Functional Evaluation of Mazandaran Province Cities Using Factor Analysis, Numerical Taxonomy and Cluster Analysis*

Shima Dadfar[1]**, Naser Azimi[2] and Hasan Ahmadi[3]

[1]Master of Urban & Regional Planning, Faculty of Art & Artitecture, Islamic Azad University, Tehran Central University, Tehran Central Branch, Tehran, Iran.

[2]Assistent Professor of Urban Planning, Faculty of Art & Artitecture, Islamic Azad University, Tehran Central Branch, Tehran, Iran.

[3]Assistent Professor of Urban & Regional Planning, Faculty of Art & Artitecture, University of Guilan, Guilan, Iran.

ABSTRACT: One priority of planning at the regional level is to recognize the system of residence and particularly its urban system. One of the features of urban system in each area or country is the way of population distribution between the cities of these areas which is called city distribution size. In functional analysis of Mazandaran province 41 development indexes of educational, cultural, social, demographic, economic, health and agricultural fields were selected, then by using factor analysis through SPSS Software, these factors were decreased into 6 main indexes and finally consolidated indexes were extracted. Then, these six factors were used as the inputs of taxonomy analysis in Excel, and the scores of cities which were valued between 0 -1 were obtained. Finally, in order to classify Mazandaran province cities by using cluster analyses, SPSS and Taxonomy scores, all of the cities were classified into 6 levels. To present the results graphically, GIS software was used to present a map entitled "Map of Mazandaran province cities classification". Results indicate that Sari as the center of Mazandaran has located in level 1 and Amol, Babol and Qaemshahr as three most populous areas have also located in level 2. At the end of the article according to the physical plan of northern coastal region, related suggestions on setting optimal and well-balanced urban system have been proposed.

Keywords: Urban System, Factor Analysis, Taxonomy Analysis, Cluster Analysis, Mazandaran Province.

INTRODUCTION

Urban system is one of the issues that besides identifying the various functional levels of city centers can specify functional areas. According to the nature of urban systems, there are hierarchies of different cities in every area in which one or two regional center are playing local and regional roles. This center provides top urban services for area's internal cities at the regional level. At the national level it can interact with other centers around the country. So on the one hand it causes

functional integration within the area and on the other hand it contributes to the creation of unity. Therefore it is expected that by analyzing the urban system of each area in the country, the nature of interactions and the power of existing services of regional centers and other cities can be recognized. Moreover, by applying these analyses the existence, unity and integration of regions will be predictable.

If this system is balanced in a way that population and facilities are distributed suitably according to all social, economic and political factors, it can be claimed that we've became close to achieve social justice. In the other words, the division of tasks between urban centers with regular system can facilitate the spatial development of social and economic conditions of our country.

Mazandaran province with its distinct climatic and

physiographic conditions has significant geographical differences from West to the East. the pattern of urban development, following the geographical space generally have evolved alongside connecting point of rivers and communication networks on alluvial and coastal plains. Continuous physical formation and development of the urban fabrics is not equal in all parts of the province. The four main cities of Mazandaran (Sary, Ghaemshahr, Amol and Babol) while maintaining their positions in the recent census, have formed the framework of metropolitan context in regional space.

There are a variety of methods and models for studying urban systems such as: rank-size model, first urban indexes, Herfindal decentralization index and the functional analysis methods such as factor analysis and taxonomy analysis. In this study, the method of functional analysis has been applied. In this method, the distribution of services across the region and the cities are classified in terms of their performances. SPSS, Excel and GIS software and three methods of factor analysis, cluster analysis and taxonomy analysis have been applied simultaneously.

LITERATURE REVIEW

System: The term "system" has its meaning in all types of research and disciplined learning. It has entered the social sciences from exact sciences especially physics. Hall believes that system is a set of components with interlocking elements and goals and relationships between attributes of elements, including the external influence by which the component has known, seen, or introduced. It should be mentioned that the relationship between components and features, ties system together (Reif, 1973).

Urban System: Urban system consists of a set of interdependent cities which create the structure of urban settlements in an area, region, country and the world. Urban system is not limited only to the physical building of urban settlements but also covers flows and communication between them. These flows include flow of population, capital, production factors, ideas, information and innovations. These systems are open systems that revising them requires investigation of their extensive relations with environment. These systems constantly adapt themselves to the structural changes of cities and their external connections (Azimi, 2002). Simon has identified two main elements of the urban system as follow: parts and connections between them (Simmons, 1978). John René Short defines urban systems as a set of different cities which are linked to each other

by population, products and informational trends and made their overall system, dynamic (Short, 1984, 210).

Urban Network: Studying of urban network as "a group of interdependent cities" has become particular important during the twentieth century in national and regional planning. Actually it is unclear when and how this term was entered in the literature of urban planning of Iran. Possibly "urban network" is a distraction from the French word of "Armature Urban" which has used widely in land preparation of French. The most familiar English word is "urban network" (Azimi, 2003).

Urban network often refers to the system of external communications of cities with each other and its borders expand along with development of technology, transportation and communications. Urban network shapes through trade, cultural, political, religious interactions and exchange of experiences and cooperation (Shokooei, 2004).

RESEARCH BACKGROUND

Urban systems (urban networks and hierarchies) and the distribution size of settlements are important topics as many researches and studies have been conducted. Auerbach (1913) was the first researcher who studied West German urban settlements. Discovering the converse relationship between the population and its place in urban system, he proposed the term "rank-size". Zipf in 1949, Richardson in 1973, Hagt in 1972 and Meyer in 1981 made some revisions and corrections on the model and tried to improve its effectiveness while there are some other important studies done by scientists such as Ltka (1924), Gvdrykh (1926), Singer (1936), Brian Barry (1961) and Su (2002).

Different studies in this field have been conducted in Iran such as follows. Azimi (2002) in his book "Investigating the urbanization and Principles of urban systems" has introduced and criticized the main patterns of urban system. He believes that surplus economic concentration on a specific location leads to activity concentration, employment and attracting more population and therefore a city can be known as an outcome of economic sociability. Surplus concentration and producing and extraction in cities are elements of urban development.

Maleki and Hosseinzadeh (2009) in an article rated the fourteen districts of Ilam urban areas in terms of sustainable development indexes. They used factor and taxonomy analysis in their study. Based on the results of the article two regions were semi-stable, twelve areas were unstable and none of the regions were stable.

Mousavi and Hekmatnia (2005) in an article titled "Functional Analysis and indexes synthesis to determine the factors affecting human development in regions of Iran" have rated 253 districts of Iran by applying the factor analysis for 38 indexes of human development. Then, they have decreased indexes to 6. In ranking the regions of Iran they have introduced 25 intra-developed regions, 77 high semi-developed regions, 73 low semi-developed regions and 78 deprived areas. Through a regression relationship between the factors and the degree of development, they provided the plans and investment priorities for each region in relation to factors and indexes.

Ebrahimzadeh et al., (2010) in an article entitled "Application of factor analysis, explaining the spatial pattern of urban-regional development in Iran" examined the level of development of all Iran cities based on political administrative division of the country. They classified all the cities into four groups titled: developed, high semi-developed, less-developed and deprived areas. Their findings indicate that conditions of provinces of Tehran, Isfahan and Yazd are the most desirable in most of development factors and Sistan-Baluchestan, Kurdistan, South Khorasan, Kermanshah, and Khuzestan have the most unfavorable conditions. In their study 32 developed, 76 high semi-developed, 126 less-developed and 106 deprived cities were identified.

In general, many studies in the field of urban systems (metropolitan and hierarchy network) have been conducted within and outside the country, either as a book or essay or article. They have investigated urban and settlements systems from different perspectives. The present study utilizes the results of these studies to analyze the factors affecting the urban system of Mazandaran province.

METHODOLOGY

In the present study, because of mutual and integrated interaction between components as well as the subject, descriptive and analytical methods were used simultaneously. The location of this study is Mazandaran province between 1956 -2011 and the statistic population of the study is cities in this province.

In this research, three methods of factor analysis, numerical taxonomy and cluster analysis were used for functional analysis of Mazandaran's cities. To provide a better hierarchical pattern with less and better indexes, using the SPSS software in factor analysis, the number of main indexes has been decreased to 6. After factor analysis to obtain factor scores, these scores were used as input for taxonomic approach in Excel. Then through

the cluster analysis, using taxonomic method output data the SPSS software prioritized cities (Adapted from: Shali & Razavi, 2010) and finally by using GIS software the distribution of these cities were presented.

INDEX SELECTION AND CONVERSION OF INDEXES TO HOMOGENEOUS INDEXES

In this study, the mixture of economic, social, cultural, educational, health, agricultural, tourism, etc. indexes are used. The combined index can illustrate the level of welfare and development of geographic locations based on selected criteria (Hekmat nia & Mousavi, 2011). The selected indexes in this paper has been selected firstly regarding to similar studies, Iranian economic activities classification (ISIC codes received from the Statistical Center of Iran) and at the second stage regarding to the city's performance. Then the necessary data gained from the statistical Center of Iran and indexs of appendix 1 were used to identify Mazandaran's cities performances.

Since the implemented indices do not have the shared scales, adding this index with different scales is not possible and it is essential to converse them to the standard unit. Therefore, at first, it is necessary that the selected indices converse to single index and empty of any scale. In this paper, from all methods of making scale-free index, the method of indexing was used. Maximum value of each index, 100 (or 1), is considered and other values are calculated regarding to proportionality. In this method the original values will not change and the obtained different coefficient is the same as the main one (Kalantary, 2009).

FACTOR ANALYSIS

Factor analysis is a generic name for some statistical methods of multivariate which main purpose is to summarize a large number of information, while the summarized results is a meaningful concept at the same time. The factor analysis has different applications but in Geographical studies R-type factor analysis is used to rate areas, towns and villages. It this paper the R-type factor analysis process is outlined (Hekmatnia & Mousavi, 2011).

NUMERICAL TAXONOMY MODEL

Analysis method of taxonomy is one of the common methods in the evaluation of level of development of the areas or points, and grouping them in homogeneous sets which was recommended in 1968 by UNESCO to assess

the development level of the countries.

In this method, usually one of the parts of the studied region is selected and other areas will be rated based on this. So the difference or distance between each zone of the area is determined from the ideal point (Kalantari, 2009).

CLUSTER ANALYSIS

A cluster analysis is one of the most popular methods in regional geographic studies. In fact, this is a method for classifying regions, towns, villages, etc while the regions in the same class are fairly similar but so different from other classes. Classification of homogeneous locations in this method is done by different techniques.

Determining the correlation coefficient and measuring the distance (Euclidean distance) is one of the most important methods of determining homogeneous locations.

A cluster analysis is done by two ways of non-hierarchical and hierarchical cluster analysis. In this paper the hierarchical cluster method is used which is fitted for geographic studies (Hekmatnia & Mousavi, 2011).

In a hierarchical cluster method, each location starts with a specific cluster, then the two locations are combined to make a new cluster. So at each step the number of clusters will be decreased. By continuing this process, gradually all location combine with each other and eventually emerge a greater cluster. To calculate this method SPSS software is used (Hekmatnia & Mousavi, 2011).

DISTRIBUTION OF THE POPULATION OF MAZANDARAN'S CITIES

In the Census of 2011 in Mazandaran province has 19 cities, 53 towns, and 122 villages. In this period there was a city with more than 250,000 inhabitants in this provenance (Sari). 54 percent of cities in the province has a population of less than 10 thousand (i.e. urban village) located less than 8 percent of the population in province. Most of the population of the province related to the class with the population of 100-250 thousand people which includes 40 percent of the province population. The population of cities and towns in the province of Mazandaran is presented in appendix 2 (Statistical Center of Iran, population and housing census, 2011).

RESEARCH FINDINGS

Factor Generating

In this study, the variance explained by all factors was more than 70 percent, which means the first condition of Factor Generating has met. Also, as noted in table 1, the value of kmo index is 0.671 and more than 0.5.It means that the data are suitable for performing factor analysis. The value of the Bartlett is also equal to zero which indicates a significant correlation between variables.

Table 1. Bartlett Test and KMO Index

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.671
Bartlett's Test of Sphericity	Approx. Chi-Square	952.312
	df	210
	Sig.	.000

The first matrix of factor analysis is primary computation matrix which includes a list of variables, their subscribers, special values (including ANOVA), the percentage of the variance of each factor and total cumulative percentage of all variances. According to the computed primary matrix, all variables have been summarized in 6 factors which explain over 90% of the variances.

The first factor has been clarified around 42.34 percent of the total variance of the set. Other factors have explained 17.29, 13.97, 7.2, 4.93, and 4.57% of the indexes' variance. In addition to this, the total variance explained by the set of these 6 factors equals to 90.32%. The results have been presented in table 2.

Table 2. Percentage of the Variance and Special Values for Different Factors

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	15.667	42.343	42.343
2	6.399	17.294	59.637
3	5.169	13.970	73.607
4	2.667	7.209	80.816
5	1.825	4.931	85.747
6	1.694	4.577	90.325

Rotated Matrix

This matrix is the same as factor matrix which its factors have been extracted through the method of decomposition into main components and have been rotated using technique of Varimax rotation. In other words, because of the difficulty in explaining the factor loading coefficient in factor matrix (of which many variables or indexes have average correlations with several items) we can use rotated matrix to detect communication and correlations and clear this communications for final analysis of factors. Results of this matrix, have presented in Appendix 3. These coefficients are very important for analyzing in the next stages and calculating the factor scores of cities.

Interpretation of Factors

Regarding the correlation of each index, the right names or titles can be fitted to any of them as following:
- **The First factor:** special value of this factor is 15.667 and is able to calculate and explain 42.34 percent of the variance. In this factor the maximum numbers of indexes which are 25 indexes have been loaded as following.

1. Guest House, Motel, Etc., 2. The Number of Licensed Construction Permits, 3. Planting Decorative Plants, 4. Poultry Farming, 5. Publication Services, 6. Production of Ready-Foods, 7. Cultural, 8. (Cinemas and Museums, Etc.). Medical and Dental Offices' Activities, 9. The Relative Density Of The Population, 10. The Activities Of Real State And Land On The Basis Of Wage Or Contract, 11. Hospital Activities, 12. Communication Activity Consists Of Posts And Telecommunications (Public And Private), 13. Higher Education, 14. Activities Of Travel Agencies And Tour Operators And Helping Tourists Who Is Not Classified In Another Place, 15. Veterinary Medicine Activities, 16. Hotel, 17. The Number Of Firefighting Stations, 18. Newspaper, Weeklies, Etc. 19. Primary Education, 20. Ground Transportation Companies, 21. Health Center, 22. Loading And Unloading Firms, 23. Activities Of Clinics And Health Centers, Except Hospitals, 24. Sport Activities, 25. Store And Warehouse Companies.

- **The second factor:** special value of this factor is 6.39 and is able to explain 17.29 percent of the variance. In this factor 7 index have been loaded as following:

1. Sport Activities, 2. Ready-Food Production Activities 3. Banking, Except For The Central Bank, 4. Livestock, 5. Producing and Storing Fruits And Vegetables, 6. Livestock and Poultry Slaughter, 7. Veterinary Activities

- **The third factor:** special value of this factor is 13.97 and is able to explain 5.169 percent of the variance. In this factor 10 index have been loaded as following:

1. Firefighting Station, Number, 2. Newspapers, Weeklies and Etc, 3. Ground Transportation Companies 4. Helth Home 5. Loading and Unloading Firms, 6. Livestock and Poultry Slaughter, 7. Store and Warehouse Companies, 8. Passenger Services Agency 9. Activity Related to the Assignment of Land, 10. Activities of Architectural, Engineering and Related Technical Consultancy.

- **The fourth factor:** In this factor with special value of 2.67 and 7.209 percent of variance two items of 1. loading and unloading companies and 2. The numbers of restaurants have been loaded.
- **The fifth factor:** this factor with special value of 1.83 and 4.93 percent of variance includes

three indexes of: 1.processing and preservation of fruits and vegetables, 2. meat companies 3.activities related to the transfer of land have been loaded.

• **The sixth factor:** this factor with special value of 1.69 and a variance of 4.58 indices: 1. activities of architectural, engineering and related technical consultancy. 2. activities of bus (ziyary, 1999).

Matrix of Factor Scores

This step involves calculating the factor scores matrix. This matrix is obtained from multiplication of homogeneous coefficients matrix by rated factor matrix. In the other words, the factor scores is numeral weight of each habitat points (investigated municipal centers)

which has gained after multiplying factor score by the homogeneous index.

By calculating this matrix, the rate-score of each city regarding to each factor can be identified. Then, using a cluster analysis, classification of municipal centers can be achieved. In Appendix 4 the values of these scores are provided.

Analysis of Taxonomy

Scores of the factors gained from the result of factor analysis, were used as the input of taxonomy and therefore the defect of correlation between indexes was fixed (extracted from Shali, 2010). The result of taxonomy analysis has been shown in table 3.

Table 3. The Results of the Taxonomy Analysis

No.	City	Score	No.	City	Score	No.	City	Score
1	Sari	0.3	17	Fereidoonkenar	0.855	33	Polsefid	0.9525
2	Amol	0.5	18	Ketalem & Sadatshahr	0.86	34	Gotab	0.954
3	Babol	0.51	19	Zireaab	0.865	35	Izadshahr	0.954
4	Ghaemshahr	0.54	20	Abbasabad	0.865	36	Kalarabad	0.9545
5	Behshahr	0.625	21	Rostamkala	0.87	37	Sorkhrood	0.9545
6	Neka	0.64	22	Rooyan	0.885	38	Marzanabad	0.9575
7	Babolsar	0.67	23	Chamestan	0.945	39	Nashtarood	0.9585
8	Challoos	0.675	24	Shirood	0.945	40	Kalebast	0.96
9	Tonekabon	0.685	25	Khalil Shahr	0.946	41	Khoshroodpi	0.961
10	Noshahr	0.695	26	Behanmir	0.946	42	Kiasar	0.9635
11	Ramsar	0.745	27	Kiakala	0.947	43	Pool	0.964
12	Mahmoodabad	0.755	28	Kalardasht	0.949	44	Galoogah(Babol)	0.9675
13	Amirkala	0.76	29	Khoramabad	0.95	45	Koohi Khil	0.97
14	Moor	0.79	30	Soork	0.95	46	Daboodasht	0.9725
15	Galoogah	0.8	31	Shirgah	0.95	47	Baladeh	0.975
16	Jooybar	0.855	32	Salmanshahr	0.9525			

Cluster Analysis and Leveling of Cities

After taxonomy analysis, the results again were transferred into SPSS software and through hierarchical cluster analysis, all of cities of province were clustered, and cities were classified in 6 levels. The results of the cluster analysis are presented in Table 4.

Table 4. Leveling of Mazandaran Province Cities Resulted from Cluster Analysis

city	level	city	level	city	level	city	level
Sari	1	Amirkala	4	Chamestan	6	Kalarabad	6
Amol	2	Moor	4	Shirood	6	Sorkhrood	6
Babol	2	Galoogah	4	Khalil Shahr	6	Marzanabad	6
Ghaemshahr	2	Jooybar	5	Behanmir	6	Nashtarood	6
Behshahr	3	Fereidoonkenar	5	Kiakala	6	Kalebast	6
Neka	3	Ketalem & Sadatshahr	5	Khoramabad	6	Khoshroodpi	6
Babolsar	3	Zireaab	5	Soork	6	Kiasar	6
Challoos	3	Abbasabad	5	Shirgah	6	Pool	6
Tonekabon	3	Rostamkala	5	Salmanshahr	6	Galoogah(Babol)	6
Noshahr	3	Rooyan	5	Polsefid	6	Koohi Khil	6
Ramsar	4	Kalardasht	5	Gotab	6	Daboodasht	6
Mahmoodabad	4			Izadshahr	6	Baladeh	6

Results of clustering Mazandaran province cities by GIS, is presented in map number1.

It is obvious that most of towns and cities especially cities in the first and second levels affected by natural and communicational factors are located in central and east areas of the province.
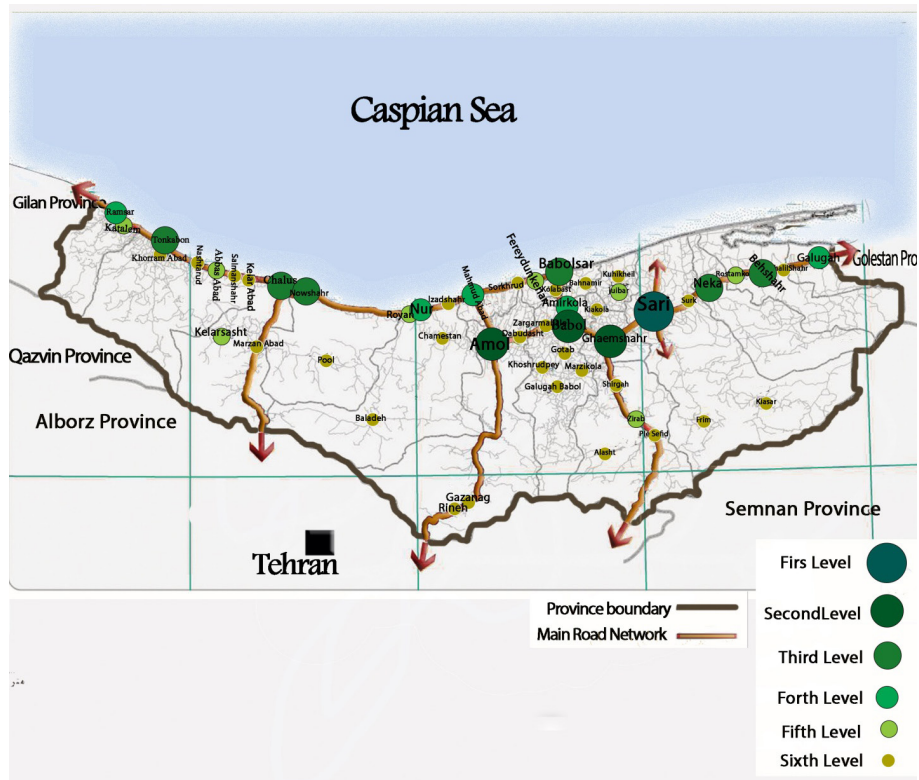
Fig. 1. Functional Classification of Mazandaran Province

CONCLUSIONS AND SUGGESTIONS

In this study, settlements of Mazandaran province in terms of size and location selection; variety of services and facilities, infrastructures and productive activities (based on the number and types of performance) have been investigated to find out the spatial distribution of performances in that area. Using 41 indexes of health economic, agricultural, educational, cultural, tourism, etc; 47 cities from 53 cities (including available statistics information) of Mazandaran province were prioritized in terms of their performances, using a combined methods of factor analysis, numerical and cluster taxonomy to 6 levels.

Using factor analysis, 41 specified indexes were reduced to 6 main indexes, then this 6 factors were converted to a scale with 0-1 scores by taxonomy method, and finally using a hierarchical cluster analysis the Mazandaran's cities were classified to 6 main levels as follows:

City of Sary as the center of province with the highest

level of service is at the first level. In the second level, there are regional urban centers (centers of large cities) that can compete with the first level. The three most populous cities of Amol, Babol and Ghaemshahr are located at this level. In the third level, the smaller urban centers such as towns around bigger cities are located such as Neka, Behshahr, Babolsar, Boshahr, Chaloos and Tonekabon which link the urban network to lower levels. The fourth level includes cities of Ramsar, Mahmoudabad, Amirkala, Nour and Galougah and as well the rest of cities are located in fifth and sixth levels.

The remarkable point in the sixth level is the existence of 23 cities from all 53 cities of Mazandaran which is more than 43 percent of the province's cities. It shows lack of any effective attention to their characteristics in shifting them into towns. Another point is that some of these cities have a long history to become the city such as Khorramabad, Polsefid, Marzanabad, Salmanshahr, Rhine, Shirgah and Nashtarood which became city before 1971 (the official Portal of the Ministry) but due to some restrictions, including lack of access to the main road, or

natural factors have not developed and well fitted.

At the end, according to the reginal documents and projects like the physical plan of the coastal region of Northern and province preparation project the following suggestions are provided:

1- Adopting policies to create balance in the urban network of the province through development of small urban centers to reduce population and capital centralizations in large cities. In fact, creating infrastructures and active markets; well fitted network access according to the hierarchy and the size of settlements in order to cost reduction and available access and communication; positioning the small and medium industrial centers and providing their resources, are some methods for strengthening small towns.

2. In order to reduce the cost of building infrastructures in small towns regarding to increased construction and land population density, some agricultural and the natural reserved land should be preserved.

3-According to the topography and climate conditions of Mazandaran and existence of numerous village center, urban village and the multiplicity and dispersion of cities and towns in the province, creating a new urban center is not a necessity. So it is recommended that instead of increasing the number of new cities and converting villages into towns, existing urban centers should be developed. The number of cities in lower levels in comparision with the upper levels in regional urban system, is too high. Hence it is necessary to avoid the recent flow of shifting towns to cities, at least in this area.

Appendixes

Appendix 1. Used Indexes in Functional Analysis of Mazandaran's Cities

No.	Index	No.	Index
1	Hospital Activities	22	Publication and Book Activities
2	Newspaper Offices	23	Therapeutic and Hygienic Centers Activities Except Hospitals
3	Sport Activities	24	Medical And Dental Offices' Activities
4	Cultural Activities (Museum, Cinema,…)	25	Veterinary Medicine Activities
5	Banking Activities	26	Social Work Activities
6	Activities Related To The Assignment Of Land	27	Health Houses
7	The Activities Of Real State And Land	28	Primary Education
8	Activities Of Architectural, Engineering And Related Technical Consultancy	29	Higher Education
9	The Number Of Licensed Construction Permits	30	Research and Development in Engineering and Natural Sciences
10	Ready Food Production Activities	31	Communication Activity Consists Of Posts And Telecommunications (Public And Private)
11	Producing And Storing Fruits And Vegetables	32	Firefighting Stations
12	Animal Husbandry	33	The relative density of population
13	Planting Decorative Plants	34	Ground Transportation Companies
14	Meat Companies	35	Loading And Unloading Firms
15	Poultry Farming	36	Store And Warehouse Companies
16	Livestock And Poultry Slaughter	37	Hotel
17	Meat Products Activities	38	Guest House, Motel,...
18	Vegetable oils Production Activities	39	Restaurant
19	Dairy Products Activities	40	Bus Activities
20	Activities Related to Rice Production	41	Travel Agency Activities
21	Activities Of Travel Agencies And Tour Operators And Helping Tourists Who Is Not Classified In Another Place		

Appendix 2. Mazandaran Province's Cities Population in Censuses 2011

Rank Of City	City	Population of City at 2011	Rank Of City	City	Population of City at 2011	Rank Of City	City	Population of City at 2011
1	Sari	296,417	19	Zirab	15,679	37	Sorkhrud	5,921
2	Amol	219,915	20	Abbasabad	11,599	38	Marzan Abad	5,789
3	Babol	219,467	21	Rostamkola	11,553	39	Nashtarud	5,642
4	Ghaem Shahr	196,050	22	Chamestan	10,617	40	Kola Bast	4,097
5	Beh Shahr	89,251	23	Shirud	10,429	41	Khosh Rud Pey	3,317
6	Neka	50,680	24	Khalil Shahr	10,141	42	Kiasar	2,837
7	Babolsar	50,477	25	Kelardasht	9,122	43	Pul	2,806
8	Chalus	47,881	26	Khoram Abad	9,114	44	Galugah(babol)	2,643
9	Tonekabon	45,338	27	Surk	8,930	45	Kuhi Kheil	2,061
10	Noshahr	43,378	28	Salman Shahr	8,654	46	Dabudasht	1,169
11	Fereydunkenar	36,192	29	Shirgah	8,129	47	Baladeh	1,037
12	Ramsar	32,294	30	Pole Sefid	7,708	48	Alasht	874
13	Mahmood Abad	31,771	31	Kia Kola	7,691	49	Rineh	782
14	Juybar	29,122	32	Bahnamir	7,410	50	Marzikola	555
15	Amirkola	28,086	33	Gotab	7,242	51	Zargar Mahale	423
16	Noor	22,978	34	Royan	7,102	52	Ferim	272
17	Galugah	19,625	35	Izad Shahr	6,797	53	Gazanak	200
18	Katalem	18,962	36	Kelar Abad	5,926			

Appendix 3. Rotated Component Matrixa						
	Component					
	1	2	3	4	5	6
Guest House, motel, etc.	.938					
The Number Of Licensed Construction Permits	.896					
Planting Decorative Plants	.887					
Poultry Farming	.863					
Publication and Book Activities	.840					
Ready Food Production Activities	.822					
Cultural Activities (Museum, Cinema,…)	.818					
Medical And Dental Offices' Activities	.806					
The relative density of population	.805					
The Activities Of Real State And Land	.799					
Hospital Activities	.797					
Communication Activity Consists Of Posts And Telecommunications (Public And Private)	.791					
Higher Education	.778					
Activities Of Travel Agencies And Tour Operators And Helping Tourists Who Is Not Classified In Another Place	.775					
Veterinary Medicine Activities	.749	.502				
Hotel	.737					
Firefighting Stations	.735		.505			
Newspaper Offices, …	.733		.516			
Primary Education	.706					
Ground Transportation Companies	.699		.504			
Health Houses	.698		.510			
Loading And Unloading Firms	.698		.510			
Therapeutic and Hygienic Centers Activities Except Hospitals	.696					
Sport Activities	.642	.552				
Ready Food Production Activities		.899				
Banking Activities		.830				
Animal Husbandry		.826				
Producing And Storing Fruits And Vegetables		.780			.529	
Livestock And Poultry Slaughter		.561	.511			
Store And Warehouse Companies	.509		.739			
Travel Agency Activities			.734			
Loading and unloading Company				.919		
Restaurant				.919		
Meat Companies					.910	
Activities Related To The Assignment Of Land			.500		.500	
Bus Activities						.895
Activities Of Architectural, Engineering And Related Technical Consultancy			.566			.719
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.a a. Rotation converged in 8 iterations.						

Appendix 4. Loading Factor Value of Seen Variables in 6 Factors

City	Factor No.1 Score	Factor No.2 Score	Factor No.3 Score	Factor No.4 Score	Factor No.5 Score	Factor No.6 Score
Sari	6.35559	-1.04349	-0.83335	0.40247	-0.11233	-0.34934
Amol	0.50992	0.74856	4.56561	-1.57413	1.00045	0.30287
Babol	0.90306	6.38586	-0.65336	0.24684	0.23406	0.12084
Ghaem Shahr	0.56698	-0.22337	3.81769	-0.12032	-1.14958	0.84133
Beh Shahr	0.32701	0.6306	0.56245	-0.07231	-0.49086	-0.77153
Neka	0.07906	-0.7517	1.31594	-0.25109	1.05773	-0.86981
Babolsar	0.13282	-0.27544	-0.9565	0.44483	1.02541	6.03341
Chalus	-0.53344	-0.01076	0.85319	3.51913	0.95834	-0.57299
Tonekabon	0.40366	-0.18073	0.33248	1.48058	-0.37235	-0.38515
Noshahr	-0.46522	-0.21117	0.2803	4.19564	-0.13117	-0.3901
Fereydunkenar	-0.12034	0.00032	-0.08001	-0.19751	0.20115	-0.03584
Ramsar	-0.11555	-0.18193	0.54581	0.57639	-1.01131	1.77727
Mahmood Abad	-0.23581	-0.19457	0.46908	1.51174	-0.52741	-0.27068
Juybar	0.02809	0.59106	-0.08841	-0.86025	0.3815	-0.60661
Amirkola	-0.19488	-0.14344	-0.22879	-0.51873	1.4969	-0.04546
Noor	0.13956	-0.26882	-0.35806	0.92919	0.33572	-0.04013
Galugah	-0.36719	-0.25602	-0.4127	-0.20257	5.43546	-0.63805
Katalem	-0.00227	-0.1845	-0.50396	0.29224	0.07805	-0.16416
Zirab	-0.23712	0.17025	-0.23495	-0.36822	-0.07327	-0.10438
Abbasabad	-0.35149	-0.15111	0.04864	0.21059	-0.411	-0.20394
Rostamkola	-0.29349	0.06069	-0.18481	-0.47963	-0.29334	-0.21024
Chamestan	-0.21253	-0.26129	0.08032	-0.44477	-0.17885	-0.25511
Shirud	-0.4699	0.07687	-0.50407	-0.26624	-0.72745	-0.09922
Khalil Shahr	-0.43845	0.01125	-0.45249	-0.267	-0.62741	-0.16957
Kelardasht	-0.44933	-0.07552	0.06561	0.71236	-0.43971	-0.2081
Khoram Abad	0.24283	-0.42371	-0.46713	-0.86974	-0.31617	-0.273
Surk	0.16424	-0.49574	-0.36681	-0.75303	0.06239	-0.2299
Salman Shahr	-0.29395	-0.25012	0.10693	-0.07704	-0.34063	-0.19073
Shirgah	-0.20652	-0.32531	-0.19345	-0.35476	0.68409	-0.12087
Pole Sefid	-0.14894	-0.31384	-0.48396	-0.41074	0.48628	-0.11839
Kia Kola	0.21213	-0.48505	-0.50626	-0.8571	-0.30293	-0.24665
Bahnamir	0.02612	-0.35127	-0.30863	-0.67677	-0.20075	-0.18985
Gotab	-0.43515	-0.00797	-0.4213	-0.26327	-0.60384	-0.1895
Royan	-0.29356	0.19883	-0.38503	-0.37339	-0.75953	-0.09411
Izad Shahr	-0.44359	0.04107	-0.50091	-0.27278	-0.66401	-0.13865
Kelar Abad	-0.50208	0.06299	-0.18057	-0.17418	-0.60154	-0.21238
Sorkhrud	-0.54726	-0.28178	0.48599	-0.81085	-0.47921	1.18119
Marzan Abad	-0.019	-0.4037	-0.61307	-0.54394	0.36966	0.05013
Nashtarud	-0.18481	-0.17666	-0.40386	0.01705	-0.37464	0.04075
Kola Bast	-0.3051	-0.17877	-0.36761	-0.27657	-0.24326	-0.2373
Khosh Rud Pey	-0.27128	-0.39713	-0.10824	-0.26127	0.55255	-0.51134
Kiasar	-0.24234	-0.21804	-0.42439	-0.39014	-0.19792	-0.12953
Pul	-0.44989	0.07766	-0.56032	-0.27988	-0.70892	-0.10069
Galugah(babol)	-0.40301	-0.15982	-0.16501	-0.23331	-0.41868	-0.34962
Kuhi Kheil	-0.20726	-0.10713	-0.53959	-0.53387	-0.66375	-0.21823
Dabudasht	-0.43978	0.01896	-0.46501	-0.26849	-0.63688	-0.16158
Baladeh	-0.21054	-0.08509	-0.57743	-0.23516	-0.30099	-0.24508

REFERENCES

Azimi, N. (2002a). *Basics of Urban System and Urbanization Scan*, Mahshad: Nika publishing.

Azimi, N. (2002b). *On the Economic and Social Developments of Gilan-a new look*, Rasht: gilkan.

Azimi, N., Tofigh, F., Amkchi, H. & Sedaghat, P. (2009). *The Physical Regional Plan of the Northern Coastal Area*, research and Studies Center of Urbanism and architecture, Iran.

Azimi, N. (2003). *Physical Regional Plan for Settlement Networks* Research and Studies Center of Urbanism and Architecture, Tehran: chap gostar, Iran.

Hekmat nia, H. & Mousavi, M., (2011). *The Application of the Model in Geography with an Emphasis on Urban and Regional Planning*, modern science publishing, Yazd, Second Edition.

Statistic Yearbook of Mazandaran province. (2010). *Planning Department of Provincial Governor of Mazandaran*.

Kalantari, Kh. (2009). *The Regional Planning and Development*. third edition, Tehran: Khoshbin.

Ebrahim Zade, I., Eskandari Sani, M., Ismail Nejad, M. (2010). The Application of Factor Analysis in Defining the Spatial Pattern of Urban Development and Un-development, the stunted in Iran, *Journal of geography and development*, Issue 17, spring 2010.

Statistic Yearbook of Organization Road Transport Organization, 2008.

Shali, M. & Razavian, M. (2010). Regional Disparities in Eastern Azerbaijan Province Using the Method of Taxonomy and Clustering, *Journal of applied research in geographical sciences*, volume 14, no. 17, pp. 25-40.

Manouchehri miandoab, A. (2011). *Urban System Developments in the Area of Azerbaijan and Providing Optimal Pattern*, master's thesis, Faculty of geography, University of Tehran.

Mousavi, M. & Hekmat nia, H. (2005). The Factor Analysis and Integration of Indexes in Determining the Factors Affecting Human Development Areas of Iran, *Journal of geography and development*.

Mazandaran consulting engineers. (2012). *Mazandaran Preparation plan, Sari*, Planning Department of Provincial Governor of Mazandaran.

Reif, B. (1973). *Models in Urban and Regional Planning*, Central University of Venezuela, Leonard Hill Books.

Simmons, J. W. (1978). *The Organization of the Urban System*. In: Bourne, L. S.,Simmons, J. W. (eds.) Systems of Cities: Reading on Structure, Growth, and Policy.

Shokooei, H. (2004). *New viewpoints of urban geography*, vol.1, SAMT publication. Tehran, 8th Edition.

Short, J. R., Kim, Y., Kuus, M. & Wells, H. (1996). The Dirty Little Secret of World Cities Research: Data Problems in Comparative Analysis. *International Journal of Urban and Regional Research*, 20, 697–717.

The Official Portal of Government Ministry: http: www.moi.ir/Portal/Home

The Statistics Center of Iran, Population and Housing Census, in year of 1956-1966-1976-1986-1996-2006 and 2011.