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## Classifying and Evaluating the Regional Development of Golestan Province, Using TOPSIS Model

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### Abstract

Regarding the necessity of regional integrated development, analyzing the dependency of human habitats in region-level, is the main duty in every planning. Optimal distribution of the population and distribution of socio – economic development procedure, is the ultimate goal of analyzing regional systems. Therefore, deprivation and inequality reduction is an important matter, due to its economic and social consequences and needs proper attention. In fact, to achieve comprehensive development and progress in the future; requires the recognition of different areas and regions. Using quantitative methods and criteria in order to classify the habitats in spatial system of regions, in one hand leads to identifying the inequality level of habitat points, and on the other hand is a criterion to try for reducing and eliminating the inequality between them. The purpose of this paper is to identify the development level in the cities of Golestan province. By investigating and analyzing the quantitative criteria in three economic, social and services categories; which are extracted from the up to date statistics of statistical almanacs and by making use of TOPSIS model which is considered to be one of the multi-criteria methods of evaluation, it was concluded that due to the used criteria, there's a large gap between the cities of Golestan province and an unequal development between them; the western cities, located between the capital city and Mazandaran province, are relatively better developed. Therefore, the cities of Gorgan, Gonbad Kavous and Maraveh Tappeh have the first three ranks, respectively and two cities of Maraveh Tappeh and Ghalish are among the most deprived cities and are placed in the bottom of the ranking.



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## INTRODUCTION

Investigating the socio-economic criteria is one of the important elements of development. Development, a gradual process in humans' progression, includes performing certain tasks to achieve physical growth and social perfection through time (Riddell, 2004). Generally, development is a comprehensive process including economic, social, cultural and political activities and its purpose is continuous improvement of people's lives; and performance, freedom, participation and fair distribution of interests are its fundamental elements (Zarrabi, 2010). Since development hasn't occurred equally in different times and places among countries, the regional inequalities are high in these countries, using every scale; and regarding different criteria some special regions have superior situation, comparing to other regions (Molayi, 2008). Developing countries, more than any other time, need planning and identifying their national resources in order to strengthen their economic infrastructures and become independent and remove their current imbalances. Certainly, in planning for national growth and development in the future, identifying the position and situation of regions is one of the most important factors in achieving the development. Our country, as a result of having heterogeneous situation and diverse natural resources, needs regional planning in all provinces, that of course paying attention to development criteria according to each province's capabilities is one of the main issues that must be considered in order to achieve success in planning (Akbari and Moradi, 2008). In Iran, inequality and lack of balance in optimal distribution of facilities due to past unsystematic policies for industrial and services topology and growth poles and the procedure of centralism in dominant regional cities and lack of spatial balance between national, regional and local levels is one of the main issues resulted from different factors affected by the events which rule economic, social and political structures. The consequence has been non-optimal distribution of facilities, well-being and wealth, destruction of regional equalities, widened gap of development and loss of economic and social justice and regional duality. Hence, studying economic, social, cultural and political inequalities among groups, classes, nations and also

geographical regions or national divisions is one of the essential or basic duties for planning and reforming in order to provide economic growth and social justice. Concerning that social justice and deprivation eradication has been two of the most important objectives of Islamic Republic of Iran and one of its important mottos; removing regional imbalances is absolutely essential. Paying attention to development of different regions and balance between regions regarding benefiting from facilities and other economic and social criteria can influence macro program of resource allocation and organize the framework of regional policy-making to achieve qualitative and quantitative objectives (Jamali et al, 2008). Therefore, it seems that in order to better understand the differences, regional development and allocating credits and resources between different regions, identifying each city's situation and classifying the levels of benefiting from development is essential.

Regarding the necessity of regional integrated development, analyzing the dependency of human habitats in regional level is considered as the basis for every work of planning. Optimal distribution of population and distributing the procedure of socio-economic development is the ultimate purpose of analyzing regional systems; hence, inequality and deprivation reduction is considered to be an important issue due to its economic and political consequences. In fact, achieving success and comprehensive development in the future, requires identifying the situation of different regions and areas. Using quantitative methods and criteria in order to classify the habitats in spatial system of regions, in one hand leads to identifying the inequality level of habitat points, and on the other hand is a criterion to try for reducing and eliminating the inequality between them. In developing countries, most plans are centralized and have been made by the government and less attention has given to needs and capabilities of the regions. Experiment has shown that in these countries the optimal allocation of resources doesn't occur and generally the allocated resources have little relationship with the needs and capabilities and the gap and duality regions increase and finally this imbalance will bring about multiple and irrecoverable problems in less benefited areas. In Golestan province, there are serious issues and

challenges about development of different cities. It seems that resources allocation in the cities of this province has a significant difference, such that the capital city and the cities between the capital and Mazandran province are generally different from other cities. Also it can be noted that scientific and rational understanding of developmental differences among the cities of this province and also the quantitative distance from each other, help them about better planning for developing budget and facilities.

The objective of the present research is to calculate and evaluate development criteria of the cities of Golestan province based on the last statistics of population and housing almanac and also to quantify the developmental differences among the cities of this province according to the most up to date information of this province's statistical almanacs.

**Materials and Methods**

Regarding the elements under study and the nature of the subject, the method of this research is "analytical – descriptive". The purpose of this research is practical and in the literature section, the methods of document and library are used for data collection. In this research, combining two methods of AHP<sup>1</sup> and TOPSIS<sup>2</sup>, a proper method for choosing the ideal location, using the systems of geographical information, is employed. In this regard, the optimal criteria for evaluating the development of the cities of Golestan province are included and compared in AHP model; then, the output of the AHP known model is used as the criteria weight in the TOPSIS model and finally the ArcGIS software is used in order to show the output of the model.

The strategy of moving toward stability must be based on enough data and information and proper knowledge. Therefore, considering information together with economic, social and environmental elements is needed. Such information is known as stability criteria. Stability criteria are effective meanings to identify the degree of stability of an area (Lee and HNG, 2007). Criteria used in this research are categorized in six groups: economic;

population; educational; cultural – religious; hygienic – therapeutic; and infrastructural which will be introduced in the analysis section.

**Introduction of the Case Study**

Golestan province is located from 35 degree and 47 min to 28 degree and 8 min of north latitude and from 53 degree and 30 min to 56 degree and 10 minutes of east longitude of Greenwich meridian. This province which is located in an area of 20437.7 square km; is limited from north to Turkmenistan, from south to Semnan province, from west to Mazandaran province, and from east to Khorasan province. The city of Gorgan (capital city of the province) is adjacent from north to Agh Ghala, from south to Semnan province, from east to Aliabad Katul and from west to Kordkoy Mill Radekan. Golestan province has an area of 20437.7 square km (1.3% of the country's total area). Most parts of this province have Caspian (Mediterranean) moderate climate but Gorgan flatland has semi-arid and hot climate because of being adjacent to Turkmenistan desert, being far away from the sea and decreased heights. Humid forests of northern range of Alborz reach Golestan and Minoodash forests from the north. Chaloyi Shah Kooch is one of the most important peaks of Golestan province which is 3750 meters high. Major winter pastures of the province are in Gorgan flatland and are located between Gorgan River and capital of Turkmenistan. Agriculture especially livestock play an important role in economy of the province. The major industry depends on agriculture, forest and handicrafts.(fig 1)

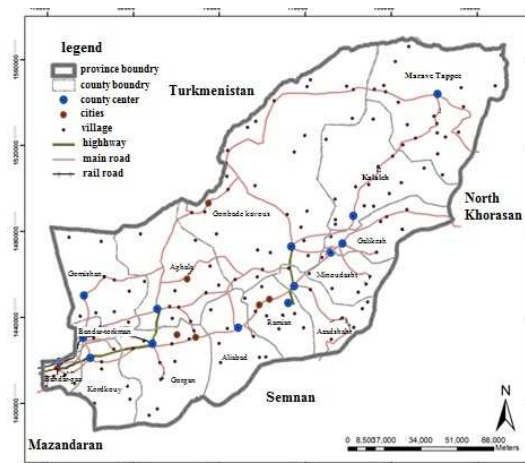


Fig 1. Geographical situation of Golestan Province

<sup>1</sup> Analytical Hierarchy Process

<sup>2</sup> Technique of Order-Preference by Similarity to Ideal Solution

**Using Methods  
TOPSIS Technique**

In this method which at first was used by Huang and Yung (Hwang and Yoon, 1981), the distance of an alternative  $A_i$  from the positive ideal point (the best position) and the negative ideal point (the worst position) is calculated. Such that, each alternative which is closer to the positive ideal point and at the same time is far away from the negative ideal point, will be preferred among other alternatives (Ertugrul, 2007). Using TOPSIS method includes the following 6 steps (Hepu, et al 2000):

Step 1: framing the decision-making matrix in order to classify, the ideal decision-making matrix can have a structure as the following matrix:

$$D = \begin{matrix} & F_1 & F_2 & \dots & F_n \\ \begin{matrix} A \\ A \\ \vdots \\ A_m \end{matrix} & \begin{bmatrix} f_{11} & f_{12} & \dots & f_{1n} \\ f_{21} & f_{22} & \dots & f_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ f_{m1} & f_{m2} & \dots & f_{mn} \end{bmatrix} \end{matrix}$$

In the above matrix,  $A_i$  represents the alternative  $i$ ,  $F$  indicates the  $j$ th feature and  $f$  represents the  $j$ th indicator feature of  $i$ th alternative.

Step 2: converting the decision-making matrix into the “normalized matrix” using the following equation:

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^m a_{kj}^2}}$$

Step 3: making “weighted normalized matrix” which derives from multiplying normalized matrix in its corresponding weights. The values of weighted normalized matrix are calculated through the following equation:

Step 4: this step includes determining the positive ideal alternative  $v^+$  and the negative ideal alternative  $v^-$  in each of the criteria:

In the above equations, the parameter  $J$  is associated with the criteria having a positive impact, and the parameter  $J'$  is associated with the criteria having a negative impact.

$$S_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2}$$

$$S_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^+)^2}$$

Step 6: calculating the relative similarity of  $A_i$  to the ideal alternative, as follows:

After taking the above steps, alternatives can be classified ascending or descending, based on the calculated values (khaliji, et al, 2014).

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^+}$$

**AHP Technique**

The AHP and its use of pairwise comparisons has inspired the creation of many other decision-making methods. Besides its wide acceptance, it also created some considerable criticism; both for theoretical and for practical reasons (Saaty, 1980) (Lin, 2007) (Boroushaki, 2008), (Saaty, 1980). The AHP method worked out by Thomas Saaty (1994) is presented in many papers as an effective tool to support the multi-attribute decision-making process. Interestingly, decision making in AHP involves the judge on the basis of the expert’s knowledge; however, it cannot reflect the exact thoughts due to the different opinions and decision making mode concepts (Kahraman, et al, 2003). One of the most significant problems with traditional AHP is that the decision makers use exact values or numbers to point out their opinions (Wang, et al, 2007). Therefore, AHP has always been criticized due to several factors including being far from reality, covering the all ranges of human thinking’s templates and the uncertainty and the lack of human knowledge (Deng, 1999). Developing the fuzzy sets theory (Bellman, et al, 1977) proposes more flexible methods and covers the above-mentioned traditional AHP difficulties (Klir, et al, 1995). In order to explain the significance coefficient of criteria and sub-criteria, we compare them two by two. The comparison basis in this regard is comparing the 9-quantity L Saaty table (table no.1), according to which and concerning the research purpose, the superiority of criterion  $i$  to criterion  $j$  is determined. So, all of the criteria are compared two by two (Hekmatnia, 2013).

The two by two comparisons are recorded in an  $n \times n$  matrix called “the binary comparison matrix of criteria”  $A = [a_{ij}]_{n \times n}$ . All the elements of this matrix are constant and concerning the principle of “adverse conditions”; in the process of hierarchical analysis, if the significance of  $i$  element comparing to  $j$  is  $k$ ; then, the significance of  $j$  element comparing to  $i$ , will be  $1/k$ . To compare the significance coefficient of criteria, the geometric mean method can be used. After calculating the



geometric mean, we normalize them by dividing geometric mean on the total geometric means (Hekmatnia, 2013)(Sarvar, et al, 2012).

Table 1. Comparison of 9-quantity L Saaty for binary comparison of alternatives

Description	Definition	Score (level of significance)
Two criteria have equal significance in the research	Equal significance	1
Experiment shows that i has more significance than j in the research	Slightly more significance	3
The significance of i is much more than j in the research	More significance	5
The significance of i is much more than j in the research	Much more significance	7
The much more significance of i comparing to j is definitely proven	Absolute significance	9

(Source: Hekmatnia, 2013)

**RESULTS AND DISSCUSION**

Implementing the Suggested Algorithm of Evaluating the Development investigating the accuracy of each spatial hypothesis requires practical implementation of the selected computational algorithm in order to test the hypothesis proposed during the preliminary process of research. In many cases, there are a set or sets of Unemployment rate, are classified as negative ideal criteria. (Table no.2)

Real data and their solutions for calculating the accuracy of research hypotheses.

1. Economic Criteria

In this research the economic criteria used for evaluating the level of regional development in Golestan province are 6 criteria as follows: 1. men’s employment rate; 2. women’s employment rate; 3. Men’s unemployment rate; 4. women’s unemployment rate; 5. active male population rate; 6. active female population rate. According to the kind of criteria for differentiating positive ideal criteria  $D_i^+$  from negative ideal criteria  $D_i^-$  it can be state that; from the above economic criteria, the first and the last two criteria (men’s employment rate, women’s employment rate, active male population rate, and active female population rate) Are classified as positive ideal criteria and the third and fourth criteria (men’s unemployment rate, women’s

The social criteria used for evaluating the level of regional development in Golestan province are the following 6 items: 1. total population (urban and rural); 2. The number of cities; 3. The number of inhabited villages; 4. The number of villages without inhabitants; 5. Urbanization rate; 6. Net Average guardianship. Similar to the previous section, in order to differentiate the positive ideal criteria from the negative ideal criteria, it can be stated that from among the above criteria, four items of total population (urban and rural), the number of cities, the number of inhabited villages and the urbanization rate, are classified in the group of positive ideal criteria and 2 criteria including villages without inhabitants and net average guardianship are classified as negative ideal criteria. (Table no.3)

1. Population Criteria

Table 2.values of selected economic indicators and ranking of counties in Golestan

criteria	men’s employment rate	women’s employment rate	men’s unemployment rate	women’s unemployment rate	active male population rate	active female population rate	TOPSIS score	TOPSIS orders
Azad Shahr	89.49	76.94	10.5	23.05	66.07	10.51	0.492	6
Aghala	84.89	85.97	15.10	14.02	71.33	7.56	0.539	4

Bandar Torkman	88.74	87.72	11.25	12.27	56.05	11.62	0.362	11
Bandar Gaz	92.73	89.8	7.26	10.19	69.03	17.21	0.275	12
Ramaian	81.26	73.02	18.73	26.97	56.33	9.73	0.49	7
Ali Abad	83.07	77.04	16.92	22.95	64.53	10.32	0.742	2
Kordkouy	90.08	83.32	9.91	16.67	67.74	9.97	0.37	10
Kalaleh	85.95	76.89	14.04	13.2	69.62	6.7	0.474	8
Galikesh	91.08	81.07	8.91	12.92	52.68	11.99	0.268	13
Gomishan	84.75	88.03	15.24	11.96	64.88	7.55	0.512	5
Maraveh Tapeh	93.59	92.54	6.43	7.45	71.76	8.08	0.184	14
Gorgan	89.95	77.34	10.04	22.65	63.26	15.21	0.778	1
Gonbade Kavoods	88.89	84.74	11.01	15.25	66.47	10.97	0.564	3
Minou Dasht	88.56	62.74	11.43	25.37	67.13	12.33	0.397	9
weight of criteria	0.169	0.226	0.153	0.122	0.077	0.169	-	-

Table 3. Values of selected population indicators and ranking of counties in Golestan

criteria county	net average guardianship	urbanization rate	the number of villages without inhabitants	the number of inhabited villages	the number of cities	total population	TOPSIS score	TOPSIS orders
Azad Shahr	2.6	54.89	53	1	3	91767	0.278	6
Aghala	2.8	30.73	82	1	2	124185	0.251	8
Bandar Torkman	2.6	66.94	57	0	1	72803	0.178	10
Bandar Gaz	1.9	55.89	25	0	2	46315	0.149	13
Ramaian	3.1	36.63	59	2	3	85324	0.303	5
Ali Abad	2.9	48.47	76	1	2	132757	0.271	7
Kordkouy	2.3	54.44	35	1	1	70244	0.169	12
Kalaleh	2.8	25.3	205	4	1	110473	0.464	3
Galikesh	2.4	34.73	61	0	1	59975	0.107	14
Gomishan	3	52.3	31	0	2	63447	0.174	11
Maraveh Tapeh	2.5	14.16	100	2	1	55821	0.357	4
Gorgan	2.4	74.38	97	2	3	462455	0.693	1
Gonbade Kavoods	2.6	45.06	164	3	2	325789	0.633	2
Minou Dasht	2.5	37.63	124	1	1	75659	0.236	9
weight of criteria	0.133	0.159	0.156	0.156	0.22	0.176	-	-

2. Educational Criteria

Educational criteria are the third group of the applied criteria. The educational criteria used for evaluating the level of regional development in Golestan province include 7 items: 1. Men's literacy rate; 2. women's literacy rate; 3. the number of special schools; 4. the number of public

and private pre-elementary schools; 5. the number of public and private elementary schools; 6. The number of public and private secondary schools; 7. the number of public and private high schools. (Table no.4)

Table 4. Values of selected educational indicators and ranking of counties in Golestan

criteria county	the number of high schools	the number of secondary schools	the number of elementary schools	the number of pre- elementar y schools	the number of special schools	Women's literacy rate	Men's literacy rate	TOPSIS score	TOPSIS orders
Azad Shahr	30	40	67	60	2	76.39	88.51	0.167	6
Aghala	34	48	87	87	4	72.5	75	0.24	5
Bandar Torkman	15	27	42	31	2	77.97	92.03	0.109	10
Bandar Gaz	18	20	35	27	2	78.24	87.88	0.091	14
Ramaian	22	38	68	31	2	72.45	83.26	0.112	9
Ali Abad	37	52	92	74	4	76.5	86.56	0.25	4
Kordkouy	27	27	40	21	2	77.17	86.19	0.106	11
Kalaleh	34	62	110	48	4	76.6	86.8	0.251	3
Galikesh	19	32	60	23	2	75.77	85.79	0.099	13

Gomishan	19	29	53	45	4	74.14	9064	0.153	8
Maraveh Tapeh	12	24	85	31	1	71.17	54.84	0.105	12
Gorgan	103	143	195	153	20	83.92	88.85	0.932	1
Gonbade Kavoods	83	121	231	119	7	79.16	89.05	0.584	2
Minou Dasht	23	27	79	33	4	75.74	83.45	0.155	7
weight of criteria	0.109	0.094	0.106	0.081	0.116	0.231	0.263	-	-

### 3. Cultural – Religious Criteria

The group of selected cultural-religious criteria in this research includes: 1. the number of theaters; 2. The number of printery; 3. the number of libraries; 4. the number of institutions for intellectual development of children and teenagers; 5. holy shrines; 6. the number of mosques. (Table no.5)

### 4. Hygienic – Therapeutic Criteria

Hygienic – Therapeutic criteria are another group applied in the present research that are used for evaluating the level of regional development in Golestan province and since hygienic – therapeutic criteria are one of the main elements, the number of their items are more than others. These hygienic – therapeutic criteria are comprised of 11 items including: 1. the number of beds available in health institutions (hospital, maternity hospital, and

sanitarium); 2. Health centers (health bases, health centers, clinic and polyclinic); 3. The number of circadian clinics; 4. The number of active rural health centers; 5. The number of laboratories; 6. The number of pharmacies; 7. The number of radiography centers; 8. The number of rehabilitation centers; 9. The number of active general practitioners; 10. The number of active medical specialists; 11. The number of clinics for family health and regulation. (Table no.6)

Table 5. Values of selected cultural–religious criteria indicators and ranking of counties in Golestan

criteria / county	the number of mosques	holy shrines	the number of institutions for children	the number of libraries	the number of printery	the number of theaters	TOPSIS score	TOPSIS orders
Azad Shahr	98	6	1	1	3	1	0.227	9
Aghala	216	6	1	3	6	1	0.28	6
Bandar Torkman	63	2	1	1	4	1	0.215	10
Bandar Gaz	33	2	0	2	3	1	0.194	11
Ramaian	124	11	2	6	2	1	0.36	4
Ali Abad	115	11	0	4	9	2	0.388	3
Kordkouy	58	12	0	2	3	1	0.231	8
Kalaleh	272	9	1	1	5	1	0.278	7
Galikesh	44	1	0	2	2	1	0.191	12
Gomishan	95	0	1	2	1	0	0.119	13
Maraveh Tapeh	6	5	1	1	1	0	0.109	14
Gorgan	273	38	4	5	50	2	0.838	1
Gonbade Kavoods	560	4	2	6	14	1	0.464	2
Minou Dasht	189	17	1	1	7	1	0.304	5
weight of criteria	0.126	0.145	0.152	0.178	0.165	0.235	-	-

Table 6. Values of selected hygienic – therapeutic criteria indicators and ranking of counties in Golestan

county / criteria	Azad Shahr	Aghala	Bandar Torkman	Bandar Gaz	Ramaian	Ali Abad	Kordkouy	weight of criteria
the number of beds in health institutions	90	101	105	65	19	116	131	0.103
health centers	9	15	6	8	8	18	10	0.102
the number of circadian clinics	3	2	1	3	1	6	1	0.109
the number of active rural health centers	31	56	15	19	40	48	20	0.071
the number of laboratories	8	8	5	8	4	11	8	0.09
the number of pharmacies	8	8	9	6	6	16	9	0.087
the number of radiography centers	1	2	2	1	1	2	1	0.083
the number of rehabilitation centers	3	4	6	2	0	4	4	0.071

the number of general practitioners	35	33	21	37	25	40	30	0.103
The number of medical specialists	0	23	22	6	2	19	32	0.115
the number of clinics for family health and regulation	39	68	19	24	48	59	26	0.7
TOPSIS score	0.096	0.156	0.1	0.084	0.073	0.197	0.135	*
TOPSIS orders	9	5	8	10	11	3	6	*
County	Kalaleh	Galikesh	Gomishan	Maraveh Tapeh	Gorgan	Gonbade Kavoods	Minou Dasht	
the number of beds in health institutions	88	53	49	37	882	527	62	
health centers	11	3	7	5	48	34	14	
the number of circadian clinics	1	1	2	1	23	7	3	
the number of active rural health centers	51	13	17	33	81	110	74	
the number of laboratories	4	4	8	4	44	25	7	
the number of pharmacies	6	3	1	5	61	32	10	
the number of radiography centers	2	1	0	0	21	12	1	
the number of rehabilitation centers	5	0	0	0	49	30	3	
the number of general practitioners	28	23	10	17	214	55	35	
The number of medical specialists	21	2	0	0	109	87	13	
the number of clinics for family health and regulation	61	30	24	38	104	137	87	
TOPSIS score	0.128	0.035	0.043	0.047	0.941	0.524	0.163	
TOPSIS orders	7	14	13	12	1	2	4	

### 5. Infrastructural Criteria

The infrastructural criteria are the last group of the criteria used in this research for evaluating the level of regional development in Golestan province. The infrastructural criteria include: 1. The number of cities having gas; 2. The number of villages having gas; 3. The number of piped water consumers in urban areas; 4. The number of sewage splits in urban areas; 5. The number of electricity consumers; 6. The number of villages having electricity; 7. Total length of roads covered by the Administration of Road and Transportation; 8. Total length of rural roads covered by the Administration of Road and Transportation; 9. The number of transportation cooperatives; 10. The number of postal service offices; 11. The number of rural areas having telephone connection. (Table no.7)

After classifying the cities of Golestan province regarding the level of benefiting, the following map is achieved about the selected criteria in five groups of very deprived; deprived; average; benefiting; very benefiting and here we can spatially investigate the level of benefiting. (Map no.2)

#### • Total Weighted Criteria Using the Weights Derived From Paired Comparisons

Although the linear combination of criteria using the mean index, to some extent indicated the level of cities' benefiting from the selected criteria in Golestan province; it must be noted that all the mentioned criteria don't have equal importance and significance and linear combination of criteria through the statistical index of computational mean

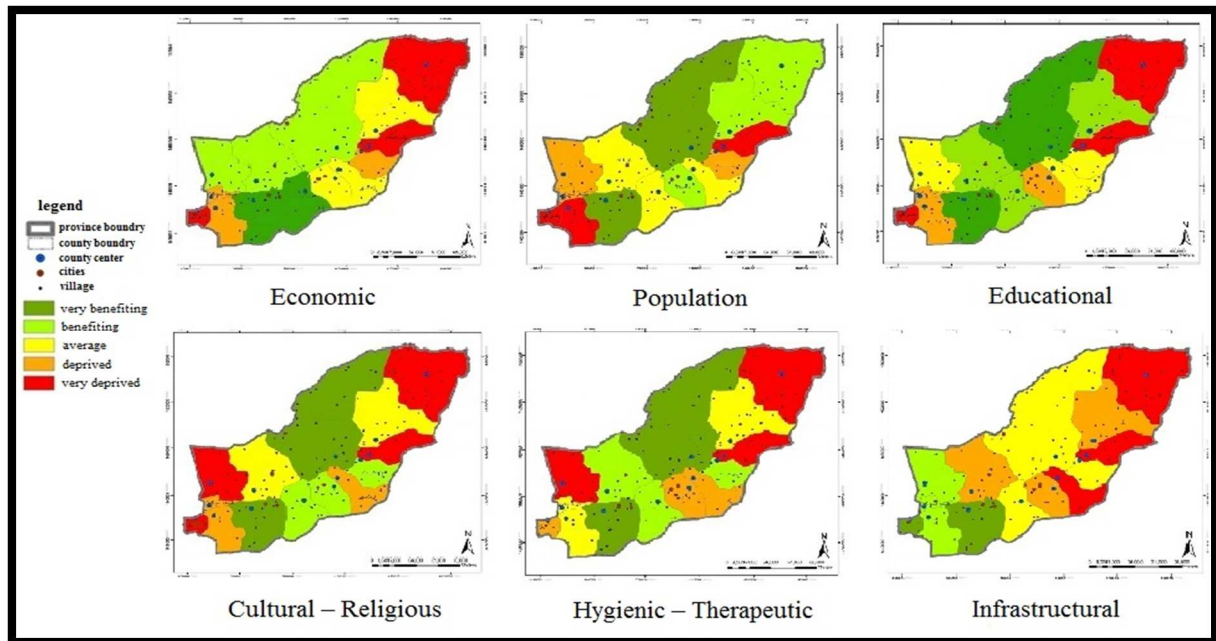
is not the best alternative to evaluate the level of benefiting from the selected criteria in the province. Therefore, the paired comparison method is used in order to optimally combine the criteria as a development criterion. The weights of the selected regional development criteria are shown in table 8. Considering the table 8, it can be found that the city of Gorgan has the highest level of final development criterion, comparing to values of other cities in the province, and the lowest level of development belongs to Maraveh Tappeh. Hence, the graph 1 presents the levels of final development criteria for the cities of Golestan province. Finally, comparing the previous section with the classification of mean benefiting level of the cities in Golestan province in five groups of very deprived, deprived, average, benefiting, very benefiting and representing the results as a map similar to the maps of each criterion; the spatial procedure of benefiting from the development criteria in the province may be investigated. It can be inferred from the map that the highest level of benefiting from the development criteria belongs to the southwest border and the city of Gonbad Kavoods. The eastern borders are not in good condition. Although in previous analysis the city of Bandar Gaz was in a low rank; its rank has elevated in the final analysis and it's due to benefiting from proper infrastructural facilities; and by making rational use of them this city's rank will be promoted in other criteria.

Table 7. Values of selected infrastructural criteria indicators and ranking of counties in Golestan

county criteria	Azad Shahr	Aghala	Bandar Torkman	Bandar Gaz	Ramaian	Ali Abad	Kordkouy	weight of criteria
the number of cities having	3	2	1	2	3	2	1	0.118



gas								
the number of villages having gas	26	48	22	24	40	50	26	0.093
the number of piped water consumers in urban areas	12146	727	12831	6235	3560	1608	1035	0.128
the number of sewage splits in urban areas	0	0	3236	4140	0	0	2962	0.091
the number of electricity consumers	24981	28085	33524	1519924	21920	39735	24143	0.096
the number of villages having electricity	53	82	57	25	59	56	33	0.097
total length of roads covered ...	104	153	72	70	7	92	48	0.073
total length of rural roads covered ...	118	183	72	123	220	279	178	0.061
the number of transportation cooperatives	4	3	8	5	1	7	4	0.079
the number of postal service offices	51	73	44	29	42	58	21	0.083
the number of rural areas having telephone connection	53	82	57	25	59	76	35	0.078
TOPSIS score	0.076	0.201	0.445	0.544	0.154	0.211	0.42	*
TOPSIS orders	13	10	3	2	11	8	4	*
County	Kalaleh	Galikes	Gomisha	Maraveh	Gorgan	Gonbade	Minou	
	h	h	n	Tapeh		Kavoos	Dasht	
the number of cities having gas	1	1	2	1	3	2	2	
the number of villages having gas	48	35	22	0	87	47	81	
the number of piped water consumers in urban areas	10583	6474	3830	1939	102732	48184	9166	
the number of sewage splits in urban areas	0	0	0	0	5402	0	0	
the number of electricity consumers	36333	4663	2562	2248	154816	87683	36449	
the number of villages having electricity	202	61	31	99	97	163	122	
total length of roads covered ...	47	29	42	98	102	302	109	
total length of rural roads covered ...	394	112	112	444	327	528	397	
the number of transportation cooperatives	8	4	4	23	35	60	6	
the number of postal service offices	66	34	34	57	135	122	89	
the number of rural areas having telephone connection	205	31	31	100	96	197	124	
TOPSIS score	0.21	0.119	0.375	0.057	0.875	0.229	0.354	
TOPSIS orders	9	12	45	14	1	7	6	



Map 2: Spatial representation of selected indicators in Golestan province (source: authors)

Table 8. values of TOPSIS scores for each criteria of counties in Golestan

TOPSIS score / county	final development criterion	TOPSIS score of infrastructural criteria	TOPSIS score of hygienic-therapeutic criteria	TOPSIS score of cultural-religious criteria	TOPSIS score of educational criteria	TOPSIS score of population criteria	TOPSIS score of economic criteria
Azad Shahr	0.239	0.076	0.096	0.227	0.167	0.278	0.492
Aghala	0.292	0.0201	0.156	0.28	0.24	0.251	0.539
Bandar Torkman	0.227	0.445	0.1	0.215	0.109	0.178	0.362
Bandar Gaz	0.395	0.544	0.084	0.194	0.091	0.149	0.275
Ramaian	0.259	0.154	0.073	0.366	0.112	0.303	0.49
Ali Abad	0.385	0.211	0.197	0.388	0.25	0.271	0.742
Kordkouy	0.492	0.42	0.135	0.231	0.106	0.169	0.37
Kalaleh	0.3	0.21	0.125	0.278	0.251	0.464	0.474
Galikesh	0.145	0.119	0.035	0.191	0.99	0.107	0.368
Gomishan	0.288	0.375	0.043	0.119	0.153	0.174	0.512
Maraveh Tapeh	0.138	0.057	0.047	0.109	0.105	0.357	0.184
Gorgan	0.845	0.845	0.941	0.838	0.932	0.693	0.778
Gonbade Kavos	0.475	0.229	0.524	0.464	0.584	0.623	0.564
Minou Dasht	0.294	0.354	0.163	0.304	0.155	0.236	0.397
weight of criteria	0.264	0.242	0.242	0.057	0.61	0.097	0.301

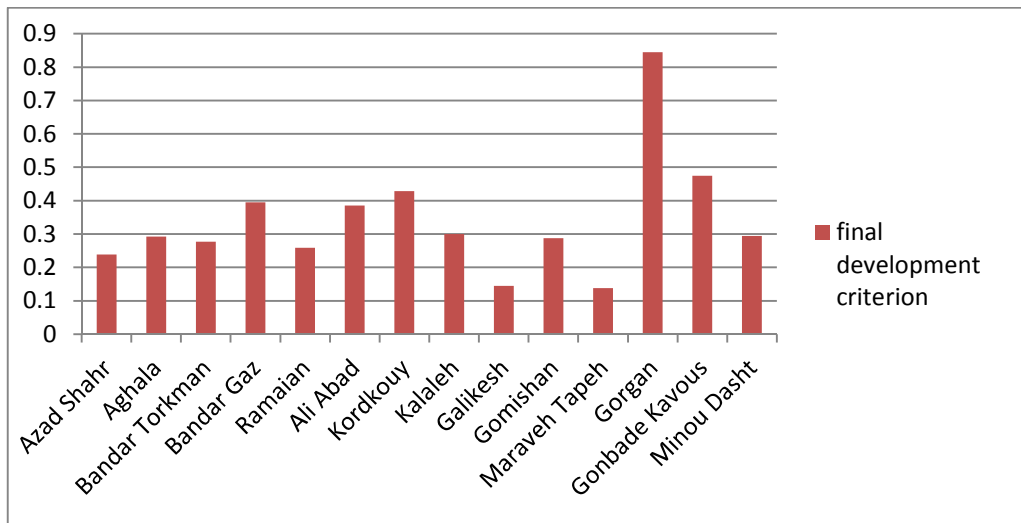


Fig2. Values of final development of counties in Golestan province



## CONCLUSION

The regional development is a combination of sustainable development that can bring about the required social development for meeting human needs and spreading social justice (Holden et al, 2008). Since, the elimination of regional inequalities is the main purpose of planners, the results of this research enables them to apply the required reforms in policies and determining the investment priorities in order to remove the development imbalances among the cities. In the present research, 6 groups of population, economic, educational, cultural – religious, hygienic-therapeutic and infrastructural criteria in Golestan province are investigated individually and totally, based on which the development level of each city according to each criterion can be identified. The final map (number 4) totally shows the level of development. The west side of the province is in good situation regarding to infrastructural facilities, due to adjacency to Mazandaran province and being located in the northeast to northwest corridor. By going away from the political center of the province toward east, the level of benefiting from development criteria has decreased and deprived areas increase. According to map 3, the development axis in the west side of the province can be identified; which includes the cities of Gorgan, Kordkoy, Bandar Gaz and Bandar Turkmen.

## Suggestions

To realize the regional sustainable development it is essential that at first, every development plan is based on mutual understanding about local needs and resources. Second; every act of development must be sum of the complete top-bottom and bottom-up planning, third; stability is available when it depends on participation of all people (Karimi and Atri, 2003; p334). Therefore, in order to regionally develop in the province, the following points are suggested:

- Studying and identifying the development opportunities in each area (relative advantages)
- Introducing the opportunities to local private sector in order for investment
- Promoting public participation in growth and development, especially

through supporting cooperatives with bank facilities and legally

- Transferring the efficient knowledge and experience from developed to deprived areas
- Eliminating infrastructural inequalities in regions as the main basis of development
- Trying to adapt all activities with the principles of sustainable development.

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