

Optimal Localization of Iran Khodro Products Agencies in Rasht

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Abstract: Determining the optimum location for the establishment of urban land uses and proper distribution of service centers is one of the main components of in urban planning and the core tasks of urban planners and it is such that all urban residents have access to them easily and this distribution is proportional to population distribution and demand in different regions. Municipal services in most cities, due to the high population density, lack of proper localization, lack of standardized access radius and isn't able to provide services to citizens modestly and balance and this problem is more in the big cities. Iran Khodro agencies in Iran are one of the service centers that we evaluated the status of its establishment in this study. This study was conducted in 2013 in Rasht (Iran) that its method is descriptive - analytic and its type is applied – developed. With regard to scientific criteria and preparing data layers by using AHP model based on GIS environment could do desirable localization for automobile agencies. Research results show that idle land of surrounding urban with consideration of all scientific standards are suitable locations for the construction of new agencies of Iran Khodro, also, due to the issue that scattering current situation in agencies of Iran Khodro is proportional to localization criteria of urban services but some areas of the city is deprived of agency. Thus considering the needs and shortages of the city in a long-term vision, locations in land suitable to surrounding urban was proposed in order to cover city completely.

Keywords: Spatial Distribution, Iran Khodro, Rasht, Analytical Hierarchy Process.

1- INTRODUCTION AND PROBLEM STATEMENT

Poor access to services Iran Khodro entrance and inside of the city increases travel time, traffic, poor performance and create imbalance in the adjacent land uses and ... will require proper localization problem situation analysis. Considering these issues, the role of service centers in provincial capitals and major cities due to their ultra-urban and regional could be considered a model for other urban centers. Development as well as service spaces didn't coordinate with population growth and physical development of cities finally; population growth has surpassed the levels of service spaces that this lead to spatial structure and physical failures in most cities. Concentration of population and activities, spatial inequality in the enjoyment of social facilities, is one of the outstanding characteristics of Third World Countries. This characteristic can be found in Iran the pre-revolutionary and post-revolutionary effects and remnants of it. According to the characteristic, most facilities and the population is concentrated in one or several locations and other areas act as marginally [15]. Nowadays, unchecked population growth, industrialization of cities, economic development, applies economic policies especially from governments and rural migration to urban has led to the rapid expansion of urban areas. Unchecked expansion of cities is a global problem, so that more than half the world's population now lives in cities and is expected that will live more than 65 percent of world population in cities in 2025 [11]. According to the above definitions, localization land uses that today has an important role in the life of human actually it is the process of decision making in a long period of time. In localization is attempted to be different parameters associated with each other [20].

Rasht is a city in and the capital of Guilan Province with population 557,366 people (in 2006 year) and having the first urban phenomenon is located in central part of the city. Due to special function and political and administrative center of the province, it has numerous land use of urban and ultra- urban have been effective in forming the body of the city

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[9]. Land uses and urban services are significant factors that by satisfy the needs of the population and increase public interest and attention to merit and deserve people can establish social and economic justice and the environment in urban areas [19]. Lack of proper distribution of urban services not only can collide population and imbalances in city but lead to form the urban space contradictory with social and economic justice [19]. Finally, with regard to all existing conditions and actions taken in this area, this research will be applied and analytical and has two variables including population and urban traffic that considering statistics and figures, the city of Rasht in term of distribution and urban services has not been commensurate with population growth. Thus, by introducing appropriate models using GIS and AHP model, and presents the solutions and suggestions about locating and optimal distribution of products agencies of Iran Khodro in the city of Rasht and with regard to the efficiency of the spatial distribution of these agencies, it will reduce traffic and pollution caused by it and by locating them in the appropriate places and considering effective factors such as economic prosperity and social welfare components, will leading to more positive effects. The hope is to create conditions that all citizens must have the balanced availability of these agencies and the wants and needs of the people meet easily and as well as create stress and less density in urban traffic that that in right organizing and distribute these agencies should be considered effective principles and meet the needs clients.

2 - MATERIALS AND METHODS

2-1 - Studied Area

Rasht is the city center and Guilan province which is located in the central city. Rasht is located in 49 degrees and 34 minutes and 45 seconds east longitude and 37 degrees 16 minutes and 30 seconds north latitude from the Greenwich meridian and is limited from north to Khomam and suburban villages and Pasikhan, from East to Kucheshfahan and villages of Sangar and Islamabad and Saravan, from west to Some'esara and shaft town and South to Lakan village and Roodbar town. Its area is about 136 square kilometers. Rasht is considered small fraction of Guilan plains and the southern plains of the Caspian Sea. This plain is in its northern and southern limits of the Alborz Mountains and the coastline, encompass Rasht , Anzali and Lahijan [5].

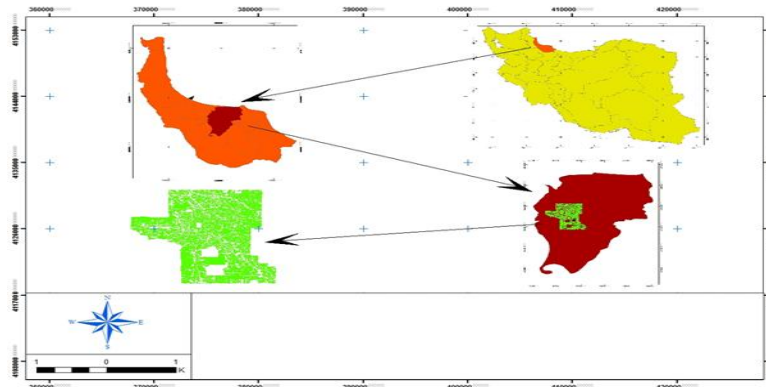


Figure 1. Geographical location map of Rasht in City, State and Country

2.2 - Research Methodology

Research Methodology in this study is descriptive - analytical and its type is applied and a method of data collection is survey. In this study, after drawing the required maps, all maps drawn, in the ArcGIS environment collected, store, and after weighting by hierarchy process (AHP) on the attached and optimal maps to make Iran Khodro agencies in Rasht has identified and analyzed. In this study, for weighting information layers was used method of paired comparisons and Expert Choice software.

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3.2 - Background of Research

Iran Khodro company (former Iran national) in 1962 create with the purpose of the establishment and managing factories to manufacture and supply all kinds of car, parts associated with them, the sale and export of products and manufacturing Peykan automobile. Based contract with Chrysler Group of UK received allow to assemble a form automobile Hillman Hunter and manufacturing it in the name of Peykan. Based on contract with France, Iran Khodro needs 60 thousand engines of suspension system in Peugeot 504 to install on Peykan was assigned to this country for 6 years and finally, production line of Peykan 1800 was opened in 1990 and in addition to new models of Peugeot were provided by Iran Khodro. Manufacturing vans, buses, engines plant and equipment and other material was followed in Iran Khodro until achieved manufacturing National Samand automobile. Iran Khodro is the largest automobile manufacturing company in Iran that on mean, 65 to 70 percent of the auto manufactured within the country permanently assigned to it [19]. In a particular field of Localization of agencies after sales of Iran Khodro isn't done research.

In this field research with assessment quality performance of auto part making company Iran Khodro based on EFQM by using the technique of Analytical Hierarchy Process was done by Asgharzadeh and Amin in 2006. Finding suggests that suitable localization of sites serving Iran Khodro has effective role in customer satisfaction [4]. In 2010 a study with title "analysis of the spatial -location of urban facilities and application of Analytical Hierarchy Process model in Tehran" is done by Meshkini & et al. fire stations was analyzed. The findings suggest the establishment of a large number of stations in a one-way roads, lack of cover the whole area and don't having measurable criteria. In this study, an appropriate location at the level central part of Tehran was proposed and located [14]. Pormohammadi , Taghipour, Jamali in article with title "Localization of urban services by combining GIS and AHP model "Concluded that localization of urban services will reduce trips in the city, traffic and decreases environmental damage [15]. Lai & et al (2011) show that localization of service areas by using GIS and AHP increases flexibility of performance spaces, certainty and satisfaction in servicing people [12]. Meanwhile Javadian & et al show that GIS & AHP increase environmentally sustainable capacities to localization urban activities and increase possible to the optimal use of urban spaces [10].

4 - RESEARCH FINDINGS

4-1 - Identification of Variables and Parameters Evaluation

In selection of evaluation criteria, the general rule is that these criteria are dependent on a specific system analyzed and they must be determined in relation to problem situation. For appropriate localization of Iran Khodro agencies, the following parameters and variables are considered that appropriate weighting on the basis of their importance can be done by using GIS.

Table 1: Identification of criteria for Localization of Iran Khodro agencies

Row	Criteria	Row	Criteria
1	Idle land	6	Distance from the main roads of the city
2	Distance from available agencies	7	Land use
3	Building Density	8	Distance from the city's main squares
4	Distance from City Center	9	Height from sea level
5	Population density	10	Land slope

4-2- Analytical Hierarchy Process Model (AHP)

AHP is logical framework that it makes easy understand and analyzes complex decision making by analyzing it into a hierarchical structure [2]. AHP does pairwise comparisons to obtain the relative importance of criteria for each level of

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the hierarchy or the evaluating sub-criteria at the lowest level of the hierarchy, in order to the best decide in strategies [8]. Saaty suggest that if the CR be less than 0.1, then degree of stability (stability) on average is acceptable. But if it be greater than 0.1, Then there are inconsistencies in the evaluation process and AHP method may not lead to meaningful results [17].

4-3- To Create Environmental GIS Data Layers

These steps are process that including data acquisition, change format, Geo-referencing, set-up and data documentation [7]. At this step according to available data, a new layer of information required be provided.

4.4 - Classification and Valuation Variables and Data Layers

This step is one of the main steps of Localization by using a geographic information system; data collection will be re-classified and re-evaluated [3]. In this study for valuation of data layer is used model of (AHP). The method based on Analytical Hierarchy Process (AHP) is based on three principles: decomposition, comparative judgments, and hierarchic composition or synthesis of priorities [13]. After identifying the criteria and sub-criteria affecting the localization process Iran Khodro agencies (five main criteria and 10 sub criteria) determined hierarchical structure of decision making problem. For done a pairwise comparison method, the following steps are performed:

4-5 - Create a Matrix of Pairwise Comparison

In this method, the weighting of the criteria is done in software of Expert Choise. Thus the method is that the first a hierarchy of target problem is created that in this hierarchy, the criteria and sub criteria are identified. Then available elements in each level of hierarchy are evaluated from the bottom up to all related elements at a higher level respectively. Hence, the decision alternatives are evaluated based on level of the latest decision indicators. Finally paired comparison matrix is formed that compared importance of the factors is 1 to 9.

Table 2: Comparison of common scale for using AHP [16]

Numerical value	Preferences
9	Extremely preferred
7	Very strongly preferred
5	Strongly preferred
3	Moderately preferred
1	Equally preferred
2,4,6,8	Strong preferences between distances

6-4 - Calculating Weight of Criteria

After comparison matrix, respectively, in the following, the relative weight of the criteria is achieved:

First Step: it is to calculate the sum of values for each column in the paired comparison matrix. Second step: it is standardization of matrix numbers, this means that each component of the matrix obtained from paired comparisons, divided by the sum of the column and obtain paired comparison matrix normalized. Normalized number for i and j is obtained from the following equation:

$$N_{ij} = \frac{V_{i,j}}{\sum_{i=1}^n V_{i,j}}$$

In this formula, j and V_i are paired comparison matrix element, index of N_{ij} is elements normalized and n the number of elements compared.

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Third step: calculating the mean components is standardized in each row of the matrix. It means dividing the sum of the standardized scores for each row on a number of criteria, resulting in column matrix. These means are estimate of the relative weights of the criteria compared. This is done by using the following equation:

$$WI = \frac{\sum_{i,j}^n v_{i,j}}{v_{i,j}}$$

In this equation, W_i index is relative weight and n is the number of criteria that finally, will obtained final weight. The final weight is the basis for decision making and be applied as efficiency ratio of both criteria to achieve the ultimate goal.

After calculating group decision matrixes for main criteria and sub-criteria associated, we calculated the relative importance and the inconsistency rate:

Step 1. To calculate weighted sum vector: pairwise comparison matrix in the column vector "relative weight" has multiplied; the new vector is obtained in this way that is called weighted sum vector.

Step 2. Consistency vector calculation: elements of weighted sum vector are divided on relative priority vector and obtained vector is called consistency index.

Step 3. Obtain λ_{max} obtain mean of consistency vector elements λ_{max} .

Step 4. Consistency index calculation: consistency index is defined as follows:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

n is the number of available option in problem

Step 5. Calculating the ratio of consistency: consistency ratio is obtained by dividing consistency index on the random index.

Consistency ratio of 0/1 or less express consistency in comparisons. A random index is derived from the following table.

$$CR = \frac{CI}{RI}$$

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Table 3: weighting process to informative layers in AHP model for Localization of Iran Khodro agencies, Source: Research findings

Criteria	Weight	Sub criteria	Weight	Inconsistency rate	Criteria	Weight	Sub criteria	Weight	Inconsistency rate
Vacant land	0.135	0-200	0.131	0.03	Distance from city sub roads	0.076	0-200	0.215	0.05
		200-400	0.145				200-400	0.187	
		400-600	0.147				400-600	0.177	
		600-800	0.138				600-800	0.176	
		800-1000	0.186				800-1000	0.142	
		greater than 1000	0.207				greater than 1000	0.104	
Distance from existing agencies	0.132	0-200	0.119	0.04	Land Use	0.075	vacant Lands	0.264	0.04
		200-400	0.122				Transport	0.221	
		400-600	0.142				Administrative	0.174	
		600-800	0.179				Commercial	0.139	
		800-1000	0.218				Farming	0.110	
		greater than 1000	0.220				Land made	0.091	
Building Density	0.129	Without building	0.383	0.08	Distance from the city's main squares	0.074	0-200	0.84	0.08
		12-50	0.273				200-400	0.98	
		120-160	0.219				400-600	0.120	
		Higher than 160	0.125				600-800	0.192	
							800-1000	0.241	
greater than 1000	0.265	greater than 1000	0.265						
Distance from City Center	0.114	0-200	0.111	0.07	Distance from main roads	0.071	0-200	0.119	0.05
		200-400	0.158				200-400	0.137	
		400-600	0.162				400-600	0.158	
		600-800	0.165				600-800	0.159	
		800-1000	0.198				800-1000	0.199	
		greater than 1000	0.207				greater than 1000	0.227	
Population density	0.108	Very low	0.280	0.05	Land slope	0.022	0-2	0.161	0.03
		low	0.223				2-5	0.179	
		Moderate	0.190				5 -10	0.226	
		high	0.170				10 -15	0.112	
							15 -20	0.127	
		Very high	0.137				Higher than 20	0.096	

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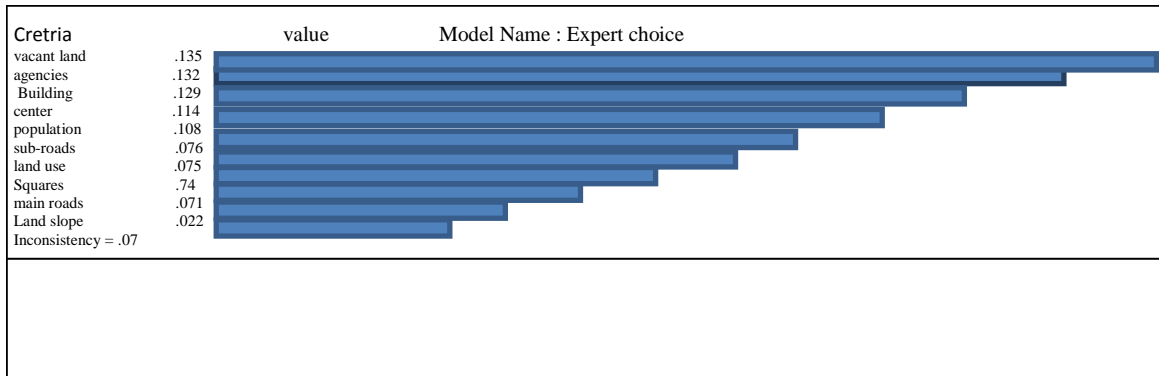


Figure 2: chart of weighting localization main criteria in Iran khodro agencies

Table 4: data layers to create map needed for Localization of Iran Khodro agencies

Row	Data layers	Strategies and characteristics of layers or criteria of weighting
1	Idle land	Identifying suitable and fertile lands, in line with purpose of localization is one of the main issues involved in localization [2]. Idle land to build agencies of Iran Khodro is more appropriate and less costly, and there aren't problems such as destruction and land acquisition made. So idle lands are suitable places to create Iran Khodro agencies, and are given more points.
2	Distance from available agencies of Iran Khodro	According to studies done, it was found that available agencies of Iran Khodro in the city of Rasht don't have proper distribution. Most of these agencies are in city East. Therefore agencies new construction should be such that they servicing, will not interfere with in the work of other agencies. Areas of the city close to agencies of Iran Khodro aren't good place to create agencies. The resulting layer noting that far from agencies of Iran Khodro is consider an advantage, areas of the city far from the available agencies have more weight.
3	Distance from city sub roads	In localization, proximity to the sub-communication networks is important. So easy and safe access of users due to the distance from crowded and polluted streets can be advantage of it .So in localization if distance to this layer be less, thus will gain more points and conversely if distance be greater, thus will gain lower points.
4	Building Density	Density means accumulation and it is the number and quantity of each phenomenon (people, buildings, animals, traffic, etc) in the standard unit of area [6]. In layers obtained for these parameters, weight parts of the city with lower building densities are increased.
5	Land Use	Land use planning is guidelines to direct the development of the city. Necessary to maintain the lands for suitable orienting of urban development by considering all the natural and economic considerations are necessary (Hosseini, 2012:98). Land use map of the study area in six categories: 1 - idle lands 2 - transports 3 - Farm 4 - Office 5 - land made 6 – Commercial. Idle lands have maximum points and land made have minimum points to create Iran Khodro agencies.
6	Population density	Discussion of population density and its role in the planning is most important research issues in the field of urban planning [1]. Layer, resulting in these parameters will increased weight parts of the city with less population density.
7	Distance from the city's main squares	The city's main squares of the city related to main road network because it has performance in the city. Localization has problems including high costs of movement for consumers and as well as the high price of land for the construction and heavy traffic. Based on in localization with increasing the layer distance to this layer gain greater points and with decreasing distance gain lower points.
8	Distance from City	Due to heavy construction density in the city center and heavy traffic at this location, One of the most important factors in choosing the best location for Iran Khodro agencies is distance

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	Centre	from city center. Therefore in this study weight of layer away from the city center will increase.
9	Land slope	According to the regulations of the city may be done maximum 15 percent of urban activity, because higher of it in term of high investments is not cost effective in land leveling and implementation of urban facilities and equipment and the optimum slope for urban planning is to 6 percent and the maximum slope of 9% can build residential complex and urban facilities and equipment [6]. Therefore, locations with 5-10 sloping are the most appropriate locations to create agencies of Iran Khodro and maximum points will be awarded to it.
10	Distance from main roads	Nowadays streets, alleys and communicative roads play a special role in urban transport and these roads are classified based on performance or quality of operation and geometric designs. The main roads of the city are outlining the physical form of the city and separate the types of services and land uses [6]. So in localization if distance to this layer be greater, thus will gain more points and conversely if distance be less, thus will gain low points.

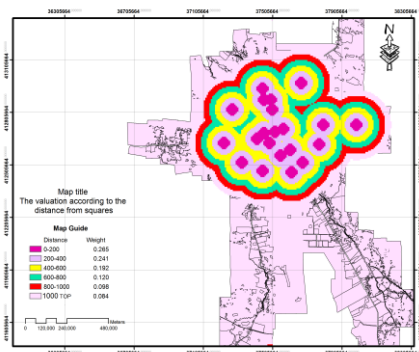


Figure 3: map of the valuation according to the distance from squares

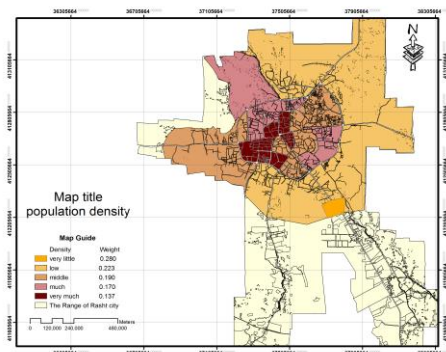


Figure 2: map of population density in Rasht city

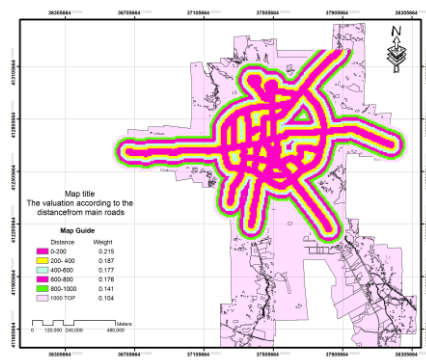
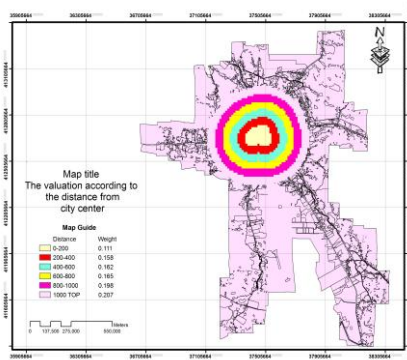


Figure 4: map of the valuation according to distance from city Center Figure 4: map of the valuation according to distance from main roads

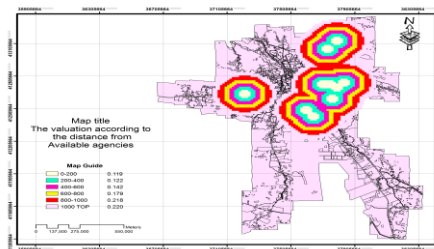


Figure 6: map of the valuation according to the distance from available agencies of Iran Khodro

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7-4 - Combining and Integration of Data Layer

After determination of the effective measures of localization and identification of their weight, the data layers should be integrated by using a suitable method. In this study, for composition of the data layers together are used index overlay model. Accordingly and by using geographic information systems were combined data layers collected and according to scores and valuating data layers, map of the final evaluation to choice the most appropriate locations for new establish branches Samen Institute in Rasht were obtained by using AHP model that its results are shown in map of Figure 7.

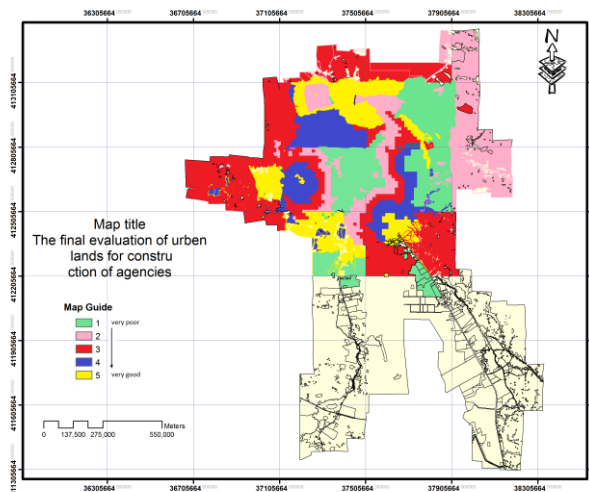


Figure 7: Map of the proper location of construction of Iran Khodro agencies in the city of Rasht, derived from a combination of criteria

Assess and review the current situation, 10 agencies of irankhodro according to the population of the city of Rasht that had a population of 625,500, there are shortages in the number of agencies that proper localization of agencies, maps overlap of criteria and their share was obtained competency map in five categories and quite convenient locations with perfect features of 10 localization criteria are identified, Finally, after overlapping layers and mapping of competence and compliance with map of idle land and visit the place and field view among fit locations with the necessary condition is identified suitable area of agencies and with regard to 1 agency is needed for every 45,000 to 60,000 people, for existing population have chosen the most appropriate and most optimum locations as agencies proposed to land without agency that are idle lands of Rasht surrounding. Despite the lack of suitable land to localization of agencies, the agencies locations have proposed so that the whole city can benefit only modestly and balanced from agencies. Meanwhile it proposed 6 agencies of Iran Khodro that with current agency can completely cover all levels of city, all of agencies have chosen entirely appropriate land.

5 – CONCLUSION

With regard to this problem that if establishment of agencies and distribution of conditions existing in the city in term of spatial structure and physical, social factors, safety and security, health, and available be more appropriate and with beforehand planning, will have more positive work to meet the needs of citizens and visitors to agencies, so, the Geographic Information System (GIS) and Analytical Hierarchy Process (AHP) is used to optimum localization of proper spaces. Layers used in this study are: idle land, available agencies, building density, land use, population density, slope, and distance from the main squares, major roads, and sub roads. After determining the criteria, sub criteria were identified. Then weights of criteria and their consistency rate were determined. So locations that have the most traction to create agencies by using this information, quickly identified as well as localization based on AHP and

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GIS data is done as accurate as advanced. Accordingly, Rasht metropolitan lands with consideration of all effective measures to localization agencies were classified in five categories. Rasht surrounding are considered also a part of perfect locations. thus if location desired to build agency has been the specified user previously, The cost of land use changes and possible damage to buildings will increase initial costs; while land without land use, initial cost only includes the cost of land and building agencies. So after consultation with managers and experts from related organizations, particularly municipality and according to such considerations as the principal of implementations, type of ownership, expenses of purchasing land, feasibility of project implementation, etc, as suitable idle lands were appointed as the most appropriate land to localization of agencies. Finally, after overlaying layers and providing competence mapping, site visits and field observations, the appropriate zones of specific agencies and according to their population of 45,000 to 60,000 was optimized 1 agency. Studies conducted indicate that Rasht need to six new agencies of Iran Khodro and also the most appropriate location for agencies of Iran Khodro is the west, east and north of the city.

6 – RECOMMENDATIONS

According to research findings and implementing agencies Iran Khodro with zonation map of value of land toward establishing Iran Khodro agencies is determined that the spatial distribution of Iran Khodro agencies in the city of Rasht doesn't have good condition. In most urban areas, there is a need to establish new Iran Khodro agencies. So in this part of research are proposed 6 Iran Khodro agencies in the lands with very well and good capability.

Table 5: Location of Iran Khodro agencies proposed for construction in the city of Rasht, Iran, Source: Research findings

Row	Type of use	Address
1	Vacant land	Between Sabryn Square toward Gholipour Square
2	Vacant land	Between Gas and the Razi Square
3	Vacant land	Gas Square of Lakan Road after Islamic Azad University
4	Vacant land	Golsar, west side of Guilan boulevard
5	Vacant land	Gil square
6	Vacant land	Pasikab Opposite Boxing Club

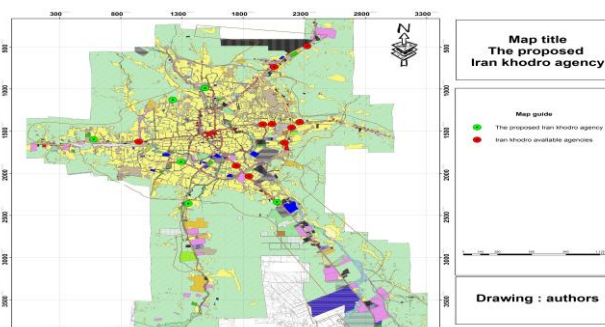


Figure 8: Location of Iran Khodro agencies proposed for construction in the city of Rasht, Iran, Source: Research findings

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