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## **Quality Assessment of Government Plans in Developing Rural Settlements Case Study: Dolatabad Rural District, Southeastern Iran**

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### **Introduction**

Considering the importance of benefiting and achieving the desired situation of housing as one of the most prominent indicators of development has led to planning in this area at different times. Accordingly, in recent years, the government has implemented several measures in the form of rural guide plan and rural reconstruction-renovation plan for the development of rural settlements in different parts of the country. These plans have improved rural housing through their control-supervision measures, and executive-practical measures. The purpose of this study was to evaluate the quality of government measures in the development of rural housing in Dolatabad rural district in Jiroft County, Southeastern Iran.

A review of previous studies on this subject confirmed that the present study will be important as a new action in the evaluation of rural housing and can be a positive step for solving problems and for better implementation of similar projects in the future. Accordingly, the present study, by considering the level of actions of a rural guide plan and rural reconstruction-renovation plan in the sample villages and by evaluating control-supervision measures, and executive-practical measures, seeks to answer this fundamental question, how was the quality of the actions of government plans on the studied rural housing?

### **Methods and Material**

This research is descriptive-analytical, in which the documentary method is used to review the research background and problem statement and a survey method is used to collect information related to government actions in the studied villages. Therefore, after studying theoretical fundamentals and relevant research, a comprehensive list of relevant indicators was compiled according to the characteristics of the study area and classified into two parts of the control-supervision measures, and executive-practical measures.

Data collection was achieved by interviewing, completing the questionnaire and by using field observations forms. In this regard, 345 households were calculated as the sample size, according to the number of households in villages having a rural guide plan or rural reconstruction-renovation plan, and by using the Cochran formula. Sampling of households was done to complete the questionnaires by simple random sampling.

To test the validity of the questionnaire, formal and content validity was used. The reliability of the research was calculated by Cronbach's alpha in the research components using a value of more than 0.842. As a result, the internal components of the scale recorded a strong correlation with each other, and thus, the reliability of the questionnaire has been confirmed.

Data analysis was conducted using descriptive, inferential statistics and integrated AHP-Vikor model with Expert Choice, SPSS and ArcGIS software. In this regard, based on the results of the paired comparison in Expert Choice software, the value of each indicator of the actions of government plans was determined. Also, the leveling of the sample villages in terms of the quality of government measures is based on the output of the AHP-Vikor model and by mapping the ArcGIS 10.3 software, the outputs are provided graphically.

### **Results and Discussion**

According to the results of the research, the overall quality of the government's executive actions in relation to rural housing with a confidence level of 99% has been in a favorable situation and the level of these measures in rural reconstruction-renovation plans was better as compared to the rural guide plans. On the other hand, comparing the level of executive-practical measures with control-supervision measures has also shown the superiority of executive-practical measures to control-supervision measures.

The results obtained after conducting a paired comparison of the research indicators showed that in the control-supervision measures, the indicators of the resilience of the Housing Foundation to the villagers, the monitoring of the use of standard materials and in the executive-practical actions section, the indicators facilitating the granting of credit to villagers and holding training courses to enhance the skill level of local builders are regarded as the most important. Also, according to the model used, it was evaluated that the state of government measures has been relatively weak in 22.7% of villages.

Investigating the distribution of studied villages, on the basis of the criteria, indicated that most of the villages located in the central part of the study area were more favorable than other villages due to the successful implementation of two rural guide plans and rural reconstruction-renovation plans. In contrast, low-populated villages in the periphery of this rural district, and mostly villages where only one housing development plan has been implemented, have been relatively weak.

### **Conclusion**

The results of this study show that the implementation of these plans in the villages of Dalatabad rural district has resulted to various changes and a relative improvement in the housing construction situation. On the other hand, the abundance of households surveyed according to the level of government measures in the two control and executive parts related to rural housing showed that the level of control-supervision measures in 19.6% of households and the level of executive-practical

measures in 15.9% of them were weak or relatively weak. A study of the factors influencing the above conditions confirmed that the arbitrary construction of housing through some villagers (without obtaining rural housing loans and government supervision), or the construction of some of them outside the scope of the plan, played a major role in the emergence of these weaknesses.

Although in the past, no research has compared the level of actions of the rural guide plan and rural reconstruction-renovation plan and their simultaneous assessment of the quality of government measures at the level of rural households; Nevertheless, a comparison of the results of the present study with previous studies related to rural dwellings (Shamsudini et al., 2011; Pourtaheri et al., 2012 & Saeidi et al., 2013) has confirmed that the results of this study are consistent with the results of previous studies which evaluated similar indices.

**Keywords:** Housing, Government measures, Quality assessment, Rural areas, Southeastern Iran.

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## **An analysis of Spatial Auto-Correlation of Monthly Frequency of Extreme Precipitation Occurrence in Iranian Coastal Region of Caspian Sea in 1966 – 2016**

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### **Introduction**

Precipitation is considered as one of the most important climate elements affecting different environmental aspects represented through several different behavioral from among of which is extreme precipitation. Extreme precipitation can occur in the form of flashfloods and draught with considerable negative consequences on humane and environment. Precipitation extremes follow a geographical pattern like all other climate elements. Recognition of such patterns, specifically in those areas where people's lives depend on precipitations, can determine the amount of success in environmental management as well as certainty in resources planning. Regarding high extreme precipitation in Iran's coastal region of Caspian Sea, especially in eastern parts, the recognition of spatial auto-correlation of such a phenomenon can facilitate environmental planning and the reduction of vulnerability and also increasing adaptability with such a disaster. The geographical position of the Iran's coastal region of Caspian Sea and placement of the Caspian sea in its northern part , Alborz mountains in its southern part and the adjacent various geographic units (sea, plain and mountains),as well as their interactions with each other, provide appropriate conditions for extreme precipitation occurrences in this area. As researchers believe that the extreme precipitation in Caspian region is part of the intrinsic properties (mofide, 1387: 3). For this reason, recognition the geographical features of this precipitation in the Caspian region is considerably importance. In this study, geographic patterns of precipitation are estimated with using acceptable quantitative methods.

### **Methods and Material**

In order to analyze the auto-correlation of the sum frequency of monthly extreme precipitations of under investigation region, 99 percentile of precipitation for each pixel of the map is considered. Accordingly, 385 stations (synoptic, climatology, and rain gauge of Islamic Republic Organization of Meteorology, and rain gauge of the Ministry of Energy) were studied during the time period covering 1966 to 2016. At first, the frequency of monthly extreme precipitation was plotted in the Surfer software. Then, we have used spatial statistics techniques (global Moran index (1), local Moran (2), and Gi\*index (3) to analyze spatial auto-correlation features.

$$I = \frac{n \sum_{i=1}^n \sum_{j=1}^n w_{ij} z_i z_j}{s_o \sum_{i=1}^n z_i^2} \quad (1)$$

$$I_i = \frac{x_i - \bar{x}}{s_i^2} \sum_{j=1, j \neq i}^n w_{i,j} (x_i - \bar{x}) \quad s_i^2 = \frac{\sum_{j=1, j \neq i}^n w_{i,j}}{n-1} - \bar{x}^2 \quad (2)$$

$$G_i^* = \frac{\sum_{j=1}^n w_{i,j} x_j - \bar{x} \sum_{j=1}^n w_{i,j}}{S \sqrt{\frac{n \sum_{j=1}^n w_{i,j}^2 - (\sum_{j=1}^n w_{i,j})^2}{n-1}}} \quad \bar{x} = \frac{\sum_{j=1}^n x_j}{n} \quad S = \sqrt{\frac{\sum_{j=1}^n x_j^2}{n} - (\bar{x})^2} \quad (3)$$

In the last step, the relationship between the spatial factors and extreme precipitation frequency for each month was calculated using general Moran multivariate statistics (4).

$$I_{kl} = \frac{z_k w_{zl}}{n} \quad z_k = \frac{[x_k - \bar{x}_k]}{\sigma_k} \quad , \quad z_l = \frac{[x_l - \bar{x}_{kl}]}{\sigma_l} \quad (4)$$

## Results and Discussion

One of the optimal methods to identify the spatial distribution of climate events, is the analyze of spatial relationships. Aim of this study is to determine the spatial pattern of the sum monthly precipitation frequency patterns (99 percentile and more) with using the spatial statistics techniques (global Moran index, local Moran, and  $G_i^*$  index) to analyze spatial auto-correlation features. The results of this research show that the global Moran index is statistically at 95% significant level. Results of the present study showed that the dominant behavior in sum frequency of monthly extreme precipitation of under study region followed a cluster pattern. The areas with positive auto-correlations were mostly found in internal areas (foothill areas) and far from the coastal line over most months. Positive auto -correlated clusters were spread in eastern and western regions and some parts in central areas.  $G_i^*$  test approved the frequency of clusters with high and low values. Positive auto -correlated clusters were spread in eastern and western regions and some parts in central areas. The results showed that the geographical location under investigation region and Alborz mountain characteristics, and also synoptic systems affecting the region have affected the spatial frequency pattern of extreme precipitation occurrence.

## Conclusion

Results of the present study showed that the dominant behavior in sum frequency of monthly extreme precipitation of under study region followed a cluster pattern. The areas with positive auto-correlations were mostly found in internal areas (foothill areas) and far from the coastal line over most months. Positive auto -correlated clusters were mostly spread in eastern and western regions and some parts in central areas.  $G_i^*$  test approved the frequency of clusters with high and low values. The comparison of our findings with previous studies showed that the geographical location of under investigation region, Alborz mountains characteristics, and also synoptic systems affecting the region

have affected the spatial auto-correlation frequency pattern of extreme precipitation occurrence. Finally, considering that extreme precipitation in the Caspian Sea region causes one of the natural hazards (flood), especially in the eastern parts, recognizing the spatial patterns of this phenomenon can be very useful in planning environmental hazards and reducing vulnerability and increasing the compatibility.

**Keywords:** Extreme precipitation, Spatial statistics, Monthly frequency, Auto-correlation analysis, Moran Index, Gi\* Index, Coastal region of Caspian Sea.

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## **Analysis of Iran's Thermal Seasons and Variation During Last Decades**

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### **Introduction**

The global warming phenomena is taking place and the climate is changing. More than two centuries later from the governing of the industry over human societies, nowadays the global warming is considered as a challenge and threat to the earth's environment. During recent decades, increased atmospheric anomalies such as sudden precipitations, severe storms, droughts, and increase of temperature taking place in some places over Iran for several times. Snowfall in the southern and central cities of Iran after the long time years, extreme cold events, and hail precipitation in the season of flowering of trees, flowering of trees in winter, and experiencing temperature above 40 centigrade degree in cities located in mountains are the signs of global warming and climate changing over Iran. Climate change is a concept that cannot easily be defined. Undoubtedly by increasing in global warming, thermal factors of the atmosphere will be significantly altered. Since the temperature is the main element of climate formation, its changes can alter the climate structure of each location. Also, changes at the time of the start and end of thermal seasons can be one of the signs of climate change. Adaption strategies to global warming will reduce the severity of its negative effects. In addition, the opportunities provided can benefit the community and especially farmers. Therefore, identification of the spatiotemporal changes of the beginning and end of thermal seasons is necessary for better understanding its impact and management of natural and agriculture resources and adopting useful strategies to climate change. The purposes of this research is to regionalize Iran's country in point of view of beginning, ending and length of thermal season and to analysis its variation during the study period.

### **Methods and Material**

In this study, we will be addressing Iran's thermal seasons and its variations during period of 1/1/1370 to 29/12/1392. To reach this purpose, daily temperature data from 49 stations across Iran obtained from Iran's Meteorological Organization (IRIMO) during the mentioned period of time. The standard deviation of each stations in each year was compared with the long-term standard deviation. Then, the Long Term Mean (LTM) in a  $366 \times 49$ -dimension frame for each station was established. The difference between yearly standard deviation and deviation for each station was calculated and the start and end of thermal seasons was detected. Finally, three matrices namely SWS (Start of

Warm season), EWS (End of Warm season) and SWL (Season Warm Length) all with dimensions of  $63 \times 49$  were developed. Afterwards, for identification of homogenous regions, cluster-analysis with Ward linkage method has been done. Finally, by using the non-parametric modified Mann-Kendall test, the variation in start, end, and length of thermal season in the studied period were measured. The changing rate evaluated by the Sen's Estimator method.

### Results and Discussion

The results of this study indicate that thermal seasons in Iran aren't coincide to the official calendar. By applying the Ward linkage method on the Euclidean distances of thermal seasons in the studied stations, the country's area can be divided into four homogenous thermal seasons. Latitude, longitude, altitude, and distance from water resources as well as atmospheric humidity have high effects on the nesting of identified regions, respectively. The result of trend analysis indicates that Iran's thermal seasons have been changed significantly during the studied period in point of view of starting, ending, and length. According to the results obtained from fitting Sen's Estimator on the data time series, the decreasing rate of the starting time of the thermal season during the study period is 4.5 days per decade. This indicate that Iran is beginning to start its spring season earlier than its predecessor. In spatial view, the decreasing trend of start of thermal season is observed in the stations located in the northern regions of the country, the southern coasts of the Caspian Sea, the northwest region, the Alborze mountain range, and the south-east region. The increasing time of ending of thermal season is statistically significant over 45 percent of country area. The decreasing rate of the starting of thermal season are significantly more than increasing rate of the length and ending of thermal period.

### Conclusion

Using data from 49 station across Iran, we have detected variability and changes in the occurrence of the thermal seasons in Iran during the period from 1370 to 1392. According to the results, we found substantial variation in start, end, and length of thermal season length over Iran country. Analysis presented in this study showed that the more decreasing rate of the time of beginning of the warm season has been leads to increasing the thermal season length over Iran. The increasing of thermal season length will have more effect on the total growth period and maturity (planting to harvesting), irrigation, flowering, and the phenological stages of the plant. These changes will play a very important effect on many human activities, especially agriculture. Due to the increasing the length of thermal season, the adaption strategies including changes in cultivar patterns or changes in planting time can be adopted based on the changes in intensity of variation in the length of thermal seasons to reduce the negative effect of these changes.

**Keywords:** Shift of thermal seasons, Climate change, Cluster analysis, Trend Analysis, Iran.

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**Assessment of Interpolation Methods in Zoning the Spatial Need into  
Power in Agriculture (Case study: Khuzestan Province)**

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**Introduction**

On-time field operations is considered as one of the effective factors for increasing crop yield. So the available tractor power in each region should meet the operational requirements in the most demanding time of cropping season in terms of operations related to machinery. For this purpose, systematic and continuous monitoring of inputs and outputs related to the power resources in agriculture is necessary. Given agricultural operations for each crop are done in a specific period of time and any delay causes financial damage and extra costs resulted from yield reduction and waste increasing, so doing agricultural operations in the optimal time is so crucial. On-time operations are subject to the availability of tractor and agricultural machinery. Therefore, considering the optimal allocation and appropriate geographical distribution of these power sources in agriculture sector of each region for timing the field operations and quantitative and qualitative improvement of crop production is one of the effective factors in proper mechanization management. Considering the fact that Khuzestan province is one of the major producers of agricultural productions, so can the available tractor power in the region meet the local agriculture's needs in the most demanding time of cropping season? On the other hand, the power availability more than the region needs waste the interest and causes extra costs such as costs related to the maintenance, repair, etc., so is there surplus tractor in different zones of province? Is there any suitable geographical distribution of tractors for availability to the tractors?

This study aimed to investigate the needs assessment and zoning of tractor power in Khuzestan province to rate each zone's needs for new power and replacement of obsolete machinery.

**Methods and Material**

For collecting the required data, documentary and library information such as agricultural statistics and general census results of the province were used. Obtained data were classified in Excel software and were analyzed by GIS software. For zoning the province to determine the priorities for importing power to counties, the combination of some criteria including mechanization level shortage, obsolete

coefficient of tractors, area (ha) per tractor ratio (ha/tractor), the harmonic mean of crop yield and scattering of farm plots, slope and land use were used. Different interpolation methods were applied for mapping the criteria including mechanization level shortage, obsolete coefficient of tractors, area (ha) per tractor ratio (ha/tractor), the harmonic mean of crop yield and scattering of farm plots. In order to provide the slope map, topographic and dem layers were determined using altitude information, then the slope map was plotted. Then for identifying the needs of different zones for new power, weighted overlapping was used. For weighting the applied criteria, fuzzy AHP was used.

### **Results and Discussions**

Results related to the comparison of interpolation methods showed that experimental variograms fitted to mechanization level have acceptable correlation coefficient. The best fitted model is Gaussian model ( $R^2=0.68$ ). Similarly, for zoning the applied criteria in power distribution zoning in Khuzestan province, the suitable variograms were fitted and best interpolation model was obtained. The value of spatial structure for obsolete coefficient of tractors in all fitted models into experimental variogram was higher than 0.75. This value for other criteria was in medium range. In order to choose the best zoning method, average error and Root Mean Square Deviation were calculated for different interpolation methods. The most suitable interpolation methods for the mechanization level shortage zoning, are GPI and LPI. For zoning the obsolete coefficient of tractors and the harmonic mean of crop yield, IDW and LPI interpolation methods were identified the most suitable methods, respectively, while RBF interpolation method was best method for area (ha) per tractor ratio. In the zoning of scattering coefficient of farm plots, all methods had same accuracy. Because of medium spatial dependency of data in the present study, the accuracy and efficiency of Kriging method and other definitive methods for zoning were almost same.

Results obtained from power estimation indicated that the available power was more than the needed power in 9 counties and other 18 counties are facing the power shortage in most demanding time. The zoning of area (ha) per tractor ratio shows that this ratio is high in southern parts and some zones of central parts of province. Northern zones and some parts of western and eastern zones are in bad status in terms of this ratio and the lowest value was related to the northern part of province. Based on the evidence, power distribution and mechanization level do not have same spatial distribution. Based on that, the shortage of mechanization level in the province was investigated. In the eastern zones and some parts of the western zones of the province, there is a severe shortage of mechanization level, while the south, center and some parts of north have good status in terms of mechanization level. Since almost 40% of available tractors has spent their useful life and are not efficient anymore, so most of agricultural operations cannot to be done on the proper time and consequently crop yield is decreased. Zoning of obsolete coefficient of available tractors in Khuzestan province showed that northern, eastern and some parts of southern zones have bad status in terms of this criterion. Based on the results obtained from area (ha) per tractor ratio zoning, northern and some parts of eastern and western zones have high value of this ratio. The harmonic mean of crop yield was best in some parts of north and center of Khuzestan province. Results related to the scattering of farm plots criterion showed that the highest scattering was related to northern part of Andimeshk and some parts of west and south of Khuzestan, while Gotvand and Izeh and southern part of Khorramshahr have lowest scattering.

To compensate the shortage of mechanization level in Khuzestan province and to determine the need of Khuzestan different zones for new power using fuzzy AHP, the highest weight was respectively related to the area (ha) per tractor ratio, mechanization level shortage and obsolete coefficient of tractors. After integrating the obtained maps from above-mentioned criteria, some parts of north and east of Khuzestan province have high priority in terms of importing new power.

### Conclusion

Khuzestan province needs a maximum of 2024755 hp of tractor power at the peak of operations, which 1643750 hp is available. Due to the inadequate distribution of power in the province, in 9 cities there are 119490 hp overcapacity. Therefore, to compensate the required power shortage, 500515 hp should be added to Khuzestan tractor fleet. In case of appropriate distribution the requirement is reduced to 381025 hp. Considering that a large proportion (almost 40%) of tractors in Khuzestan are over 13 years of age and should be eliminated from production cycle, the need for new power will increase up to about 1158015 hp. Results obtained from the zoning of new power need in different zones of Khuzestan using some criteria including mechanization level shortage, obsolete coefficient of tractors, area (ha) per tractor ratio (ha/tractor), the harmonic mean of crop yield and scattering of farm plots, slope and land use showed that the Khuzestan's Counties are in three levels of need.

**Keywords:** Zoning, Power distribution, Interpolation, Fuzzy AHP.

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**Investigating the Role of Urban Night Activities in Serving Citizens**  
**Case study: 11 Metropolitan Area of Mashhad**

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**Introduction**

Urban life and related economic requirements require that human activities continue from day to night (samani, 2012), but what contributes to the realization of this important consideration is the concerns of both groups of stakeholders, namely, the citizens and urban management. Nightly attractiveness is the most important factor in attracting citizens at night. On the other way, urban management should have the incentive to provide services and facilities that are commensurate with the night space. Perhaps, the most prominent features of an inviting city space at night can be found in cases such as (different activities), (proper illumination and, consequently, the beauty of space), (access- convenient transportation) and ultimately (the physical safety of space). The nightly city, in the first place, includes cafes, cabarets, as well as fast food media in the city center which boosts the economic growth of urban centers (Tierney and Hobbs, 2003), whose activities include hobbies and retails and nonalcoholic beverage economies are numerous that are considered as a means of rebuilding the activities of the city center areas (Talbot, 2007, p.1). and on the other hand, these cities aim to bring people to the center of the city by festivals and the implementation of cultural projects which has led to the creation of brilliant offices, the prosperity of residential economics, and the expansion of cultural and social facilities in the city, providing space for lively and fun activities at night (Lovatt and O'Connor 1995, 130).

**Research Methodology**

The purpose of present study is applied and it is descriptive-analytical method. A comprehensive data collection is done in the library and it is field one (questionnaire and observation). The statistical population of this research is the citizens of 11<sup>th</sup> area of Mashhad which is estimated to be 222000, which is considered by Cochran formula with error coefficient of 0.076. For data analysis, descriptive statistics (mean, standard deviation and variance) and inferential (correlation, multiple regression, t single sample) have been used.

**Results and Discussion**

Considering the importance of the issue, the statistical tests have been used to investigate the role of the nightly Activities in providing services to the citizens. So, in order to measure the importance of

the subject and answer to the raised questions, the items in the research were indexed in 19 groups. The findings of the research showed that some of the dimensions were evaluated higher and some of them lower. And its significant difference was significant for all indices. On the other hand, Spearman correlation test was used to investigate the relationship between the service components of the nightly city with the equipment and facilities of the city which showed that there is a direct and significant relationship between all the service components of the nightly cities and urban equipment and facilities at 0.05% alpha. Also, the study of regression fit model shows that 0.835 of variables can explain the role of nightly city in providing services in the study area, which indicates a direct relationship between the two variables. Therefore, given the evident evidence, it can be stated in general that the raised questions are confirmed. There are some guidelines for the indicators that are below the threshold of the baseline in this research.

### Conclusion

The findings of this shows that the means were evaluated lower than desired conditions in the indicators of health, caretakers, hotels, and taxis and in the other indicators were higher than the desired conditions. The difference is quite meaningful for all of the indicators. So, considering the obtained result, it can be stated that the nightly city has provided the ground for the provision of services to citizens, that is, the services to the citizens have increased by increasing the equipment and facilities and they are decreased by decreasing of equipment and facilities. This showed that the role of the nightly city was considered as an important service and it had the satisfaction of the citizens in the area of the study. The study of regression fit model shows that 0.835 of variables could explain the role of the nightly city in service provision in the study area, which indicates a direct relationship between the two variables.

**Keywords:** Nightly city, Service, satisfaction, 11<sup>th</sup> district of Mashhad.

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## **Geomorphological Evidences of Heinrich Events in North West of Iran**

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### **Introduction**

Changing climatic conditions in marine and lake environments has a direct impact on their water level changes. In the lake environment and middle latitudes of the Earth, cold periods accompanied with decreasing air temperatures, increasing rainfall and decreasing evaporation. This situation leads to a Pluvial period, which is the result of rising lake water levels. Conversely, during warm periods, with increasing temperature, decreasing rainfall and increasing evapotranspiration over a long period of time, it is possible to see lake water level decrease. According to data from the history of climate change based on the northern Atlantic and Greenland cores, as well as the historiography of Heinrich event from the Cold era, Heinrich 1 and 2 may portray the coldest climatic conditions in the last glacial period in quaternary. If this is true, more moderate phases (still dryer than current ones) may overcome the region's conditions in parts of the course. The younger Dryas is also a form of Heinrich's event, and it can be considered the latest era of Heinrichs events. This research was carried out with the aim of identifying and rehabilitating climatic changes in the late Pleistocene and finding the evidence of cold weather in the northwest of Iran by studying the Urmia Lake terraces as an indicator of climate change.

### **Methodology**

During field studies, 24 lake terraces were identified at a height of 1298 meters to 1365 meters above global mean sea level. Determining the age of 6 terraces was achieved using carbon 14 method. The results of the determination of the age of the fluctuations in the Urmia Lake water level were matched with the climatic events in the late Pleistocene, and the climate conditions in the region were reconstructed by linking the time between the lake water fluctuation event and the climate change in this period. In addition, in order to confirm the results of this study and its verification, the results of the review of the long-term fluctuations in the water level of Urmia Lake were adapted with the results of the lake level fluctuations of the "Dead Sea.

### **Discussion**

The rise of the Urmia Lake water level in the late Pleistocene coincides with the northern glacial period of Worm. The four dated lake terraces in this study synchronise with the Heinrich 4 and 5 climate events. These events have been linked to the expansion of glaciers in northern Europe at the end of

the Pleistocene, reflecting the impact of the climatic conditions of Iran on the cold times of Heinrich. The evidence of the Heinrich Cold Periods in Iran was identified for first in this research. At the Urmia Lake, During Heinrich event, lake water level has increased, indicating the impact of these climate changes on the area of the country.

### Results

The results indicate that the present semi-arid region of the studied area, possibly in the cooler periods of Heinrich, may have changed to a more humid climate and these events coincided with the occurrence of pluvial periods and the increase in precipitation, reduced evaporation and temperature in this region of the country. This has led to an increase in the amount of water entering the rivers in the catchment area of the Urmia lake, and the formation of lakes terraces in the Pleistocene. The rise of Urmia Lake water level in the late Pleistocene synchronic with 4th and 5th Heinrichs Cold periods and associated with the rise of the "dead sea " lake water. This evidence confirms the verity of the results obtained from this study.

**Keywords:** Northwest of Iran, late Pleistocene, Heinrichs Events .

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## **Evaluating the Potential and Ranking the Ability to Convert Open-air Office Buildings to Public open Space (Case study: Rasht city)**

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### **Introduction**

Urban Open spaces are the physical spaces of human interaction and one of the essential requirements for living in cities. Increasing these spaces has a significant impact on increasing the health, security and social interaction of citizens. There are several potential to increase this type of space in the urban spatial organization which governmental offices and organizations are one of the types. Governmental organizations and offices are usually located in densely populated areas and have a lot of space that remains unused and while in the same urban areas there are severe deficiencies in providing urban open space and furniture. Therefore, if the space of these organizations and offices is used, new open spaces can be created for the city and will create a good environment for the development of urban furniture and a place for temporary resting of pedestrians. Rasht city as one of the most important cities in the north of Iran, is in bottleneck in relation to urban open spaces and it requires the development of urban open spaces in some areas. Therefore, in this research, after identifying the existing governmental offices and organizations in the city, the potential for developing urban open spaces is examined and then the capability of the above organizations ranked in term of creating of open spaces.

### **Methods and Material**

This study is a descriptive- analytical research. Library and documentary method was used to collect data. In order to identify governmental offices and organization, at first a distance of 500 meters from the main North-South and East-West streets of the city, which has urban spatial deficits, is considered. Accordingly, 66 governmental offices were identified. Finally, the AHP method was used to rank offices in terms of open space office area, street width, distance from green space, type of visitors, open space width and population density around offices. GIS software is also used to prepare the maps.

## Results and Discussion

Among the research criteria, according to the opinion of experts the types of visitors to the offices have had the highest score and the lowest score is the distance from the green space. The results of the studies show that the power distribution company with the weight of 0.24 is the highest rank and the lowest rating is for the fire department with a weight of 0.03. According to studies, governmental offices and organizations located in the peripheral regions of the city of Rasht, especially in the south and south-east of the city, because of their less land value in these areas, have more open spaces than the central areas of the city and have higher rank and only a few of the offices in the central part of the city can turn a part of their open spaces into urban open spaces. The parking area of the above offices and organizations was studied and it was found that most of the above mentioned organizations had an appropriate and enough parking spaces and the available open space is not used as parking.

## Conclusion

The results show that the governmental offices and organization in the area under review, do not have the same spatial distribution in the city of Rasht and their concentration in the central areas of the city is more than other parts. Base on hierarchical analysis, the priorities of each governmental offices and organization were determined according to their open space related criteria. Studies have shown that 16.7 percent of organizations have low potential for using open spaces for urban furniture and temporary use for pedestrians, while 62.1 percent of them are in moderate condition. It is noteworthy that the highest numbers of them are in the upper and middle densities of Rasht city. Finally, 21.2 percent of the organizations have a high ability to allocate part of their open space to the open space for citizens that largest number of them are in the southern entrance of the city that one of the most important of them was Guilan power distribution company.

**Keywords:** Urban Open Space, Governmental Offices, AHP, Evaluating the Potential, Rasht City.

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## **Earthquake and Landslide Hazard Zonation Using Fuzzy Logic in Bagheran Mountain (South of Birjand)**

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### **Introduction**

Earthquakes and landslides are always among the most important natural hazards that many people in the world suffer from their adverse effects each year. Therefore, in order to reduce the mortality and economic losses and social consequences, it is necessary, based on the current knowledge and the latest reliable technologies, to reduce the risk of Earthquake at different points. Investigation of seismotectonic maps shows that this area has high seismic potential and there have been many earthquakes in this area. Due to the density of the rural population and the massive construction that has taken place in the area of active faults, the importance of this zoning is apparent in order to prevent the loss of life. The first and important step in the analysis of seismic risk is the strategy of reducing population deployment in high-risk areas. Although accurate prediction of this great natural hazard cannot be made definitively, it is possible to determine the probable location of the occurrence of an earthquake or possible locations of landslide occurrence, so the need for zoning is apparent. The area is about 1100 square kilometers in the south of Birjand. Bagharan Mountain range is one of the branches of Sistan branch to the Lut zone. Sistan structural state of eastern Iran with the general north-south trend represents a seamless earthquake of the Lut and Afghan parts.

### **Methodology and Methods**

Fuzzy logic was first introduced by Dr. Lotfizadeh, a professor at the University of California in 1965 in an article entitled "Fuzzy sets". Fuzzy logic is a multiplicity of logic, meaning its parameters and variables, as well as the number of 0 or 1, can take all the values between these two numbers. The membership of each reference entity to a particular substrate member is not definite, that is, it cannot be said with certainty that the member in question belongs to this collection or not. This uncertainty is done by assigning a number between 0 and 1 to this member. If this number is equal to 0, then it is possible to say with certainty that the member in question is not belong to that set, and if this number is 1, then it can be claimed that the member in question belongs to that set. In this way, you can represent the subsets of a fuzzy set by assigning numbers 0 and 1 to each member of the set.

## **Results and Discussion**

In this study, four parameters of seismic alignment map, fracture coincidence, distances from fault and unit resistance were used to study the earthquake hazard. Seismic alignment, fracture probability, distance from the fault, distance from the waterway, unit resistance, topography, slope, the direction of slope and precipitation were used to study the landslide hazard.

### **- Sequential alignment parameter**

Accordingly, the maximum acceleration from the active faults on the surrounding villages is estimated to be 0.63 g (gravity acceleration). As a result, more than 46% of the area is at high risk and very hazardous seismic courses, and 42% of it is at high risk and high-risk classes in terms of landslide hazard.

### **- Fracture Coincidence Parameter**

Statistically, about 70% of the Landslides are located in high-density classes.

### **-Distance from fault**

Due to the slope of the faults, the boundary for the faults of the 700-meter zone was considered. Based on the results, more than 95 percent of the land surveys are located at less than 700 meters of fault.

### **-Resistance Units**

This division is based on the unit's resistance to weathering and the rigidity of the rock unit. Based on the results, most of the landslides are located in low and medium risk classes.

### **- Slope map and slope direction**

Based on the results, more than 80 percent of the landslides are formed in the topographic topography of 10-40 degrees. The percentage of landslide distribution based on the slope parameter indicates an almost uniform distribution in all directions.

### **- Rainfall**

Based on the results, the area under study has a rainfall range of over 200 mm per year.

### **- Distance from the waterway**

Based on the results, most of the land surveys are located between zero and 700 meters from the waterways.

### **- Topography**

The results indicate that most of the landslides are at high altitudes of over 1900 meters, which can be due to precipitation at high altitudes.

### **Prioritizing Factors Affecting Landslides and Earthquakes**

Among the factors affecting the earthquake, the geometric parameter had the highest weight. Among the factors influencing the occurrence of the landslide, seismic alignment parameter, and distance from the fault, the highest weight was allocated.

## **Conclusion**

Based on the results obtained from the fuzzy degree maps of each of the parameters, it was determined that there is a direct correlation between faults and landslides, so that about 95% of the landslides of the region are located at a distance of 0 to 700 meters of fault, indicating a direct relationship with the regional tension. Among the factors affecting the earthquake, the geometric parameter had the highest weight. Among the factors influencing the occurrence of the landslide, seismic alignment parameter, and distance from the fault, the highest weight was allocated. According to the seismic alignment map, the maximum acceleration from active faults to surrounding villages is estimated to be 0.63 g, of which 46% of the area is in high risk and very high-risk seismic

conditions, and 42% of it in high risk and high-risk classes in terms of landslide hazard contract. Based on the fuzzy field maps, it became clear that the fuzzy algebraic and fuzzy inputs have the best matching with the actual zoning plan so that in the fuzzy algebraic neighborhood, 80% of the land libraries are located in 30% of the area and in two classes of high risk. Based on the earthquake fuzzy outflow maps, it was found that the fuzzy algebraic population has the best fit with the distribution of earthquakes in the area, with 42% of the area in the classroom being a high and very high risk of earthquakes. After combining the maps of landslide and earthquake, it was found that the fuzzy algebraic sum is the best match, which is 0.25, 0.09, 0.20, 0.21 and 0.20% respectively, in very low, Moderate, high and extreme final result from the combination of earthquakes and landslides.

**Keywords:** Paired Comparison, Fuzzy Logic, Fuzzy Membership, Fuzzy Operators, Network Analysis, Bagharan Mountain.

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## **Examining Saudi Arabia's Geopolitical Challenges with the Islamic Republic of Iran and its Impact on Southwest Asia Region**

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### **Introduction**

Southwest Asia is one of the most strategic and important areas in the world that has experienced geopolitical challenges and political crises in the recent decades. The two countries of the Islamic Republic of Iran and Saudi Arabia are the most important actors in its regional level. The two countries were complementary to each other in Nixon's Twin-Pillar strategy, but after the Islamic Revolution, they became rivals. Between them there was a competitive and tense relationship. Meanwhile, the Southwest Asia region is one of the geopolitical and strategic areas in the world, which for many reasons has been a turbulent, tense and crisis region for many reasons. The two major countries of the region, the Islamic Republic of Iran and Saudi Arabia, are the most important actors in the region's geopolitical region that are ideologically opposed. The victory of the Islamic Revolution of Iran in February 1979 created a lot of ideological and geopolitical faults between the two countries that are activated at specific times and events of history. For historical and geopolitical reasons, Iran has always been one of the regional powers and has played an active role in events around it. But in recent decades, Saudi Arabia has been pushing for currency surpluses with Western oil exports and supporting Western powers to seek a balance of power with the Islamic Republic of Iran in the South West Asia region. Therefore, it has chosen a competitive approach and a challenge to the Islamic Republic of Iran in geopolitical issues. Accordingly, this research seeks to explore the geopolitical challenges of Saudi Arabia's relationship with the Islamic Republic of Iran and its impact on the South West Asia region.

### **Methods and Material**

This research has done with descriptive-analytical and documentary method and using library data and geopolitical view. Research data is collected from articles, international news agencies, news websites, and reputable sources. The realm of research in the region of Southwest Asia and the Persian Gulf and the realm of the time has been from the Islamic Revolution of Iran in 1979 to 2016. The main question of the research what is that Saudi Arabia's geopolitical challenges with the Islamic Republic of Iran and what impact these challenges have on the South West Asia region.

### **Results and Discussion**

After the Islamic Revolution, relations between Saudi Arabia and the Islamic Republic of Iran can be divided into three terms. Each term had certain geopolitical and political challenges and had a direct impact on the West Asian region. These three courses are:

**1. From the victory of the Islamic Revolution to the end of the Iran-Iraq War (1979-1989):** In this term, Iran had a Shiite revolutionary nature with an anti-Western nature, with the goals of issuing a revolution and a vision of providing regional security without the involvement of trans-national powers. In contrast, Saudi Arabia is a Wahhabi nature and allies of the United States and the West, and believes in securing the region with the participation of global powers. By creating a new security and political structure, the Saudis called on the Co-operation Council to increase their geopolitical weight and national power in the region in order to confront the Islamic Revolution of Iran. Saudi Arabia and allies of the Cooperation Council openly supported the Ba'ath regime in the war against Iran.

**2. The post-war period of Iran and Iraq until the end of the twentieth century:** Iran after the end of the war, sought to rebuild its regional role in the Persian Gulf and Southwest Asia, and saw it as a way of restoring its regional ties with its neighbors. Accordingly, the Islamic Republic of Iran has called for official relations with Saudi Arabia. The geopolitical challenges rooted in between the two regional powers failed to create good relations and sustainability.

**3. The first decade of the third millennium and recent years:** In the term, Saudi relations with Iran once again entered a stage of cold, competitive and tense relations due to internal political events in the member states of the Cooperation Council and Iran, and some events outside of the Gulf region and the international arena. During this period, the political variables affecting the relations between the two sides were enormous and, on this basis, had a lot of complexity, most notably the Arab Spring and the Syrian crisis.

### Conclusion

Historically and geopolitically, the relations between these two regional powers can be divided into three terms: From the victory of the Islamic Revolution to the end of the Iran-Iraq War (1979-1989), post-war period of Iran and Iraq until the end of the twentieth century, The first decade of the third millennium and recent years which the most complex taken place in the contemporary era.

In general, the rivalry between the two countries to expand its sphere of influence in the South West Asia region has exacerbated, spread and sustained more political and geopolitical crises in the region. The ideological contradictions, conflicting interests and rivalry over the expansion of the spheres of influence of the two countries have led to geopolitical challenges and numerous political crises that have spread throughout the region.

**Key words:** Southwest Asia Region, Geopolitics, Regional Power, Saudi Arabia, Islamic Republic of Iran.

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## **Estimation of ELA of the Geomorphic Unit of Central Iran**

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### **Interdiction**

Assessment of Quaternary climate change has always been one of the most controversial and the most attractive issues that have attracted the attention of geomorphologists due to the reflection on shaping systems and created forms on the surface of the earth (Moayeri et al, 2008: 113). The nature of most surface forms of earth related to climatic conditions. Especially they related to the severe and intermittent climate changes in the Quaternary period (Abtahi, 2013: 186). Despite the current location of Iran and the domination of dry and semi-arid conditions, the rule of glaciers in Iran has been made with doubts, but the existence of geomorphologic evidence of glaciers in different regions indicates the function of glaciers in its various regions (Ramesht et al, 2011: 60). Despite the current location of Iran and the domination of dry and semi-arid condition that has been made with doubts the domination of glacier process, but the existence of geomorphologic evidence of glaciers in different regions indicates the function of glaciers in various regions. Domestic and foreign researchers have confirmed the effect of quaternary glacial processes in the heights of Central Iran as the driest geomorphic unit of Iran. Central Iran is a triangular area with a geographic coordinates of 51 to 58 degrees east longitude and 29 to 34 degrees north latitude and its area is 376,632 square kilometers and covers 23 percent of Iran's area.

### **Methods and Material**

In this article, it is tried to estimate the ELA in central Iran by Wright, cirque-floor altitude, Terminus-to-Head Altitude Ratio (of Wright and Porter), and altitude ratio's methods. Then to be introduced the best method to estimate the ELA. Glacial cirques, as the most important landforms of the Quaternary cold periods, are recognizable the form of the curve lines in topographic maps. The first step to estimating the ELA, identifying glacial evidence such as the cirque. To track the cirques of the area were used topographic maps with scale 1: 50000, the curve lines, the 30 \* 30 digital elevation model, and the ARC GIS and Global mapper software. Accordingly, more than 3300 cirques were identified in Central Iran. The mountainous terrains of central Iran, examining it as a geomorphic unit faced with the problem, therefore, in order to solve this problem, first the ELA was calculated in the water basins, which are located in this unit. The mountainous terrains in most parts of central Iran are northwestern - southeastern and sometimes western - eastern. The cirques were identified in different directions and the ELA was estimated for different slopes in this geomorphic unit.

## Results and Discussion

The geomorphic unit of central Iran is located in central parts of Iran. Quaternary glaciers of this unit were identified in the western and northwestern regions of the mountainous regions. Salt Lake, Gavkhoni, Abarghu-Sirjan, Siahkuh Desert, Duranjir Desert, Lut Desert are among the basins located in the geomorphic unit of Central Iran. From these basins, only mountainous terrains of Duranjir desert is western-eastern, and its cirques are formed in the north and south directions. In other basins mountainous terrains are northwestern-southeastern, and the cirques are formed in the northeastern and southwestern directions. In Wright's method, ELA is determined using determining the location of the cirques and passing 60% of the line (Entezari et al, 2015: 172). For Porter, the glacier fills the cirques when the ELA is not much higher than the average cirque-floor height. This method is used to obtain the Quaternary ELA. Using THAR approach, the equilibrium line altitude (ELA) and the THAR ratio are obtained. With the THAR method, the best result is obtained for small and symmetrical glaciers with the normal distribution of areas and heights. The THAR ratio is between zero and one. This method is also used to identify cirques, and if the THAR ratio is less than 0.46 or greater than 0.86, the identified figure is not considered a cirque (Yamani et al. 2013: 7). In this method, ELA is determined by means of the mean elevation range of the glacial tabular terminus and the highest ridge of the basin or region under study (Sharifi et al, 2016: 116).

## Conclusion

Investigation of cirques in different directions indicates that most glacier cirques are formed in the northeastern or southwestern slopes. The dispersion of the number of cirques indicates that Nesar slopes (Northeastern) of the geomorphic unit of Central Iran have better conditions for the formation of glacial cirques. Analysis of ELA was estimated by THAR applying the Wright method indicates, in terms of elevation and direction effects are more consistent with the environmental conditions. The ELA in this unit was estimated between 2743 meters and 3098 meters (with 360 meters height difference). The average elevation of ELA of central Iran was 2853 meters. Analysis of the results of the effect of the value of slope and height of the peak on the ELA indicates that the effect of the slope in the Nesar slopes and height of the peak in Nesar slopes is greater.

**Keywords:** Quaternary, Cirque, ELA, Terminus-to-Head Altitude Ratio, Central Iran.

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## **Identifying and Analyzing Affecting barriers on the Expansion of Environmental NGOs' Activities in Rural Areas (Case Study: Chia Green Society in Marivan County)**

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### **Introduction**

Given the fact that NGOs are rooted in local people and are effectively familiar with the needs and aspirations of local people, As the heart and the core of rural settlements And influential in the villages, as the completion of public sector efforts, provide the basis for the adoption and implementation of rural development programs, the most important of which is the protection of the environment. But these NGOs are always faced with a number of obstacles faced by their high and active presence in the field of development, especially environmental protection. In the meantime, the border town of Marivan in the province of Kurdistan as one of the regions of the country, which has virgin nature, has a large number of villages. In recent years, with the growth of border trade, the transformation of rural areas and agricultural lands prone to secondary urban homes, urban development and, ultimately, poverty and villagers' ignorance, the natural environment of villages in the area has been damaged a lot. Regarding the principle that the solution to any problem and failure in the first place, requires accurate identification of the status quo and the causes and obstacles that affect the incidence of deficiencies and weaknesses. The present study was initially aimed at identifying the causes and obstacles that led to the lack of influence and effective influence of the Chia People's Society in the villages of Marivan county, In the future, adopting practical solutions tailored to the current situation in order to broadly influence the effectiveness of the organization's activities in protecting the environment in the villages of Marivan county. In order to accomplish this, the research questions were based on the main and the Sub-question main questions as follows:

- What are the most important barriers affecting the development and effectiveness of the activities of the Chia Environmental Society in protecting the environment of the villages of Marivan? (The main question)

Among the most important obstacles identified, which has the greatest impact as a barrier on the current status of the Chia Association in the environmental field of the villages of Marivan County? (Sub-question)

### **Methods and Material**

Current applied research is a combination of both quantitative and qualitative methods. To collect data in the theoretical part of the documentary studies and in the practical stage in the qualitative

section, semi-structured interviews with local informants, the main members of the Chia Association and the rural area experts of the region were used. The basis for the end of the interviews was to reach theoretical saturation. The achievement of theoretical saturation was also achieved by interviewing 23 people. Then the fundamental theory technique was used to analyze the interviews. Subsequently, in the quantitative section, the indices and extracted variables (barriers and problems) were formulated in a five-choice Likert scale questionnaire, and among the 50 elected members of the Chia Association, local informants and rural experts of the area was distributed. In order to select the interviewees, snowball inertial sampling was used. But in the distribution of questionnaires among locals using the Cocran formula, 300 heads of household were selected as sample size and then, in order to distribute questionnaires according to the share of each village in the total number of households, the number of questionnaires allocated to each rural district was determined.

### **Results and Discussion**

In order to identify the barriers and problems of the progression of desirable performance and the development of community environmental activities in villages, based on the theory of fundamental theory, interviews were coded in three stages: open, axial and selective. This resulted in the formation of four categories of undesirable functions of state institutions and weaknesses in the laws, the low level of local population capacities, management weaknesses and community planning, and barriers and financial constraints, which are divided into two main categories of failures External organization (external environment) and internal organizational deficiencies (internal environment) were merged. In the next step, in order to confirm and generalize the findings of the qualitative section, factor analysis was used. Finally, the three primary and main obstacles, which in total, explain the satisfactory amount of 53% of the changes and the cumulative variance, Basis of action and analysis.

**First barrier:** This barrier with a special value of 7.25 and an explanation of 21.32% of the variances contains 11 indicators. Given the aggregate indicators, of which 8 indicators related to low level of local population capacity, this barrier can be called the lack of capacity development of the local community.

**Second barrier:** This obstacle with a specific value of 6.57 and an explanation of 19.85% of the variances contains 13 indicators. According to aggregate indicators, among which 9 indicators related to managerial weaknesses, planning and oversight in the Chia Forum, and 3 indicators point to financial barriers, this obstacle can be considered as managerial failure, Poor planning and lack of financial resources.

**Third obstacle:** This barrier has 7 indicators with a specific value of 4.08 and 12.1% of variances. According to aggregate indicators, among which 5 indicators related to inadequate performance status and development planning of state institutions, this barrier can be considered as weaknesses and failures of government institutions.

### **Conclusion**

The findings of the fundamental theory technique in the qualitative section and their summarization by factor analysis in the quantitative section showed that the most important obstacles to the desired performance and the expansion of the activities of the Chia Environmental Society in the rural areas of Marivan, Three factors are the lack of capacity development of the local community, management

weaknesses, planning and funding constraints in the Chia Forum, and inappropriate status of the performance and development planning of state institutions. The results show that the barriers to optimal performance and the expansion of the organization's activities in rural areas of the Marivan county in terms of two dimensions of the organization that indicate the sustainability and professionalism, and external barriers that indicate capacity status Social and cultural of local people and the functioning of state institutions. Indeed, in accordance with the current view of the organization's management and performance, the system's vision, efficiency and effectiveness of each organization in the group of favorable conditions within the organization and the external environment affecting it, and the utility of the two fields that can be achieved to provide organizational goals in a sustainable manner. Accordingly, the Chia Environmental NGO, due to the need to communicate with its members from the internal dimension and the need for interaction with other organizations related to environmental issues from the external dimension, should be able to carry out internal coordination due to the diversity and multiplicity of members Monitor the issues and challenges external and provide appropriate responses to it.

**Keywords:** Non-Governmental institutions, Chia environmental society, Marivan rural areas.

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**Potential Analysis of Apiculture Development Using Analytical Hierarchy Process  
Case Study: Tamin Rangelands – Mirjaveh City**

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**Introduction**

Exploitation of natural ecosystems has been a long history and human has always seeking to sustainable utilization and productivity enhancement of these ecosystems (Shirvani et al., 2005). Rangeland ecosystems have not been the exception and the excessive use and ignoring the suitability assessment of these resources for each specific utilization has reduced the ecological potential of these resources (Salehi et al., 2017). In order to develop apiculture, some features such as vegetation characteristics (length and time of flowering, percentage of plants composition and their attractiveness), environmental factors (average temperature during apiculture, relative humidity, prevailing wind speed and network accessibility criteria) and water resource modulus (distance from water resources, hydrological forms and water resources) have particular importance. Thus, considering these factors plays a special role in determining the rangeland suitability to development of apiculture (Amiri and Arzani, 2012; Sour et al., 2012; Yari et al., 2016). Using multiple decision-making methods such as hierarchical analysis can be a good option for solving these complicated issues, due to the multiplicity of effective criteria in assessing the suitability of an area to apiculture development, as well as, the different effects of these criteria in various regions (Ghodsi pour, 2013). Based on mentioned points, one of the requirements of sustainable exploitation prerequisite and prevention of the rangeland degradation is identification of the most suitable area of rangelands in order to apiculture development plans. In this research, apiculture potential of the Tamin rangelands was evaluated in order to develop of apiculture through AHP method.

**Methods and Material**

Tamin rangelands are located at 100 km of southwest Mirjaveh city (area of 5572 hectares). This area extends from 28° 04' N, 61° 06' E to 28° 42' N, 61° 41'E. In order to suitability evaluation, apiculture suitability model was determined through integrating vegetation criteria using the proposed FAO

method and geographic information system, then the apiculture suitability of different region was determined. Vegetation sampling carried out using randomized - systematic method through establishment of three transect with 300 m length. Suitability of different vegetation types (as a land unit) was assessed using Analytical Hierarchy process and their priority was determined for apiculture after determination of the effective criteria weight in each model through paired comparison.

### **Results and Discussion**

Based on results, weight of vegetation cover factor (0.62) was more than environmental factors (0.37) and water resource availability (0.014). Overall comparison of effective criteria sets showed that *Artemisia sieberi* - *Astragalus eriastylus* (total weight= 0.34) and *Astragalus eriastylus* - *Cousinia stocksii* (total weight=0.055) have the highest and lowest priority in terms of apiculture, respectively. Also, paired comparison of the sub criteria showed that, in the apiculture model, the substrate of the plants related to the vegetation criterion, sub-criteria of the degree of heat and relative humidity associated to environmental factors criterion and sub-criterion of water quality related to water resources index have the highest weight (52.50, 0.26 and 0.83 weight respectively). Vegetation characteristics such as the diversity and richness of plant species (nectarous and pollen plants) are one of the most important vegetation-related characteristics that play an important role in determining suitability area for the apiculture development (Safaeian, 2005; Shaemi, 2000). In general, 1820.9 hectares (equivalent to 32.68 %) in the S1' category (high suitability), 2630 hectares (equivalent to 47.2 %) in the S2' category with limited constraints or moderate suitability (770.05 hectares (equivalent to 13.82 %t ) in the S3 category with the high limitation and 351 hectares (equivalent to 6.3%) in the non-suitable (N) was placed for the apiculture' development from the entire of the study area (5572 ha). The inconsistency coefficient of paired comparison of plant species also confirms the validity of the results.

### **Conclusion**

According to the results of the present study, due to the high variety of pollen and nectarous species, as well as, low limitation of other effective factors, the considerable area of Tamin rangelands (approximately 80%) have high potential for development of apiculture. Hence, planning to develop of apiculture in Tamin rangelands (especially in the eastern and southern parts) is necessary, since could provide new job opportunities and improving farmers livelihood, which can lead to the sustainable utilization of these rangelands, eventually. Apiculture development can guarantee the ecological health of these valuable resources in addition to creating a stable livelihood for the rural community in this region. Although, it should be noted that achieving this, in addition to taking into account the ecological potential of the region, requires interacting and constructive cooperation between managers and farmers through extension programs and continuous monitoring of the vegetation situation in the rangeland's region. In addition to the above mentioned, it should be noted that most of the activities related to the apiculture, can be done in the spring and summer (from May to September) according to the weather condition of study area. Obviously, successful implementation of such plans, in addition to reducing pressure on the rangelands through providing job opportunity for local communities and increasing their income, can provide sustainable

utilization of natural resources. Therefore, in order to apiculture development, after suitability assessment and determining the spatial priority of Tamin rangelands, carrying out of economic justification research is inevitable.

**Keywords:** Sustainable utilization, Apiculture suitability model, FAO method, Analytical Hierarchy Process, Tamin rangelands.

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