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EVALUATION OF WATER PUMPING STATIONS BY VIEW OF PASSIVE DEFENSE, WITH TOPSIS M ODEL(CASE STUDY:MASHHAD CITY)

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Abstract. Location is one of the most challenging issues in today's world. Due to the natural and abnormal hazards, determining the appropriate location for the construction of each structure is based on a set of principles. These princ iples are comprehensively and managed in the form of non-operational defense principles.

In this research, using the multivariate decision-making space in TOPSIS software, the ideal answer from the multiva riable analysis including economics, earthquake hazard, Territorial and military factors under the supervision of a ba chelor to assess four pumping stations in the city of Mashhad and the suburbs Came.

The results of the four pumping stations showed that the pumping station of Manzelabad in terms of applying the co mments of all experts with a correction factor of 0.57 in the highest and Dosti Dam pumping station in the worst case with a preference factor of 0.44.

Analysis of the effect of each of the four criteria indicated that the Manzelabad pumping station had more vulnerabili ty to earthquake and military hazard than other pumping stations; in order to address the weaknesses and improve the situation of this location, two burial scenarios In order to enhance the structural strength and also to create suitable v egetation around the ManzelAbad pumping station, it was proposed.

The results of this analysis showed that the effect of these two changes on the status of the pumping station of Mezel babad is effective and can reduce its relative vulnerability to the three pumping stations of Dosti, Saber and Toroq D am.

Keywords. Pumping station,Location,passive defense, multi-criteria decision making،TOPSIS

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1. INTRODUCTION

Determining the proper location for the construction a nd construction of any structure requires considering many factors that create a safe and proper condition i n its structure. This means that, with the passage of ti me, imposing effective location affairs will cause the damage and potential damage to it to decrease and, as far as possible, increase the life of the building. Over the lifetime of each structure, many threats threaten it s structure. These threats are classified into both natur al and abnormal threats. Since each of these two categ ories is different in nature, the way to deal with them is also very important.

Today, natural hazards, such as earthquakes, endange r the presence of structures, and considering appropri ate improvements to structural upgrading can be effec tive.

On the other hand, the creation of any project requires financial estimation, because economic analysis can r estore the financial crisis, especially in our country, to a certain extent. It should be mentioned that these fi nancial and economic evolution before starting any p roject can change the viability of project in total and finally increase or decrease the level of development of a country can directly or indirectly influences the welfare of people who are living there by changing th eir decision regarding saving and consumption.Previo us studies argued that the level of financial and econo mic development of a country a Items such as land ac quisition costs and the required budget for constructio n and utilization must be decisive with engineering an d operational visibility. On the other hand, with the gr owth and development of the world of technology, es pecially military affairs, and how to deal with them, it has a significant role in reducing operational losses.

For many years, the world has been able to overcome many military threats through a new and effective app roach. Briefly, the factors that cause the loss of life an d financial resources as much as possible without the direct involvement of military equipment; defective d efense is known It can be used in the categories of pri nciples and important elements of the structure struct ure and the exploitation of any facilities and facilities.

Switzerland has a long history of neutrality in global affairs, so that the country has not entered into any wa r since 1815. In 1959, the Swiss people voted in favor of adding the passive defense clause to the constituti on of the central government (Karimzadegan and Bag heri, 2009).

The country is symbolized by the non-operational def ense of the country, and it has no threats and a neutral state in Europe, but it looks ahead and there is a stron g non-operating defense in that country. Switzerland has no natural resources but has one of the highest per capita income in the world, and its economy is based on industry, agriculture, tourism, banking and insuran ce.

The non-operating Swiss defense program began with much more seriousness from the early 1960s. In Swit zerland, the CDO, a civilian and non-governmental or ganization, carries out passive defense plans.

Civil defense planners and non-operating civilians arg ue that the war for a nation's life is not confined to the military front. The goal of any state in a full-fledged conflict is to preserve its survival, including the conti nuation of economic, financial, spiritual resources an d, in short, its entire civilian population. Many of its f acilities and facilities are dual-purpose and, in additio n to different applications under normal conditions, w ill become sheltered in times of crisis. People and nati onal and private companies will receive financial assi stance in the event of non-operational defense standar ds from governments, and build Shelter is required in schools, universities and similar centers.

Providing an appropriate solution for managing the w ater crisis in the macro to the neighborhoods, by prese nting the case studies on the establishment of rescue water supply facilities and case studies in the design o f water supply networks (Farhoudi, 2009). Therefore, considering the sensitivity of this critical element, it is suggested to study the status quo and to investigate t he points of incident and transfer it from the danger ar eas and carry out detailed and executive studies to im prove the modification and, finally, to strengthen the existing facilities and how to mobilize. Facilities at th e time of the incident.

Any program designed and implemented under this h eading should, in addition to addressing security and economic issues, seek to increase the country's capaci ty to deal with threats and possible attacks, and to enh ance the capacity and threshold of national tolerance f or dealing with emergencies. Hyun, 2014). According ly, urban and rural water and wastewater companies a nd competent consultants should take action in condu cting in-field defense studies in the projects under stu dy, in operation and in operation facilities. These stud ies are carried out according to the circumstances, situ ation and location of the project. In any case, inertial defense plans should include identifying and anticipat ing threats, identifying threats, risk reduction and cou ntering threats, investigating possible damage caused by enemy attacks, ways to reduce and control damage s, and remedy and repair damages. It is very importan t for the time being, in order to punch the famine of th e water. People, companies, institutions, governments and states are not going to take new measures to tack le water scarcity, (Sedighi, 2007).

Managing water crisis and implementing non-operati

onal defense strategies are crucial at this time.

Intelligent water management has been a good solutio n in countries such as the United States, the European Union, Singapore, Australia and Japan. Research resu lts indicate that an appropriate approach has been put in place to implement the legal framework for intellig ent management in these areas facing climate change. The optimal allocation and distribution of service cent ers is a problem that most planners are dealing with. The balanced distribution of these spaces requires the establishment of appropriate facilities and facilities in such a way that all segments of society can access th em equitably (Javari, 2010).

Among these uses, the placement of educational spac es is important because of their importance with the p roximity of heterogeneous applications and the lack o f adjacency with heterogeneous applications, as well as the consideration of environmentally and physicall y tolerable conditions such as comfort, efficiency, hea lth and safety of necessity has it. In this paper, using t he geographic information system and spatial analysis , we used the spatial data analysis to select the best pl aces for Payam Noor University. Using the minimum distance from the desired indicators (commercial, edu cational, residential , Military, main roads, mountains and rocks, cemeteries, etc.) and rating of user's applic ations based on the amount of economic value and ph ysical fitness to create them, and the extent and bound aries of the city of Khoramabad based on the amount and GIS of the university, In a value-added environm ent, to create a university environment, they are divid ed into five groups: very good, good, medium, weak a nd very weak.

Today's growth in population and increasing demand for water with better quality of intensified competitio n between water demand in different sectors of agricu lture. Industry and drink. Increasing water use per cap ita due to improving the welfare and health of people. The crisis caused by droughts and atmospheric fluctu ations and excessive water withdrawals. Groundwater has been important for water resource management. The purpose of this research is to find the right place t o establish a drinking water treatment plant with resp ect to groundwater quality parameters (Habibi Daouja ni et al., 2012).

. In recent years, due to the superiority of ground-base d methods, researchers have been using these method s to draw up a map of groundwater properties due to t he superiority of ground-based methods. The choice o f the location of the water treatment plant should be d ue to the quality of the aquifer, due to the presence of heavy metals and water hardness And the requirement s for improving the quality of water extracted. Using geostatistical methods and fuzzy logic in GIS, taking i nto account 14 basic water quality parameters, the loc ation of the best groundwater extraction point in the r egion was studied and finally, an uncertainty analysis was used to estimate the accuracy of the data.

Since the issue of location determination is high, ther e are several methods in this regard. And in addition t o the actions of the non-operational defense principles this could be the solution. In this research, using theT opsis software, a multi-criteria decision making probl em was designed in the framework of evaluation of fo ur water pumping stations. By applying four basic crit eria, these stations were analyzed and their weaknesse s were determined based on these principles.

2. MATERIALS AND METHODS

2.1. Topsis Model

Due to the multiplicity of different criteria and scenar ios, it is difficult to apply a decent decision and deter mine the best place of work. Therefore, TOPSIS soft ware is used to locate this research. The topsis model is a multivariate decision making, (Çiftçioğlu, Almasi fard 2015). In this method, the m option is evaluated by the n index, so any problem can be considered as a geometric system including the m point in a n dimen sional space. This technique is based on the notion th at the choice option should be the minimum distance with the ideal ideal solution (Ai +), the solution that is among the most positive criteria, the least and among the least negative criteria, and the greatest distance th rough the path The ideal negative solution (Ai) means the solution that is among the most negative criteria a nd the least among the positive criteria. The TOPSIS t echnique compares decision-making criteria and intro duces the superior option by presenting a higher impa ct factor.

2.2 How to choose Criteria and Scoring

Several factors are involved in determining the locati on of a pumping station. These factors could be hydra ulic characteristics or other considerations. In this res earch, considering the goal of evaluating the four stati ons of water pumping from the point of view of defec tive defense. Table 1 presents the name and position o f the four pumping stations examined. Among the diff erent criteria of this research, four criteria that were c onsidered by the experts as the basic and challenging criteria of the city of Mashhad were raised.

Table 1 : Specifications of mashhad pumping stations

Address	Pumping Station Name	NO.
In the vicinity of ManzelAbad village, Quchan old road sideway	ManzelAbad	1
Sayad Shirazi 56th , Saber Alley	Kardeh Dam	2
4th kilometer of dehgheybi road	Toroq Dam	3
Shahid Kalntari Highway sideway,in front of Koohsangi, in the vicinity of Ayeha center	Doosti Dam	4

In this research, decision-making criteria are categorized into two categories of qualitative and quantitative criteria. Qualitative criteria are criteria that are not measurable and can only be differentiated by rating. Also, measurable measures that are not dimensional and do not require a concession rating are quantitative criteria. In order to categorize the exact criteria and analyze them, the other two categories are defined as the profit (+) and cost (-) criteria that can be identified in the TOPSIS model. The benchmark for profit means that as much as its privilege increases, the power of the benchmark will increase in the introduction of the desired location. And vice versa, in terms of cost criteria, if the score is lower, its effect is to lower the location of the pumping station. Non-functional defense decision-making criteria are presented in two qualitative and quantitative categories in Table 2.

Table 2 : Category of criterion

Criterion	Evaluation tool	Criterion type(qualitative or quantitative)	Criterion
Cost	Territorial appropriation(Rial)	quantitative	Economic
Benefit	Distance from the fault(Km)	quantitative	Earthquake hazard
Benefit	Distance from the first craggy highlands(Km)	quantitative	Territorial
Cost	Distance from the first military territory	quantitative	military

For easy and appropriate evaluation of the location of the pumping stations, four pumping stations are ranked in four rations for each criterion, and the concession rating to each rank is determined according to Table 3 from 0 to 20.

Table 3 : Rate each rate and description

Criterion point (0-20)	Description	Rating
20	Very appropriate	1
15	Appropriate	2
10	Fairly appropriate	3
5	inappropriate	4

The questionnaire was defined as the value of each criterion, and 10 experts evaluated the value of each criterion from 1 to 9. Table 4 presents the average weight of each criterion based on the expert opinion.

Table 4 : Average weight of each criterion based on opinion 10 expert

Average weight (1-9)	Criterion
9	Economic
6	Earthquake hazard
8	Territorial
7	Military

The results are presented in three sections including the application of expert opinion, the determination of the effect of each criterion, and the resolution of the vulnerabilities of the vulnerable pumping station.

1.3 Based on the average weight of Expert's opinion

Using the data mentioned in the tables above and the TOPSIS software, the preference factor of each pump ing station was determined. In order to determine the mean weight of experts, experienced and familiar wit h the questions of the questionnaire? Figure 1 shows t he information page to the topsis. Where the score of each scenario is displayed according to the benchmar k examined.

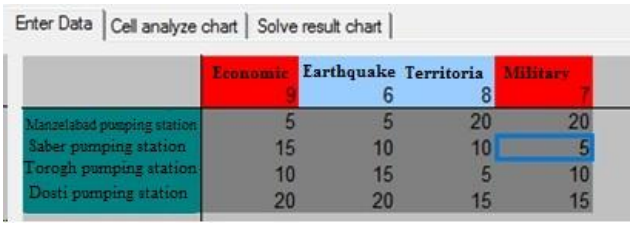

Figure.1 Entrance information page to TOPSIS with master's idea

It should be noted that the cost criteria are red and the profit criteria are displayed in blue? In addition, four scenarios for the location of the pumping station are a lso shown in the picture. Figure 2 shows the appropri ate location among the four pumping stations on the b asis of the preference factor.

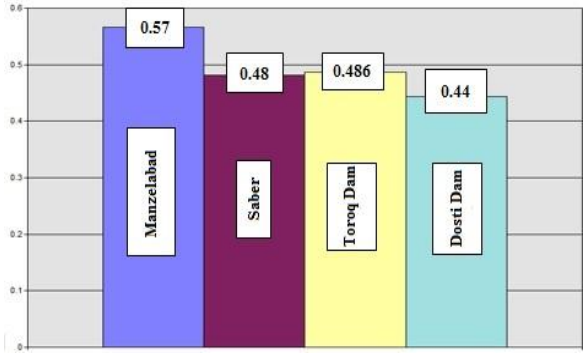

Figure.2 Appropriate location among the four pumpi ng stations based on the weight of the applied benchm ark

Based on Fig. 2, the highest location among the four pumping stations mentioned above, ManzelAbad area with a preference factor of 0.57, and on Alka, Kohsa ngi home, which is located at the Dosti Dam dampem ent station. In the worst case scenario, the preference factor is 0.44. The Toroq and Saber pumping stations are also slightly different in the next category.

2.3. Effects of criterion weight

In this study, the effect of the criterion weight of each criterion is analysed separately. Therefore, in this cas e, the weight of the benchmark, the criterion under co nsideration, which is to be determined in determining the location, is assumed to be 9, and the other criteria are analyzed with a moderate weight, which is 5. Tabl e 5 summarizes Vern's analysis of the criterion of loca tion selection.

Table 5 : Summary of the effect of the weight of the cr iterion on the choice of location

Wors t optio n	Best optio n	Preferenc e factor	Scenarios	Conditio n
		0.59	ManzelAba d	Economic
		0.45	Saber	
		0.54	Toroq Dam	
		0.39	Doosti Dam	
		0.4	ManzelAba d	Earthquake Hazard
		0.45	Saber	
		0.54	Toroq Dam	
		0.61	Doosti Dam	
		0.59	ManzelAba d	Territorial
		0.45	Saber	
		0.38	Toroq Dam	
		0.54	Doosti Dam	
		0.4	ManzelAba d	Military
		0.62	Saber	
		0.55	Toroq Dam	
		0.46	Doosti Dam	

It is worth noting that, economically, the Dosti Dam p umping station in the Kuhsangi region is in the worst situation, in this case, many costs have been paid for l and tenure, and the non-operating defense plan in the field only suggests the construction of pumping statio ns in Low cost areas like the Toroq or Saber, and in a ddition, are recommended to apply a suitable method for the economic sector in all selected location project s. On the other hand, the home-pumping station in ter ms of earthquake hazard will prioritize the reconstruct ion and upgrading of structural strength, and it is bett er to adopt retrofitting measures in this regard. In the

state of land conditions, the pumping station of the da m is not in a suitable location. Also, in the case of the effect of military agents, the pumping station is very vulnerable. In this regard, some non-operating defens es can be used to secure this location. Such as decepti on, hiding and vegetation. In the next section, with th e suggestion of practical solutions, the safety factor of higher pumping stations is exceeded. According to T able 5, the home-pumping station is vulnerable to eart hquake and military risks and some basic steps must b e taken to ensure security.

2.3.1. Improvement of the status of pumping stations at Manzelabad

During the survey, it became clear that the pumping s tation at Manzelabad needed basic considerations to i mprove the structural and military status. Some meas ures could be taken in this regard and could be effecti ve in improving the existing situation.

2.3.2. Create vegetation

The first option to improve the status of this plant is t o create vegetation to enhance the safety coefficient o f the military to detect the enemy's vision. In this case , another criterion is added to the four past criteria. In this scenario, vegetation is assumed to be around the Manzelabad station and the impact of this vegetation on its current status is determined. Accordingly, the b enchmark score for the home-pumping station is assu med to be appropriate for the provision of vegetation, and other pumping stations will be rated at 5 points d ue to lack of suitable vegetation cover. It is noted that in this case the weight of the military standard is 9 an d the other criteria, including vegetation criteria, are 5 . Figure 3 shows the result of applying vegetation.

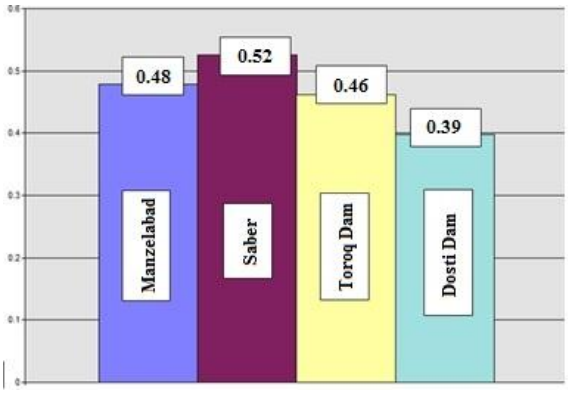

Figure.3 Create vegetation in the MANZELABAD stat ion

It should be noted that as a result of applying appropri ate vegetation around the pumping station, the prefere nce factor is higher and ranked secondarily in the mili tary station. In this case, the station's preference facto r is 0.48 and the Dosti Dam pumping station is locate d at the lowest level of military security.

2.3.3. Burial of MANZELABAD pumping station

Another solution is proposed to upgrade the structure of the site to prevent damage to the Manzelabad pum ping station; it is to be buried at the station. It is obvio us that this station will not be able to be deposited bec ause it is in use and it will no longer be possible to do so. On the other hand, military conditions will be upg raded by burial of this pumping station. But what if th e hypothesis scenario was happening at this sampling station, what was the situation in terms of earthquake hazard? Therefore, in this analysis, the rate of burial i s added to other criteria, and the benchmark score of t he pumping station is 20 and its standard weight is 5, and other pumping stations are rated zero for non-buri al. . Figure 4 shows the effect of the pumping station burial.

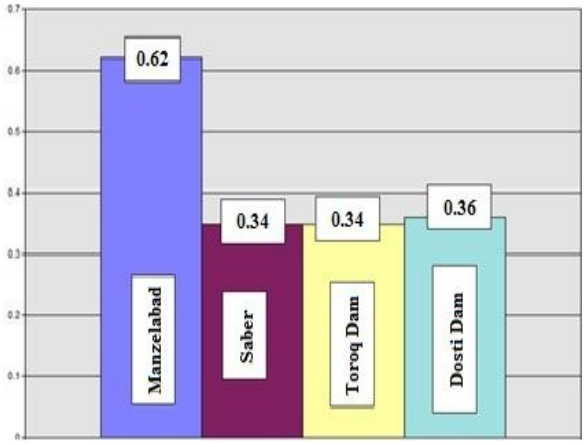

Figure.4.effect of burial MANZELABAD pumping stat ion

As it is observed, due to the burial of the pumping sta tion, the coefficient of preference, safety, structural st rength of the above is higher, so that the coefficient of preference is 0.62 in the best place.

3. CONCLUSION

The application of the principles of non-operating def ense, in particular, four fundamental topics, including economic, earthquake, Territorial, and military, have a significant role in choosing the best place. In this re gard, in order to analyze the existing status of four pu

mping stations in the city of Mashhad, the four basic principles of this study were used. In order to make th e highest decision, the multi-criteria decision making problem was created and evaluated in the space of the Topsis model. The results of this study showed that b y applying the expert opinion, the Manzelabad pumpi ng station was located in the northwest of Mashhad w ith the preference factor of 0.57, and the most favorab le location and pumping station of Dushanbe dam wit h a preference factor of 0.44 was in the worst conditio n.

Results from the review? The economic impact on the four places that has taken place shows that the MAN ZELABAD is in good condition and in the area of the DOSTI DAM is in inappropriate conditions. The effe ct of the earthquake hazard on the four pumping statio ns under review indicates that pumping stations of Do sti and Manzalabad Dam with the preference coefficie nts of 0.61 and 0.4 are classified in the worst and wor st conditions.

In the section on the effect of Territorial factors, it wa s found that the TOROQ dam station is inappropriate and the station is home to 0.59 with a preference facto r of 0.59. The military agent indicated that the pumpi ng station is in vulnerable conditions and Saber Pump ing station is suitable with a 0.62 preferred factor. Th e Manzelabad pumping station was found to be vulne rable to the impact of two criteria of the earthquake a nd military hazard.

To improve the status of the station،With the burial of the MANZELABAD pumping station. in addition to upgrading the structural strength, the safety factor of t he structure can be increased against military threats. In this regard, the carving scenario of the MANZELA BAD pumping station caused the station to rank 0.62 with a preference factor of 0.62 and this weakness wil l be overcome.

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