Ranking for service- giving of rural facilities by means of TOPSIS and SAW methods (Case study: Khodabandeh County)

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Abstract: Rural organizing and leveling of service providing project is set up as a leading supply in planning for rural areas and aims to improve the conditions and the performance of rural areas in line with their potentials and capabilities, however, one of the fundamental problems in rural community has been the lack of a strategic plan for the organization of rural space and centers, but in this regard, leveling rural services and facilities has been able to eliminate the problem of lack of planning for rural areas and bring about a renewal of rural areas towards their improvement. The present study have been conducted using library research method and statistics from 2006 to 2011, in line with leveling service providing of rural facilities in Khodabande County, with a study population of 219 villages in the study area, and after necessary measures, all data have been analyzed in SPSS software and studied using Topsis and SAW. In the meantime, the results of field research and obtained data suggested that the villages of the county based on the population had different facilities and, the level of service providing was a function of the population indices in these villages, and villages with large populations showed a positive performance in service providing.

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Introduction and subject interpretation:

The importance of measuring rurality may be revealed according to nature and homogeneity of rural zones in national planning and management system. the importance of ranking will be identified in planning when the differences in development of several areas and regions are characterized in planning at macroeconomic level (Asayesh; 2008:43) since paying attention to typology of villages in macro planning may reduce inequality of development level among various zones at geographic space throughout the country and this is assumed as one of the fundamental objectives for policymaking and planning sustainable development to establish spatial and developmental balance and survey (Mardia et al, 1982,p).

Hence, the rural areas may not be considered identically, but they are even more heterogeneous than urban zones. Thus, they possess some properties, which may vary in a certain village and or among the countries. In many studies, human's habitats have been so far classified into two urban and rural categories (Zarabi; 2011:79). According to the territorial approach as well as urban- rural continuum attitude, the existing habitats are closely related together within a certain domain and zone and they could not be separated from each other by Bolin Process (black and white, zero and one, and town and village), but there is a range of habitats at the both ends of them some fully urban and fully- rural communities exist. Hence, moving at both end of this range that indicates rural and urban degree as

higher or lower may be assumed as an appropriate criterion for classification of habitats (Jomehpour; 2005:63).

In fact, urban and rural communities could not be considered as some separate isles, but they are interwoven together and with reliance on fuzzy approach and an attitudinal spectrum, addressing urban- rural continuum may be appropriate for planning and administration of human's habitats in the field of geographic space (Eftekhari; 2001:96). For this reason, today several rural-orientation and urban- tendency approaches have been presented based on which each of the existing habitats with the domain of administrative and political divisions is placed at various degrees of urban and rural lifestyles. Therefore, with respect to the aforesaid subjects, the objectives of the present investigation include study on concept and nature of ranking the villages and their measurement and recognition of the effective factors and parameters on them in the studied zone where in line with this subject we have examined the ranking of villages based on the

employed 9 parameters in TOPSUS and SAW techniques including (population in 2006, field of influence, cultural and sport and educational parameters, water and electricity and gas services (utilities),healthcare and medical, telecommunication and communication, political and administrative, commercial, and services indicators) as well as fair distribution of services and facilities among the aforesaid villages in the given town with respect to their rank and position within the habitat hierarchy.

Research history:

In an investigation under title of 'Ranking of touristic centers in Isfahan' which was conducted by Zangiabadi et al have recognized the internal tourism market in Isfahan and identified the problems which the tourists encountered and finally they determined the given attributes and problems and expressed some strategies to develop those zones with susceptibility for tourism by means of TOPSIS technique.

In the investigatory studies, Ghaffari (2009) examined order preference for investment and topology (location finding) of tourism facilities in the touristic centers at Chehar Mahal and Bakhtiari Province (Iran) and ranked them with execution of Analytic Hierarchy Process (AHP) model for investment and giving appropriate services proportional to weight and performance in each of them.

In his essay titled 'Analysis and classification of rural zones in provinces of the country based on Human Development Index (HDI)', Masoud Taghvaee concluded that Kurdistan and Sistan and Baluchestan provinces were considered as very underprivileged (deprived) provinces in terms of HDI indices while Tehran and Isfahan were assumed as the most prosperous provinces in Iran. Similarly, eleven provinces or 43.85% of Iranian provinces are deemed as deprived provinces while eight provinces or 33.3% of total provinces were ranked as developed provinces with high HDI and at the same time thirteen provinces or 54.14% of them have been classified as underprivileged and very deprived provinces in terms of HDI. Roberts (Roberts; 1985:127) has have classified several employed evaluation techniques in planning into two groups of comprehensive evaluation methods. Introducing multicriteria techniques have purposed new classifications during recent years.

Falowdy and Voogd classify the employed evaluation techniques for urban planning into three following groups:

A) Financial evaluation technique, in which the evaluation framework is based on monetary values; for example, analytic technique of cost effect and threshold analytic technique;

B) Comprehensive evaluation technique in which not only financial and monetary consequences but also the non- monetary effects and consequences are examined through analysis of clustered ranking; and

C) Multicriteria evaluation techniques, in which it is possible to analyze and present all the existing data regarding the choices based on different and multidimensional criteria.

Theoretical bases:

Ranking of villages within geographic range may influence in rural development planning and management based on their developmental requirements and preferences. Today, new types of populated habitats emerge and such habitats are not completely compatible and consistent with dual conditions and patterns of city and village (Ricketts al; 1998:2). There are multicriteria evaluation techniques in which it is possible to analyze and purpose all existing information about choices based on different and multidimensional criteria (Khakee, 1998:361).Recognition and creating appropriate ranking in geographical range may affect on rural development planning and management according to capacities, requirements, and preferences of their development and it may be also assumed as a step for making definition of village clearer and more accurate despite of this fact that the studies have started to distinguish and determine rurality since 20th century (Wirth, 1938; Halfacree, 2004). On the other hand, Brown and Cromatie (2004) argue that due to considering several factors in ranking of zones and habitats, concept of village becomes important (Brown & Cromatie, 2004) since new types of habitats are not perfectly compatible and adjusted with conditions and dual patterns in city and village today (Rickett et al, 1998:2). Both of urban and rural spaces are going to be converted into multidimensional space where the interaction is intensified among city and village and for this reason today dual concepts of city and village may not interpret such ranking among city and village (Ziari; 1999:54). The spatial and location-related communications among city and village have led to formation of interfacial habitats, which could not be distinguished as a certain urban or rural point from each other (Lotfali; 2004:106). In fact, one could ask for many techniques to define their ranking and implementation where they are evaluated in TOPSIS and SAW ranking models.

SAW (Simple Additive Weighting) model:

This technique is one of the oldest methods, which have been used in Multiple Attribute Decision Making (MADM). The given technique needs to

similar scales and or descaled measurements, which could be compared to each other. In fact, this technique has formed according to core parameters in statistics. In other words, utility function is typically a decision-maker in linear technique and therefore the ability for summation (addition) of indices has been guaranteed. In this method, the linear norm is employed for descaling or normalization of data matrix.

Capabilities of SAW model:

Ease of use- ability of ranking choices, solutions and or strategies- overall utility in separable parameters based on the existing utility in each of the assumed parameters and as a result the additive model may be utilized- and restraints of SAW techniques include the assumption for employing the above technique based on independence of preference and disparity of effects of indices from each other (Azar; 2008).

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) model:

This technique was introduced by Huang and Yoon (1981) in which *m* factors or choices are evaluated by and individual or a group of decision-makers. This technique is based this concept that every selected factor should be placed in minimum distance from the positive ideal factor (paramount) and in maximum distance from negative ideal factor (least important one).

Advantages of TOPSIS technique:

The quantitative and qualitative criteria intervene simultaneously in evaluation- A noticeable number of criteria are considered- This technique is done easily and with appropriate speed- The input data may be altered and way of system responsiveness can be examined according to this variance.

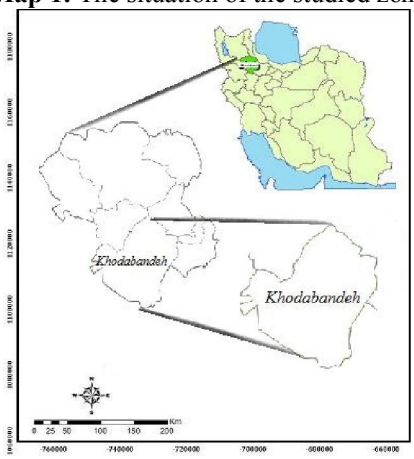
Methodology:

The current research has been prepared by librarian technique and by means of statistics during years 2006-2011. All of data have been analyzed after doing the needed measures in SPSS software. Finally, we tried to achieve reasonable results by using the given software and TOPSIS technique as well as SAW method that is purposed in the following in line with leveling service providing of rural facilities in Khodabande County, with a study population of 219 villages in the study area.

The studies zone:

With approximately area of 4800sq.km, Khodabandeh town is situated among eastern longitude (48°, 35') and northern latitude (36°, 7') at the southern part of Zanjan province. It is limited from northward to Zanjan and Abhar towns and Avaj County and from the southern side to Hamedan province and from the west to Kurdistan and from some part of western side to Zanjan. Khodabandeh town includes 4 counties i.e. Markazi (central), Afshar, Bezinehrood, and Sajasrood with 232 populated village and 33 deserted villages.

Map 1: The situation of the studied zone



Research findings:

The findings indicated in survey on the studied villages that among 216 studied villages, 127 villages are situated in plain; 73 villages are placed on hillside; 2 villages are located as afforested region within the plain; and 14 villages are situated in valley so none of our studied villages is not of afforested village locating in mountains.

Table (1): Natural situation of villages

Villages in plain	Mountainous or hillside villages	The afforested villages located in plain	The afforested villages located in mountain or hill	Villages in valley
127	73	2	0	14

Source: Findings of authors (2014)

Demographic dimensions:

In this regard, the population of villages was classified into 5 groups based on family dimension and a figure was selected as a code for any class so at this step the highest and lowest population rates were considered for ease of use and 5 groups formed and then frequency of them were acquired where the following table denotes these dimensions. And also this table signifies that the second group possesses the highest frequency while the fifth group has the lowest frequency based on this dimension

Table(2): Demographic dimensions

Cumulative percent	Valid percent	Percent	Frequency	valid
27.9	27.9	27.9	61	1.00
76.7	48.9	48.9	107	2.00
96.3	19.6	19.6	43	3.00
98.6	2.3	2.3	5	4.00
100.0	1.4	1.4	3	5.00
	100.0	100.	219	Total

Source: Findings of authors (2014)

Dimension of rural family

In fact, family dimension is a parameter for measurement of the housing unit per capita, measuring population density, ratio of family to housing unit, number of rooms per individual in housing unit, and its shortage etc where to acquire the family dimension, primarily total population was divided by number of families for every village and the result was counted as family dimension per village and then the related data for family dimension were entered into SPSS software in which data were classified into five groups and afterward their frequencies were calculated so the following table indicates the given data.

Table (3): Frequency of family number

Cumulative percent	Valid percent	Percent	Frequency	Valid
27.9	27.9	27.9	61	1.00
76.7	48.9	48.9	107	2.00
96.3	19.6	19.6	43	3.00
98.6	2.3	2.3	5	4.00
100.0	1.4	1.4	3	5.00
	100.0	100.	219	Total

Source: Findings of authors (2014)

Gender ratio:

To obtain gender ratio, we have acted as follows:

Gender ratio = (Number of males) / (Number of females) × 100

In this proportion, gender ratio for any village was obtained by dividing number of men to women; among of them of course, principally in most of villages, the gender ratio is lower due to further migration by males from the village to find jobs and or to continue study etc so quantity of females is going to increase so after considering their maximum and minimum figures, they have been put in 5 groups in the following format in which code 1 comprised of numbers (0-60) and code-2 consisted of numbers (61-100) and code-3 included numbers (101-120), code-4 comprised numbers (121-140), and finally code-5 interpreted numbers > 141. The following table expresses this fact.

Table (4): Gander ratio

Cumulative percent	Valid percent	Percent	Frequency	valid
.9	.9	.9	2	1.00
75.8	74.9	74.9	164	2.00
97.3	21.5	21.5	47	3.00
99.1	1.8	1.8	4	4.00
100.0	.9	.9	2	5.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

With respect to the above table, it was shown that the second group included the greatest number of villages where the gender ratio was the highest and among of them, both first and fifth groups included the lowest number of villages as it shown in table above.

Growth rate:

The following formula was used to estimate growth rate:

Growth rate = {Population (2011) ÷ population (2006) - 1} ^ 0.2

The growth rate was calculated in this formula by means of the derived data from population rates in 2006 and 2011.

Table (5): Growth rate

Cumulative percent	Valid percent	percent	Frequency	valid
31.5	31.5	31.5	69	1.00
100.0	68.5	68.5	150	2.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

Of course, after calculation the growth rates by SPSS software in this formula, they have been considered in two groups in which growth negative rates were assumed as 1 and the growth positive rates were considered as 2. The above table suggests that growth rate is positive in villages at Khodabandeh town therefore 150 villages had growth positive rate while 60 villages had negative rate of growth.

Literacy rate:

The following formula was employed to estimate literacy rate.

Literacy rate = number of literates ÷ + 6 population

Table (6): Literacy rate

Cumulative percent	Valid percent	Percent	Frequency	valid
.9	.9	.9	2	1.00
9.6	8.7	8.7	19	2.00
100.0	90.4	90.4	198	3.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

In this regard, firstly literacy rate was estimated for each of villages and then they became recoded in three groups by SPSS software; namely, the first choice included literacy rate less than 54, the code-2 comprised numbers (55-65), and finally code-3 consisted of numbers > 66. The above table indicated that 90.4% of villages were placed at third level and this rate included the highest rate and frequency; among them of course, each of these counties was examined in terms of literacy level and either of those counties was also evaluated:

Table (7): The review of literacy rate separately based on county

Literacy rate in Afshar county Literacy rate in Bezinehrood County

40	Valid N
182	Missing
73.9500	Mean
57	Valid N
165	Missing
69.1754	Mean

Literacy rate in Central county Literacy rate in Sojasrood County

46	Valid N
176	Missing
72.9348	Mean
76	Valid N
146	Missing
74.0526	Mean

Employment rate index:

The following formula was utilized to derive employment rate (The active population is considered from age 10 in Iran and for this reason we assumed active population within age range (10-64) not (15-64)).

Employment rate = Employed population ÷ Active population × 100

To facilitate this task and to find the comparative mode after calculation of employment rates, their data entered in SPSS environment where they became recoded and thereby they were encoded in which code-1 referred to employment rate smaller than 30; code-2 = 31- 60; code-3 = 61-90, and finally code-4 included the number with employment ratio higher than 4. The following table indicates that villages in group-2 had the highest rate of employment while villages in group-4 included the least rate (0.5).

Table (8): Employment rate

Cumulative percent	Valid percent	Percent	Frequency	valid
2.3	2.3	2.3	5	1.00
85.4	83.1	83.1	182	2.00
99.5	14.2	14.2	31	3.00
100	.5	.5	1	4.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

Rural residential pattern in county:

The number of the existing villages in Khodabandeh town was 219 villages with more than 20 families during two recent decades (according to census 2006 and 2011) while 44 other villages included less than 20 inhabitant families and or deserted from any inhabitant. In general, this means that of totally 263 villages, some villages were deserted from inhabitants and or as little population settled in adjacent village and or migrated to town. But, overall there are about 219 villages with population more than 20 families in this town according to statistics (2011).

Access to utilities (public services) and infrastructures (water- electricity- gas)

The findings suggest that in the second group in which most of villages are placed the inhabitants have access to these facilities at approximately average level while 1.8% of villages have access to these facilities at highest levels and 24.2% of villages have low access to these utilities.

Table (9): Accessibility to water- electricity- gas utilities

Cumulative percent	Valid percent	Percent	Frequency	valid
24.2	24.2	24.2	53	1.00
78.5	54.3	54.3	119	2.00
98.2	19.6	19.6	43	3.00
100.0	1.8	1.8	4	4.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

Type of roads in villages:

In terms of type of access routes, all villages in this town possess land routes among of them a lot of villages are overpopulated and or situated across the course of transportation in main routes with asphalted roads while some of villages include earth roads with respect to their location in one-way and deadlock route so it can be generally implied that most of villages are placed under favorable condition in terms of access routes to the center of town and or the surrounding great villages for access to facilities.

Information and communication index:

Regarding telecommunication and communication index, many villages have no direct access to newspaper and magazine; namely, to use newspaper and magazine, they should refer to town. Likewise, in terms of access to internet, given that most of villages are benefitted from telecommunication and even

telephone lines, many of them have no easily access to internet. In this sense, to compare the villages in terms of access to ICT facilities, they were scored (0-5) in which score 0 denoted lack of access and also score 5 suggested the highest access as mentioned according to the following table:

Table (10): Access to information and communication

Cumulative percent	Valid percent	Percent	Frequency	valid
23.7	23.7	23.7	52	.00
62.1	38.4	38.4	84	1.00
90.9	28.8	28.8	63	2.00
95.4	4.6	4.6	10	3.00
98.2	2.7	2.7	6	4.00
100.0	1.8	1.8	4	5.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

In this table, 23.7% of villages have no access to information and communication facilities and among them 1.8% of villages have the highest access while 38.4 with the maximum percentage have relatively low access to these facilities.

Medical and healthcare services

Concerning to medical and healthcare indices, we have added sub-branches of medical and healthcare services and their sum was evaluated under title of medical and healthcare indices in environment of SPSS software.

Table (11): Access to medical and healthcare services in villages

Cumulative percent	Valid percent	Percent	Frequency	valid
37.0	37.0	37.0	81	.00
47.0	10.0	10.0	22	1.00
68.5	21.5	21.5	47	2.00
84.9	16.4	16.4	36	3.00
92.2	7.3	7.3	16	4.00
93.2	.9	.9	2	5.00
95.0	1.8	1.8	4	6.00
98.2	3.2	3.2	7	7.00
99.5	1.4	1.4	3	8.00
100.0	.5	.5	1	11.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

With respect to above table, the scores of villages (0-11) were added together; namely, zero (0) denotes lack of adequate access to medical and healthcare services and number 11 indicates the highest access to those services. Among them, 37% of villages lacked medical and healthcare facilities while only 0.5% of villages have the highest access to medical and healthcare services.

Commercial and services index:

Table (12): Commercial- services facilities

Cumulative percent	Valid percent	Percent	Frequency	valid
21.5	21.5	21.5	47	.00
60.7	39.3	39.3	86	1.00
82.6	21.9	21.9	48	2.00
92.2	9.6	9.6	21	3.00
96.8	4.6	4.6	10	4.00
98.2	1.4	1.4	3	5.00
99.5	1.4	1.4	3	6.00
100.0	.5	.5	1	7.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

The above table suggests this fact that out of total villages, 21.5% of them lacked commercial and services facilities and 0.5% of them had the highest access to commercial and services facilities among

them 39.3% of villages had the lower access to commercial and services facilities.

Ranking of villages in town separately based on dimensions:

Ranking with TOPSIS model at level of unit

In this regard, we entered data from EXCEL software into SPSS software separately based on the unit. It is noteworthy that we will identify type of test through the given significance level therefore if that level was significant we employ ANOVA, Tukey test, and Duncan multiple range test; otherwise, if this level was not significant, we do not need to use these tests. We have utilized ANOVA, Tukey test, and Duncan multiple range test in the following table because it has been significant.

Table (16): Tukey and Duncan test

			N	Subset for alpha = 0.05		
				1	2	3
Tukey	Di	1.00	58	.2449		
	Me	4.00	46	.2790	.2790	
	Nsi	2.00	39		.3042	.3042
	On	3.00	76			.3239
	1	Sig		.182	.440	.644
Duncan	Di	1.00	58	.2449		
	Me	4.00	46		.2790	
	Nsi	2.00	39		.3042	.3042
	On	3.00	76			.3239
	1	Sig		1.000	.135	.241

Source: Findings of authors (2014)

To do this task for the weight which has been derived from TOPSIS model for any village separately based on unit, we give one code to each of units and then we enter the given data in SPSS software where with respect to significance level, it shows that there is significant difference among villages at level of units.

Ranking with TOPSIS at level of county:

We ranked the counties again so according to the following table, whereas the difference was significant thus Tukey and Duncan tests were used.

Table (17): Ranking with TOPSIS at level of county

	VAR00003	N	Subset for alpha = 0.05			
			1	2	3	4
Tukey	2.00		.2332			
	1.00	30	.2575	.2575		
	8.00	28	.2604	.2604		
	9.00	17	.2898	.2898		
	7.00	29	.3000	.3000		
	3.00	21	.3042	.3042	.3042	
	5.00	39	.3126	.3126	.3126	
	4.00	30		.3503	.3503	
	6.00	21			.3961	
	Sig	4	.172	.055	.059	
	VAR00003	N	1	2	3	4
Duncan	2.00	30	.2332			
	1.00	28	.2575	.2575		
	8.00	17	.2604	.2604		
	9.00	29	.2898	.2898	.2898	
	7.00	21		.2790	.3000	
	3.00	39		.3042	.3042	
	5.00	30		.3126	.3126	
	4.00	21			.3503	.3503
	6.00	4				.3961
	Sig		.085	.110	.073	.127

Source: Findings of authors (2014)

To do it, we gave a code to the weight that we had derived for every village through TOPSIS model and separately based on each of counties and then entered the given data into the software and afterward with respect to significance level it was found that there was significant difference at level of counties as well so we utilized Tukey and Duncan tests for this purpose.

With respect to significance of data, ANOVA technique was employed in both ranking processes and also Tukey and Duncan Tests were used for this objective.

Table (18): Tukey and Duncan test

Cumulative percent	Valid percent	Percent	Frequency	valid
86.3	86.3	86.3	189	1.00
97.3	11.0	11.0	24	2.00
98.6	1.4	1.4	3	3.00
99.5	.9	.9	2	4.00
100.0	.5	.5	1	5.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

Correlation test for weights in SAW model

We entered the weight, which had been calculated through SAW model in EXCEL software, into SPSS software and then each of units were given Codes of 1, 2, and 3 respectively.

Table (19): *Ranking at level of units with SAW model*

	Sum of Squares	Df	Mean Squares	F	Sig
Between Groups	16.151	8	2.019	1.719	.095
Within Groups	246.598	210	1.174		
Total	262.749	218			

Source: Findings of authors (2014)

As the significance level shows in this test, there is significant difference at level of counties in Khodabandeh town.

Ranking at level of counties with SAW model

To do this task, one code was given to weight of every village through SAW model separately based on each of counties and the given data entered into the software. With respect to level of significance, it is characterized that there is also significant difference throughout the counties.

Table (20): Ranking at level of counties with SAW model

	Sum of Squares	Df	Mean Squares	F	Sig
Between Groups	75.521	8	9.440	1.331	.229
Within Groups	1489.119	210	7.091		
Total	1564.639	218			

Source: Findings of authors (2014)

Classification and ranking of villages in town by clustered analysis technique:

In this part, primarily we entered the derived results from TOPSIS method into SPSS software in which clustered analysis started in 5 classes.

Table (21): Average Linkage (Between Groups)

Cumulative percent	Valid percent	Percent	Frequency	Valid
67.1	67.1	67.1	147	1.00
94.5	27.4	27.4	60	2.00
97.7	3.2	3.2	7	3.00
98.6	.9	.9	2	4.00
100.0	1.4	1.4	3	5.00
	100.0	100.0	219	Total

Source: Findings of authors (2014)

According to the table, it has been shown that the first group has the highest value (67.1) and in contrast this is the clustered analysis in group-4 that includes the lowest value (0.9).

Conclusion:

Given that during the survey on development of zones and especially rural areas, ranking can be assumed as a policy based on regional development and city-village continuum that is led to a type of balanced and purposeful planning and spatial development so eventually this leads to change in rural planning approaches based on the balanced territorial development attitude. At last, whereas today decision making models are employed to define some issues like ranking of villages and the related zones thus multicriteria decision making models were utilized in the present investigation that might provide possibility to enter simultaneously several decision makers with various criteria, goals, and choices. In this study, TOPSIS and SAW models were used and at the same time statistical data relating to years 2006 and 2011 were utilized and finally we acquired the weight as well as ranking that we achieved through this score and final weight all indicated that since in the relevant subjects about sustainable development, which include three dimensions i.e. human, exploitation from resources, and environment today in this ranking techniques, population and its proportional distribution to environmental facilities possesses special position and during search for balance among the above-said factors, human continues this trend as the moving axis toward sustainable development. In fact, optimal allocation of our facilities among villages with respect to their population and potentials not only will prevent from migration to cities but also will balance in this sector as well. Even in our final results, which we derived, it was indicated that that group of our villages in Khodabandeh town that comprised of great population in terms of access to facilities mainly showed they possessed these facilities at high level such Sohravard, Doutapeh, Karasf villages etc. Hence, these models indicated that in fact their application might act as very appropriate strategies to give services to rural areas.

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