Crescent Society
	Closeness to the fire station
Safety standards and Passive defense	Distance from fault lines
	Distance from river channels
	Urban facilities and equipment right-of-way
	Land Slope
	Distance from chaotic areas
	Distance from military bases
	Distance from industrial and warehousing towns
	Fuel transfer centers right-of-way
	Water stagnation
	Hypsometric
	Soil type
6 Criteria	30 Indexes

Explaining the technique of network analysis and weighting the criteria and sub-criteria based on it:

In this section, the network analysis process is used to evaluate and rank the criteria. In the process of network analysis, pairwise comparisons and determination of correlations and dependencies will be done after network construction, and the formation of a supermatrix is the final step, which can be expressed as follows:

a) Formation of the unweighted Eigen supermatrix: By combining eigenvectors obtained from comparisons of elements in a matrix, an unweighted Eigen matrix is obtained. The eigenvectors are obtained by normalizing the matrices obtained in the previous step, which in fact represent relative weights. Thus, in the left column of the matrix and also in its upper part, all the elements of the control handles are located.
b) Formation of the weighted Eigen supermatrix: Once an unweighted Eigen matrix is obtained, some columns may not be probabilistic or, more simply, the sum of the elements of the columns may not be equal to one. In this case, it can not be said that the final effect of the control criterion on all elements is shown correctly. To prevent the corresponding property of each criterion, a weighted Eigen matrix is obtained in proportion to its effect and the final normalization of the columns.
c) Formation of a restricted matrix: When drawing a network of elements and categories, some of the effects are direct and obvious and are drawn directly; but there are many hidden effects in a network of dependencies that are not drawn due to the lack of direct communication. But one of the most important features of the network analysis method is to consider these effects as well.
The network analysis method does this by sequential exponentiation of a weighted Eigen supermatrix. The result of this step is a matrix in which all the columns of each row are equal. Finally, these equalized numbers show us the rank of the criteria.
The data in the rows of the supermatrix are equal to each other and the sum of the columns of numbers in this matrix is equal to one. In such a case, the data in the rows of the matrix show the importance coefficients of that index. Therefore, it can be said that the distance index from the urban decay, distance from the city center, and access to the passages have the highest and natural indexes have the lowest importance factor in zoning the spatial desirability of land use to locate Ardabil sports centers.

Investigating the status of criteria and indexes in the study area and the method of evaluating them:

At this stage, each of the indexes is converted to a raster in the form of information layers and their evaluation method was applied in the range of 1 to 9 for the whole space based on their effective radius and impact on sports centers and adjacent physical spaces in the form of five zones from very appropriate to the very inappropriate establishment. In the meantime, the damage radius and safe distances for each of the indexes have been extracted according to the criteria of the organizations and the opinions of executive experts and specialists and the results are presented in the form of tables 2 to 7.

Table 2. Comfort criterion valuation

Comfort Criterion						
Index		Valuation Method			Source	Index Weight
		Intervals	Scores	Meaning		
Density of Buildings	Neighbor units, neighborhood, …	0 to 100 m	1	Very inappropriate	The opinion of related experts	0.0254
		101 to 250 m	3	Inappropriate		
		251 to 400 m	5	Relatively appropriate		
		401 to 550 m	7	appropriate		
		> 550 m	9	Very appropriate		
Population density	-	0 to 50 capita	9	Very appropriate	The opinion of related experts	0.0757
		51 to 140	7	appropriate		
		141 to 280	5	Relatively appropriate		
		281 to 580	3	Inappropriate		
		> 580	1	Very inappropriate		
The passages having access and transportation role	Main highways and arteries	0 to 150 m	9	Very appropriate	Ghanbari et al., 2015	0.0439
		151 to 300 m	7	appropriate		
		301 to 400 m	5	Relatively appropriate		
		401 to 500 m	3	Inappropriate		
		> 500 m	1	Very inappropriate		
Sports Spaces (distance)	Stadium, gyms, …	0 to 200 m	1	Very inappropriate	Namazi et al., 2018	0.0657
		201 to 500 m	3	Inappropriate		
		501 to 1000 m	5	Relatively appropriate		
		1001 to 1500 m	7	appropriate		
		> 1500 m	9	Very appropriate		
Administrative centers	Governmental buildings, …	0 to 152 m	1	Very inappropriate	Cabinet - Regulations on land use, construction of buildings and facilities, 29th April 2012	0.0235
		153 to 300 m	3	Inappropriate		
		301 to 450 m	5	Relatively appropriate		
		451 to 600 m	7	appropriate		
		> 600 m	9	Very appropriate		
Historical and ancient monuments (distance)	Tombs, Baths, Historic Houses	0 to 200 m	1	Very inappropriate	The opinion of related experts	0.0178
		201 to 450 m	3	Inappropriate		
		451 to 750 m	5	Relatively appropriate		
		751 to 1200 m	7	appropriate		
		> 1200 m	9	Very appropriate		
The importance Coefficient of the Comfort Cluster: 0.1966						

Table 3. Compatibility criterion valuation

Compatibility Criterion						
Index		Valuation Method			Source	Index Weight
		Intervals	Scores	Meaning		
Therapeutic centers	Hospital, emergency center, …	0 to 249 m	9	Very appropriate	The opinion of related experts	0.0113
		250 to 499 m	7	appropriate		
		500 to 749 m	5	Relatively appropriate		
		750 to 1249 m	3	Inappropriate		
		> 1250 m	1	Very inappropriate		
Disciplinary centers	Police stations, police barracks	0 to 400 m	9	Very appropriate	Cabinet - Regulations on land use, construction of buildings and facilities, 29th April 2012	0.05442
		401 to 800	7	appropriate		
		801 to 1200	5	Relatively appropriate		
		1201 to 2000	3	Inappropriate		
		> 2000	1	Very inappropriate		
Cultural and art centers	Research centers, libraries, …	0 to 150 m	9	Very appropriate	Khademi and Sarhangi, 2013	0.01178
		151 to 320 m	7	appropriate		
		321 to 470 m	5	Relatively appropriate		
		471 to 620 m	3	Inappropriate		
		> 620 m	1	Very inappropriate		
Park and green spaces	Parks, gardens, …	0 to 150 m	9	Very appropriate	Khademi and Sarhangi, 2013	0.0637
		151 to 350 m	7	appropriate		
		351 to 550 m	5	Relatively appropriate		
		551 to 750 m	3	Inappropriate		
		> 750 m	1	Very inappropriate		
Educational centers	Universities, high school, …	0 to 249 m	9	Very appropriate	Cabinet - Regulations on land use, construction of buildings and facilities, 29th April 2012	0.0375
		250 to 499 m	7	appropriate		
		500 to 749 m	5	Relatively appropriate		
		750 to 1249 m	3	Inappropriate		
		> 1250 m	1	Very inappropriate		
Religious centers (distance)	Tombs, Baths, Historic Houses	0 to 249 m	9	Very appropriate	Namazi et al., 2018	0.00031
		250 to 499 m	7	appropriate		
		500 to 749 m	5	Relatively appropriate		
		750 to 1249 m	3	Inappropriate		
		> 1250 m	1	Very inappropriate		
The importance Coefficient of the compatibility Cluster: 0.1471						

Table 4. Desirability criterion valuation

Desirability Criterion						
Index		Valuation Method			Source	Index Weight
		Intervals	Scores	Meaning		
Barren and empty lands	In terms of area	1 to 1.5 ha	1	Very inappropriate	Namazi et al., 2018	0.0657
		1.5 to 3 ha	3	Inappropriate		
		3 to 5 ha	5	Relatively appropriate		
		5 to 11 ha	7	appropriate		
		> 11 ha	9	Very appropriate		
Passages' width	In terms of three groups of urban communication lines	Highway	9	Very appropriate	Yazdani et al. 2017	0.0422
		Collector and distributor	5	Relatively appropriate		
		Local	1	Very inappropriate		
Urban decay	-	(<100 m)	1	Very inappropriate	Sabz Samaneh Consulting engineers, 2016	0.0594
		(100 to 200 m)	3	Inappropriate		
		(200 to 300 m)	5	Relatively appropriate		
		(300 to 400 m)	7	appropriate		
		(>400 m)	9	Very appropriate		
The importance Coefficient of the desirability Cluster: 0.1242						

Table 5. Efficiency criterion valuation

Efficiency Criterion					
Index	Valuation Method			Source	Weight
	Intervals	Scores	Meaning		
Land price	14,000,000 to 18,000,000	9	Very appropriate	The opinion of related experts	0.0254
	18,000,000 to 23,000,000	7	appropriate		
	23,000,000 to 30,000,000	5	Relatively appropriate		
	30,000,000 to 45,000,000	3	Inappropriate		
	> 45,000,000	1	Very inappropriate		
In the direction of the urban physical growth	South-Southwest	9	Very appropriate	The opinion of related experts	0.0804
	Southeast	7	appropriate		
	East-Northeast	5	Relatively appropriate		
	North-Northwest	3	Inappropriate		
	City center	1	Very inappropriate		
The importance Coefficient of the efficiency Cluster: 0.1362					

Table 7. Health criterion valuation

Health Criterion					
Index	Valuation Method			Source	Weight
	Intervals	Scores	Meaning		
Red Crescent Society	0 to 249 m	9	Very appropriate	The opinion of related experts	0.0133
	250 to 499 m	7	appropriate		
	500 to 749 m	5	Relatively appropriate		
	750 to 1249 m	3	Inappropriate		
	> 1250 m	1	Very inappropriate		
Closeness to the fire station	0 to 249 m	9	Very appropriate	The opinion of related experts	0.0340
	250 to 499 m	7	appropriate		
	500 to 749 m	5	Relatively appropriate		
	750 to 1249 m	3	Inappropriate		
	> 1250 m	1	Very inappropriate		
The importance Coefficient of the efficiency Cluster: 0.05424					

Table 7. Safety and passive defense criterion valuation

Comfort Criterion					
Index	Valuation Method			Source	Index Weight
	Intervals	Scores	Meaning		
Distance from fault lines	0 to 200 m	1	Very inappropriate	Bahrampour, 2009	0.0031
	200 to 400 m	3	Inappropriate		
	400 to 600 m	5	Relatively appropriate		
	600 to 800 m	7	appropriate		
	> 800 m	9	Very appropriate		
Riparian zone (distance)	0 to 150 m	1	Very inappropriate	Correction Paragraph number h29101t58977 dated 8th March, 2004	0.0048
	150 to 200 m	3	Inappropriate		
	200 to 250 m	5	Relatively appropriate		
	250 to 300 m	7	appropriate		
	> 300 m	9	Very appropriate		
Urban facilities and equipment right-of-way	0 to 100 m	1	Very inappropriate	Criteria related to the National Iranian Gas Company and the privacy of high-pressure lines approved by the government	0.0439
	101 to 200 m	3	Inappropriate		
	201 to 300 m	5	Relatively appropriate		
	301 to 400 m	7	appropriate		
	> 400 m	9	Very appropriate		
Land Slope	0 to 0.5 degree	1	Very inappropriate	The opinion of related experts	0.0080
	0.5 to 1.5	3	Inappropriate		
	1.5 to 2.8	5	Relatively appropriate		
	2.8 to 4.85	7	appropriate		
	> 4.85	9	Very appropriate		
Distance from	0 to 500 m	1	Very inappropriate	The opinion of	0.0356

chaotic areas	501 to 1000 m	3	Inappropriate	related experts	
	1001 to 1500 m	5	Relatively appropriate		
	1501 to 2000 m	7	appropriate		
	> 2000 m	9	Very appropriate		
Distance from military bases	0 to 400 m	1	Very inappropriate	Cabinet - Regulations on land use, construction of buildings and facilities, 29th April 2012	0.0644
	401 to 800 m	3	Inappropriate		
	801 to 1200 m	5	Relatively appropriate		
	1201 to 2000 m	7	appropriate		
	> 2000 m	9	Very appropriate		
Distance from industrial and warehousing towns	0 to 500 m	1	Very inappropriate	Department of Environment regulation, 5th March 2009	0.0550
	501 to 1000 m	3	Inappropriate		
	1001 to 1500 m	5	Relatively appropriate		
	1501 to 2000 m	7	appropriate		
	> 2000 m	9	Very appropriate		
Fuel transfer centers right-of-way	0 to 100 m	1	Very inappropriate	Zebardast, 2005	0.0190
	101 to 160 m	3	Inappropriate		
	161 to 210 m	5	Relatively appropriate		
	211 to 300 m	7	appropriate		
	> 300 m	9	Very appropriate		
Water table	0 to 2 m	1	Very inappropriate	The opinion of related experts	0.0102
	2 to 4 m	3	Inappropriate		
	4 to 6 m	5	Relatively appropriate		
	6 to 8 m	7	appropriate		
	> 8 m	9	Very appropriate		
Hypsometric	1340 to 1380 m	1	Very inappropriate	The opinion of related experts	0.0053
	1381 to 1410 m	3	Inappropriate		
	1411 to 1440 m	5	Relatively appropriate		
	1441 to 1470 m	7	appropriate		
	> 1470 m	9	Very appropriate		
Soil type	-	1	Very inappropriate	The opinion of related experts	0.0144
		3	Inappropriate		
		5	Relatively appropriate		
		7	appropriate		
		9	Very appropriate		
The importance Coefficient of the Comfort Cluster: 0.3415					

After obtaining the standardized maps, it is time to overlap the final classified maps of the six criteria (safety, health, efficiency, desirability, comfort, and compatibility criteria) and create an assessment and spatial desirability zoning of the land use for the locating of sports centers of Ardabil in terms of passive defense. For this purpose, 6 previous criteria were classified into 30 sub-criteria and were overlapped and the final map was generated. Of course, to overlap the layers and create an output layer from two operations of numerical multiplication and the summation based on the overlapping, which is used by applying the coefficients of criteria and sub-criteria, and its output is shown as a map in Figure 3.

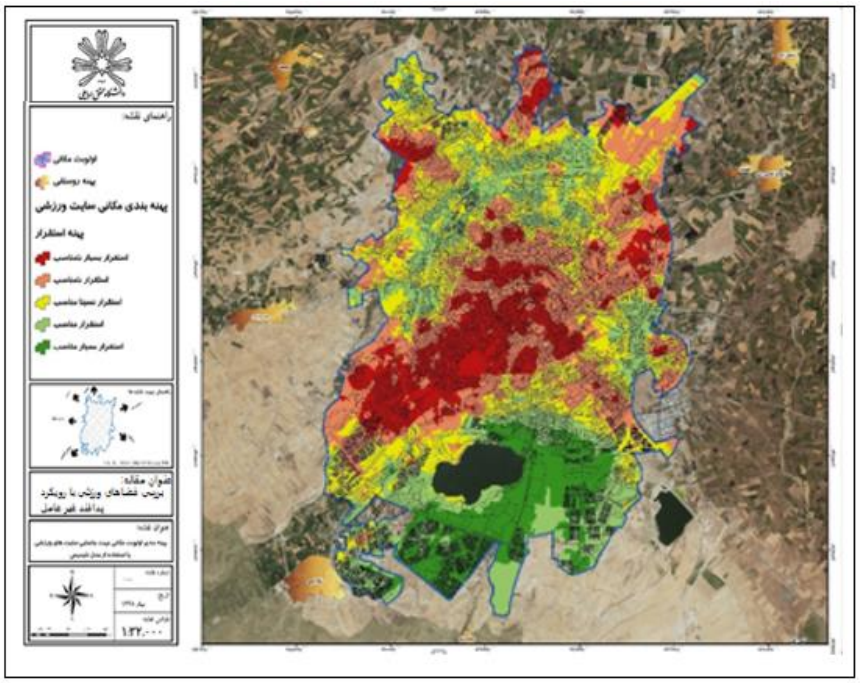

Figure 3. Zoning of spatial desirability of land use for Ardabil sports spaces locating

The output findings of the spatial zoning map for Ardabil sports centers locating show that the most suitable lands for the construction of a new site of sports centers are located in the southern, southeastern, and somewhat southwestern directions, i.e. the directions of the physical development planning of Ardabil and in inclined directions relative to the city center towards Lake Shurabil.
In total, out of 60,322,563 hectares of land use in Ardabil city evaluated on a scale of 1: 32000, 950,149 hectares of lands are in the category of very inappropriate location, 1,297,735 hectares of lands in the inappropriate group, 1,525,144 hectares in relatively appropriate lands for locating, 1,500,744 hectares in the appropriate group and finally 758,483 hectares in the very appropriate group.

TOPSIS Technique (ranking based on similarity to the ideal solution)

This technique was proposed by Yun and Huang in 1981 for the best proposal in a similar way to the ideal solution, in the sense that the choice of the desired option should have the shortest distance from the positive ideal solution and at the same time the farthest distance from the negative ideal solution (M.-T. Chu et al, 2006: 4). The basic principle of this model is to consider an option that has the minimum Euclidean distance from the ideal solution and at the same time the farthest distance from the negative ideal solution (S. Opricovic, G.-H. Tzeng 2004: 448). In the following, the location of the six optimal zones identified for the locating of sports centers within the city of Ardabil is proposed.
To identify the most preferred zones for location and construction according to the values of 1, 3, 5, 7, and 9, indicating the status of very inappropriate, inappropriate, relatively appropriate, appropriate, and very appropriate, respectively, each of the appropriate zones for the locating of sports centers has been rated. After determining the weight of each of the evaluated criteria, using the TOPSIS model, the final ranking of each of the identified zones has been made and 6 sites have been proposed in the vicinity of Ardabil city. The results are shown in table 8 and figure 4.

Table 8. Ranking of appropriate zones for the desirable locating of sports site using TOPSIS model

Criterion rating								Positive and negative distance and relative distance			
Site		Compatibility	Comfort	Desirability	Efficiency	Health	Safety	Di+	Di-	CLi	TOPSIS Rank
The zone for the prioritization of the city domain	Zone 1	9	9	9	9	3	5	0.0175	0.2212	0.9263	1
	Zone 2	7	9	7	9	1	7	0.1746	0.1332	0.4328	3
	Zone 3	5	9	9	9	1	7	0.1745	0.1336	0.4335	2
	Zone 4	3	9	9	9	1	5	0.1795	0.1304	0.4207	4
	Zone 5	7	1	7	3	3	9	0.2175	0.0332	0.1325	6
	Zone 6	9	7	5	9	1	5	0.1777	0.1088	0.3798	5

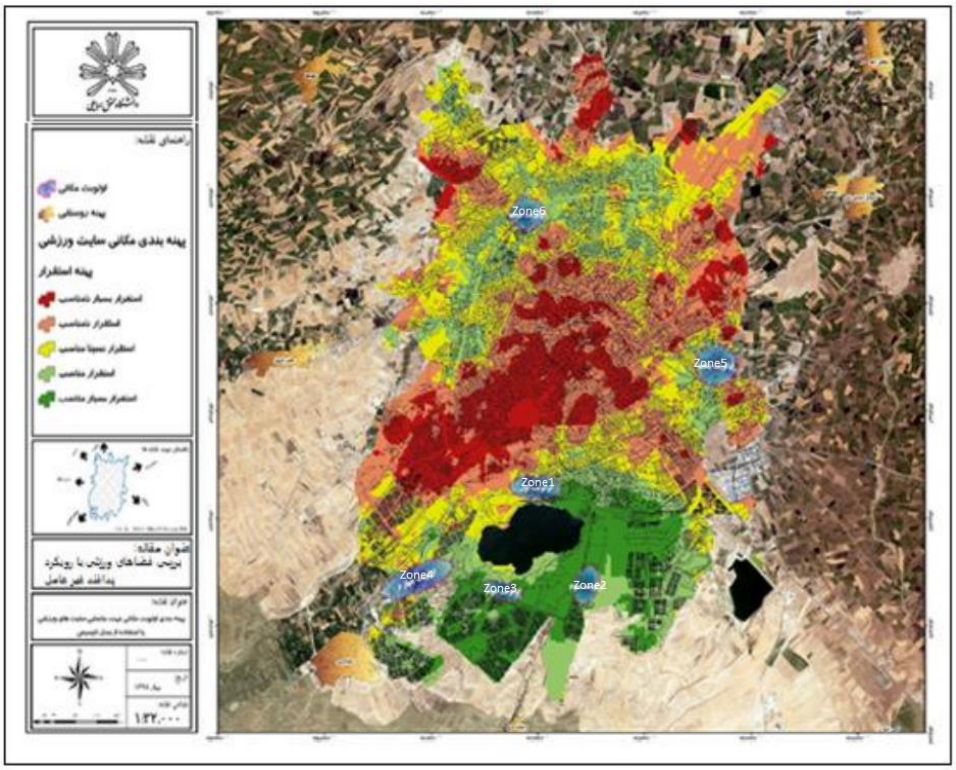

Figure 4. Prioritized zones for optimal locating of sports spaces using TOPSIS model

The results of ranking the appropriate zones for the locating of a sports site using the TOPSIS model show a total of 6 proposed zones within the city boundaries as follows:
Zone 1 (located in the range of Ataee Street and the axis of Milad Highway) at the first rank;
Zone 3 (located adjacent to the international exhibition and Kowsar town) at the second rank;
Zone 2 (located at the end of University Street and next to Dadgostari Town) at the third rank;
Zone 4 (located in the range of the southern and southwestern lands of Naderi town- Shurabil lake, Mostafa Irannejad axis) at the fourth rank;
Zone 6 (Wahdat Square- adjacent to Banihashem highway) at the fifth rank;
Zone 5 (Wahdat Square- adjacent to Banihashem highway) at the sixth rank.

It is worth mentioning that Zone No. 5 of this priority is intended only for deprivation and development of this area of Ardabil city, so due to the low social capital of this area, it is necessary to consider this priority for construction in special circumstances.
In general, it should be stated that the proposals formed are only in line with the executive priorities of the current plan, and all identified locations can be executed and converted into development centers capable of providing services to citizens with proper planning.

DISCUSSION

Today, with the development of cities, the use of passive defense is essential in urban design and planning to deal with unexpected natural and human disasters. Due to its location in one of the most strategically sensitive parts of the world, already made the need for passive defense plans has been made more important for Iran. Urban passive defense advocates the rules of strengthening urban strategic structures more than following the rules of building strength and urban structures. Passive defense is a useful tool for crisis management and an important part of the deterrence strategy and a key factor in the sustainable urban development of the country's cities.

Today, sports spaces are one of the most important land-uses in the city, which has assigned a significant level of urban spaces to itself. On one hand, sports spaces are effective in shaping the physical body of the city, and on the other hand as a service center affect or are affected by the surrounding land-uses. Paying attention to this point, locating sports spaces in the city is necessary; therefore, optimal locating maximizes the efficiency of sports facilities and provides better services to users at a fixed cost. In this regard, according to the data and information available in Ardabil, the spatial and optimal model for locating sports centers in Ardabil has been studied. Accordingly, to determine the optimal criteria for locating urban functions with a passive defense approach, 30 indexes were identified in the form of 6 components. After the calculations, the most value of importance weight was assigned to the comfort criterion (0.1966) and the health criterion was assigned by weight (0.054). Based on the results of the model of the average of the nearest neighborhood unit, it was found that the spatial distribution of sports centers in Ardabil is appropriate and the principle of spatial justice is observed in the distribution of these uses which have a completely scattered pattern at the level of 99%.

Based on the results of the evaluations concerning different criteria, zones No. 1, No. 3, and No. 2 of Ardabil city are the most appropriate points for locating sports sites from the perspective of passive defense approach; therefore, 6 proposed sites were identified for locating sports sites from the perspective of passive defense in the study area according to the identified optimal zones and, these centers were prioritized using the TOPSIS model. The results of this ranking showed that Zones No. 1, 3, and 2 have the highest capability and Zones No. 5 have the lowest capability in terms of passive defense.

CONCLUSION

The results of this study show that by selecting practical indexes and appropriate analysis methods, the problem of locating the sports spaces in urban areas with a passive defense approach can be best and scientifically analyzed and obtain specified results. The findings of this study also show that GIS can provide an efficient basis for combining different data sources to measure the efficiency of urban services and the TOPSIS model can be used as a suitable model for locating land uses and help the urban planners to understand and prioritize urban issues. For the purposes of passive defense, the managers of the General Department of Sports and Youth Affairs of Ardabil Province should plan according to the ranking results of suitable zones for establishing a sports site in this research.

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چکیده فارسی

بررسی فضاهای ورزشی با رویکرد پدافند غیرعامل در شهر اردبیل

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چکیده

فضاهای ورزشی بخشی از فضاهای عمومی است که با توجه به رشد جمعیت و درصد بالای اوقات فراغت در سطح جامعه، به‌عنوان یک نیاز مطرح شده است. احداث فضاها و اماکن ورزشی، مستلزم صرف هزینه‌های زیادی است و تعیین مکان بهینه آنها به شیوه‌ای که تمامی شهروندان به نحو موثر با امنیت از آن بهره‌مند شوند ضروری است. با درک این موضوع و شناخت هرچه بیشتر از پدافند غیرعامل و عوامل و مولفه‌های شکل دهنده آن و همچنین تأثیر آن در امنیت فضاها می‌توان راه‌هایی را شناسایی کرد که بتوان خسارت، ضایعات و تلفات را کاهش داد. از این‌رو تحقیق حاضر با هدف بررسی فضاهای ورزشی با رویکرد پدافند غیرعامل با مورد نمونه شهر اردبیل انجام گرفته است. این مطالعه از نوع توصیفی و به روش میدانی انجام گردید. جامعه آماری این مطالعه را ۶۸ پارسل با کاربری ورزشی در شهر اردبیل تشکیل می دهند که با استفاده از روش کل شماری همه آنها در مطالعه شرکت داده شدند. در چارچوب مباحث معیارهای بهینه در مکانیابی کارکردهای شهری با رویکرد پدافند غیرعامل ۳۰ شاخص در قالب ۶ مولفه سازگاری، آسایش، مطلوبیت، کارایی، سلامتی و استانداردهای ایمنی و پدافند غیرعامل تهیه شد. با استفاده از روش میانگین نزدیک‌ترین همسایگی الگوی پراکندگی فضاهای ورزشی مورد ارزیابی قرار گرفت. همچنین داده‌های گردآوری شده در نرم افزار SuperDecision وزن دهی، سپس در محیط GIS نقشه سازی شد و در نهایت با استفاده از تکنیک تاپسیس پهنه‌بندی انجام گرفت. نتایج بدست آمده از بررسی‌ها نشان که الگوی پراکندگی فضاهای ورزشی در شهر اردبیل مناسب است. علاوه بر این، شش پهنه مناسب جانمایی جهت استقرار مراکز ورزشی با رویکرد پدافند غیرعامل در شهر اردبیل شناسایی شد که می‌توان مکانیابی فضاهای ورزشی در سطوح شهری را به روش علمی تحلیل کرده و نتایج مطلوبی گرفت. پیشنهاد می شود مدیران اداره کل ورزش و جوانان استان اردبیل برای ایجاد یک سایت ورزشی از پهنه‌های اولویت بندی شده در این تحقیق به منظور رعایت اهداف پدافند غیرعامل استفاده کنند.

واژگان کلیدی: فضاهای ورزشی، مکانیابی، پدافند غیرعامل، شهر اردبیل