

Evaluation of Ecology, Land Uses in Different Parts and the State of the Land Uses' per Capita of Ahwaz City

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Received 5 April 2016; accepted 9 May 2016; published 12 May 2016

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Abstract

There has been a progressively rivalry among different cities for attaining development opportunities and attraction of economic and social capitals in the recent years. In this universal rivalry, the quality of spaces and urban design are considered as key factors for evaluating cities. Therefore, in this research in order to comprehend the spatial deficiency of the public welfare services in different regions of Ahwaz city, issues such as land uses in different parts of the city, the state and per capita of land uses in the city and comparison of the current land uses with per capita of Comprehensive Plan approved in 1988 are analyzed. Also, evaluation and comparison of the land uses distribution state in different parts of Ahwaz in form of different regions of the city, population distribution in those regions, residential spaces distribution in the regions, commercial spaces distribution in the regions, educational spaces distribution in the regions, religious, sanitary and therapeutic, athletic, administrative spaces, green spaces and other spaces distribution in the different regions are also evaluated in this research.

Keywords

Ecology, Land, Ahwaz City, Geography

1. Introduction

Nowadays, rapid increase of population, expansion of urban and natural resources restriction have caused many problems for humans, which make planning necessary for all countries. Evacuation of the villages, expansion of the cities, and willingness for living in cities regarding its special issues, especially in the Third World countries,

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How to cite this paper: Bahadori, B. and Boynagryan, V. (2016) Evaluation of Ecology, Land Uses in Different Parts and the State of the Land Uses' per Capita of Ahwaz City. *Open Journal of Ecology*, 6, 288-302.

<http://dx.doi.org/10.4236/oje.2016.66029>

are so complicated and overlooking them will add on economic and social problems. So, for attaining a stable development trend, geographical studies and researches can be useful here.

Cities are regarded as the main residence for cultural and industrial communities. City is the work, education and recreation place for citizens. It is a base for people's interactions, creating cultural structure for communities, and bonding people to each other, which have been the reasons of civilization in most of the cases. In this environment, all the actions and reactions between people and groups need defined and appointed spaces, and these should have proper quantity and quality related to their usages.

Urban development in the last decades has been in a way that has led to the unbalanced usage of urban lands and, as a result, has changed villages into cities and small cities into mega cities. This has forced planners to meet these challenges and let them know their important duty in which they should protect security, serenity and welfare of residents from being affected by these inconsistencies. Therefore, they should always try to provide more accurate plans that are consistent with location and time conditions.

The world is rapidly changing. Generally, the affective factors causing changes in phenomena can consist of two natural and human categories. Natural and human factors have different effects on phenomena and features in different locations and times. Based on the extent of mentioned effective factors, trend and form of changes will differ. In some cases, natural and human factors help each other to change a phenomenon or a feature, and in some other situations they neutralize each other's effect. In extensive scales, earth is considered as a source and land use as usage of this source, but in urban scales, instead of evaluation of earth based on productive power of soil or so, rather it is evaluated based on power of using soil trend for basement of different activities. Using land uses maps, main characteristics of regions can be known. In the same extent that land uses and land coverings maps have special importance, knowledge of land use changes in certain duration is also important.

Remote sensing has had applications in detecting and recovering changes through data and in evaluating changes of the land uses and so on. Using data from satellite images has prevailed in the world, since it has a universal view of phenomena and land sources, records characteristics of phenomena, gains needed information by electromagnetic waves and spectrums, reflects phenomena by detectors, and finally analyzes them by computer software and hardware.

2. Subject Literature

Industry growth and GIS have been in line with each other in the 1980's and 1990's. Growth speed in all systems increased in 20th century and finally a free growth with open source (through internet) for GIS was created, like Grass GIS and Quantum GIS, which flows in a scientific system. The following instances can be mentioned regarding Iran:

-Mahmoudzadeh presented his master degree thesis entitled "usage of multi-temporal satellite data in GIS aiming evaluation of Tabriz's land use changes". This project was aimed at modeling physical extension of city Tabriz in terms of land use changes attained from multi-temporal images of detectors alongside digital maps and finally it was witnessed that significant changes in land uses had taken place.

-Rahimiyan through researches about Tehran, first evaluated the city based on natural and human factors and then explained the urban land uses in different parts and analyzed them via digital data and images. He created original, auxiliary and base maps, then analyzed them using geographical software and at the end presented the sample maps for residential development for the city Baghershahr [1].

-Ziya'yanin his doctorate thesis entitled "digital methods for detecting changes in urban areas using Remote Sensing data" first discussed the necessity of using these methods for cities, towns, etc., and discussed the reasons for increasing urban problems which have been as a result of migration, increase in growth of city's population and so on. In this thesis, multi-temporal and multi-spectrum satellite data have been used and applied on India's Madras city. The period during which the research took place was from April 1933 to April 1994 and 1995, and it was by India's IRS satellite and LIS II detector. At the end, he analyzed landuses and covering changes, and therefore it was known that sea's water has advanced and moved toward the littoral areas in a region with nearly 10 kilometers in the fishing littoral areas over a course of 20 years, which it made this place as a tourist-attracted region. Finally, he concluded that most of the changes had occurred in Madras coastline areas [2].

-Brandon & Bottomly, through using Landsat satellite's images worked on rural areas of Arkansas in United States. In this research, work with GPS, earth sampling as well as correspondence of earth source data and satellite images and GPS accomplished, and also image processing methods, image classification, changes detection

and at the end providing land uses, covering changes maps and preparation of output maps were performed [3].

3. Research Methodology

The aim of this research is to evaluate the ecology condition, land uses in different parts of the city and the state of distribution and land uses per capita in city Ahwaz. The data collection tools are as follows:

Topography maps: These maps were used as study base and general structure for geo-referencing satellite images and other scanned maps. In this research two types of topography maps on a scale of 1:5000 and digital maps in a scale of 1:25,000 were used.

Geological maps: For evaluation of tectonic and geology condition of studied areas, geology maps in small and medium scales like 1:25,000 and 1:100,000 and in large and applied scales like 1:25,000 and 1:10,000 from Oil Ministry were used.

The used images were acquired by Landsat, IRS, and Spot satellites. Evaluation of Karoun River, from the beginning of the city to the end of its limitation was carried out by aerial photos taken in year 1955.

4. Findings

Ahwaz is the center of Khuzestan province, with an area of 222 square kilometers and service limitation of 300 square kilometers and 895 square kilometers of shielding region is the largest city of Khuzestan. The city is located in 31 degrees 20 arcminutes N latitude and 48 degrees 40 arcminutes E longitude, and in an 18 m above sea level flat. The city of Ahwaz has common borders with cities of Sheyban, Veys, Molathani, Shoushtar, Dezfoul, Shoush from the north, Ramhormoz from the east, Hamidiyeh and Dasht-e-Azadeghan from the west, and Shadeghan, Mahshar and Abadan from the south. The city has 8 municipality regions each of which has three or four zones.

Khuzestan province has an area of 64,664 square kilometers and is located between 30 degrees 5 arcminutes and 32 degrees 30 arcminutes N latitude and between 47 degrees 40 arcminutes and 49 degrees 50 arcminutes E longitude. The province has common borders with Lorestan province from the north, the country of Iraq and Ilam province from the west, Persian Gulf from the south, and Chahar Mahalva Bakhtiyari and Kohkiluyehva Boyer Ahmad provinces from the north. This Plateau is a plain, featureless, and almost squared land. Its North side width is 110 KMS and the distance between North side and sea is 200 KMS. The height of north side from mean sea level is 180 Meters (Ahvaz Comprehensive plan). Khuzestan province's roughness can be categorized into two regions; Mountainous region in north and east of the province and the plain region (Khuzestan Plateau).

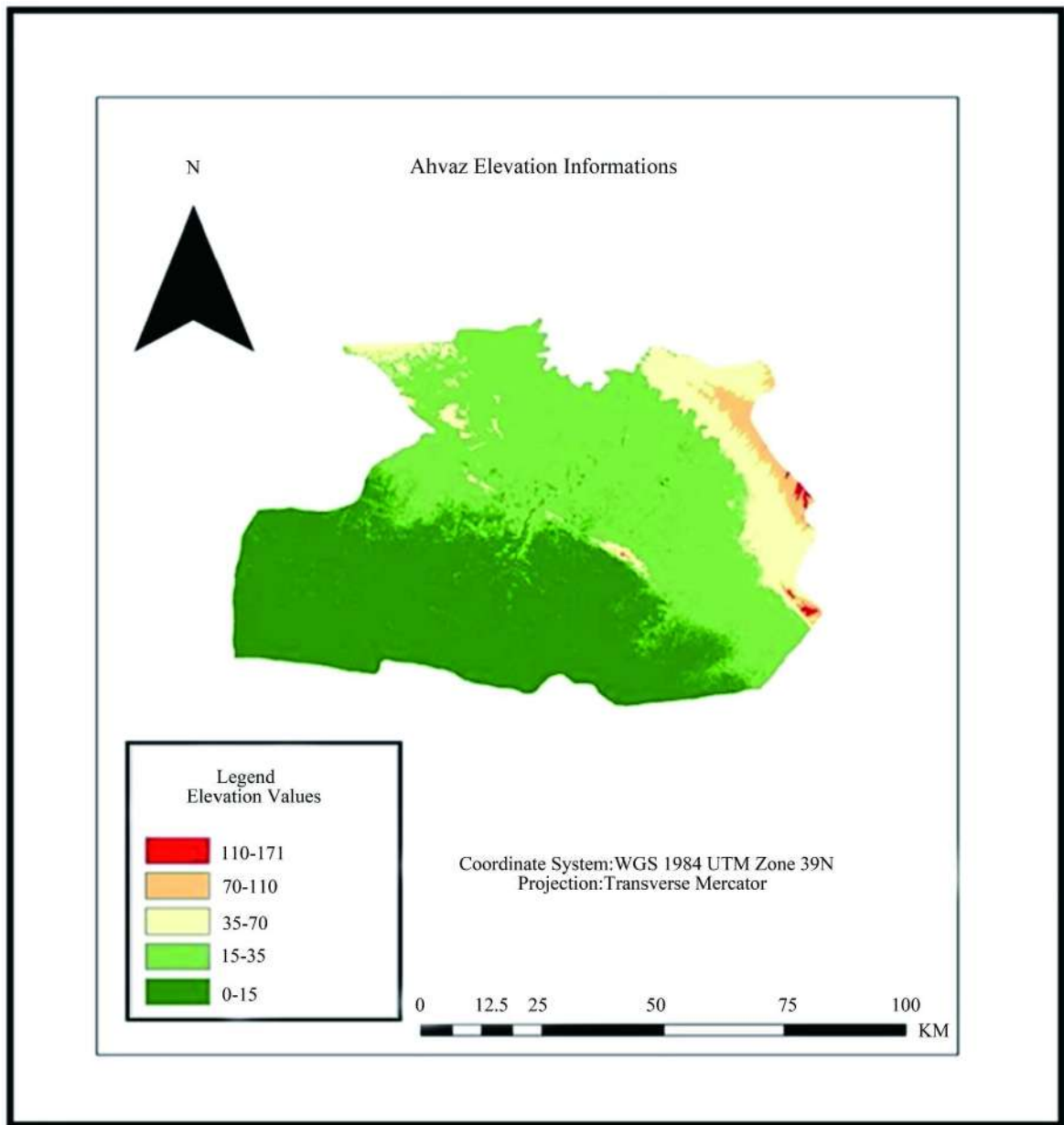
The high northern and eastern part of Khuzestan is a part of western Zagros southern region and these heights gradually decrease toward the Plateau and is disconnected by river. Direction of these wrinkles is toward Northwest, which gradually changes toward South. Mountains such as Chou, Zardkuoh, Savish, Bahl' hava, Mi'yangran, Monghasht, Mamazad, Siyah and Chal are among the most significant mountains of this region. The sole internal heights of Khuzestan are a range of heights that are placed in center of province. These ranges of heights have begun from 32 kilometers from east of Karoun river and are disconnected by Karoun river and then continue to the Northwest up to the Karkheh river. The elevation of these heights does not exceed 120 meters.

There are vast wetlands in the flat of Khuzestan, which are created due to the low elevation of the plain by the sea and in some parts due to the river stream, and because of having permanent water are called Hoor (lagoon). Hoorolazim, Mishan, Miyan'garan and Shadegan are the most important hoor's (lagoons) of Khuzestan. Shadegan lagoon is located next to the Karoun River and Karoun's spates in the time that the water is high used to enter into this lagoon in the past. The depth of water in the deepest part of these lagoons is mostly less than 10 meters (**Map 1**).

In different parts of the city due to erosions and fractures, the height of Karoun River's bed would be less than its adjacent areas, but the elevation difference is not so high as to prevent the arrival of the flood during heavy rains and, as a result, river's water will rise and flow in the city during the rainfalls.

In the southeastern parts of the city Karoun mountain with a height of 120 meters and a in the northwest side of city vast area of sand dunes with a height of approximately 50 meters are located (**Map 2**).

In general, except in a few cases, there is no significant elevation difference compared to the extent of the city. Karoun mountain's slope in the northern side maximally is 45 percent and in the southern side 8 percent. The homo-slope maps have presented the slope percent in the height of region. The heights of the East and Southeast and the sand dunes located in East and West of Ahvaz have a general slope between 5 to 45 percent (Ahvaz



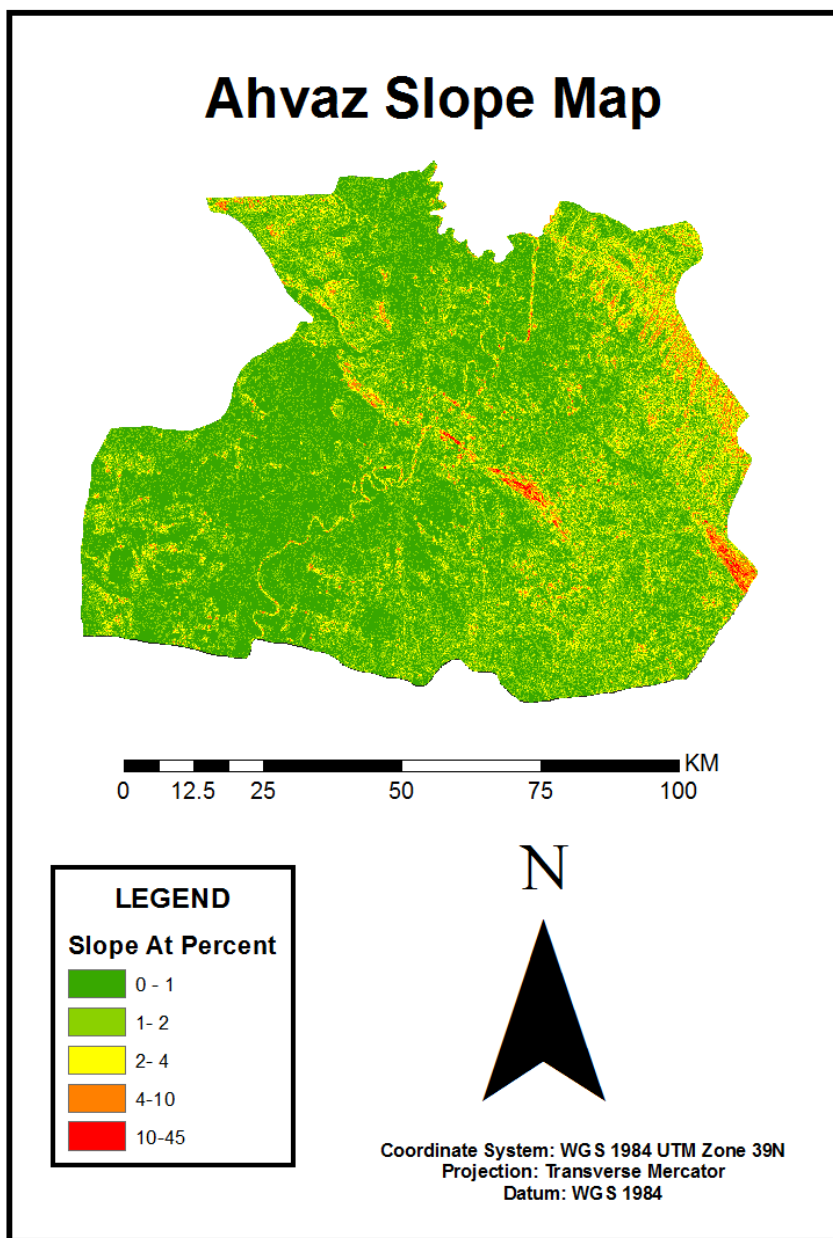
Map 1. Elevation information of Ahvaz (author).

Comprehensive plan).

The city Ahvaz, in general, has no considerable relief, except Karoun Mountain, and topography factor hasn't been a forming factor or a hindrance in development. One of the most important issues in Ahvaz that is associated with its topography is the issue of surface water guidance, which causes severe damages to the city and the life of citizens during rainfall and also causes severe problems to sewage disposal system.

Evaluation of land uses in city Ahvaz in terms of area and per capita

According to the year 2007 census, Ahvaz has a population of 975,000 and an extent of 21,925 hectares (Iran's Census Center). The city comprise of eight regions. Regions 4 and 1 are the largest and smallest regions of the city, respectively. Out of all extent of the city, which is 220 square kilometers, 57 square kilometers, *i.e.* 27 percent of city's area, have not been used and are barren and rest of the areas include land uses and are considered as active parts of the city. The considerable amounts of unconstructed parts are located in regions 5 and 8 in south and east of the city. Respectively, out of 220 square kilometers of the city's area 116 square kilometers



Map 2. Ahvaz slope map (author).

forms constructed area of the city (Ahvaz Comprehensive plan).

Presenting an image from condition of earth usage in the city, urban land uses, and specific and un-urban land uses have been distinguished from each other. Specific land uses include military, agricultural, livestock, river and miscellaneous land uses. Other service and green spaces land uses are considered in the next category. Thus, in the first step for comprehending how to use lands in the city, five land use groups are considered as follows (Table 1).

- Residential land uses including houses and housing compounds.
- Service land uses including welfare and infrastructure services and recreational and green space areas.
- Transportation network from main roads and highways to the local access roads.
- Specific land uses including agricultural, military, livestock, river and miscellaneous land uses.
- Barren and unconstructed land uses including barren lands and abandoned places.

Karoun River which flows from Northeast to Southeast includes 11.1 square kilometers of the city. Industrial

Table 1. Land uses distribution in the city of Ahwaz (Ahvaz comprehensive plan).

Land-Use	Area (Hectare)	Percentage	Per capita (Square Meter)	The Percent of Urban Constructed Area
Residential	3569.66	16	36.66	30.51
Service and Green Space	4534.09	21	46.56	38.75
Unconstructed and Barren	5641.57	26	57.93	–
Specific and Miscellaneous	4582.35	21	47.06	–
Transportation Network	3597.47	16	3597.47	30.74
Total	21925.14	100	21925.14	100

lands which mainly are concentrated in form of heavy industries in east and Southwest of the city form 10.5 square kilometers of the city. Green spaces which have an area of 7.5 square kilometers lack a balanced distribution in the city and most of them are located in margin area of Karoun River and in regions 3 and 8 (Table 2).

Population density index shows the immobile population compressibility based on the area of the region. The evaluation of the overall density of population in the city indicates that the most compact regions of the city are located in center and southeastern part of the city. Regions 1, 7 and 6 have the most density of Ahvaz. The density of the regions ranges from 59 to 116 persons in hectare. Their neighbor regions, which are regions 3 and 4, are in the next place and have a density of 45 people in hectare. Other regions possess less than 42 people in hectare density (Map 3).

Areas dedicated to commercial land use in Ahvaz shows that commercial activities are mainly concentrated in the center of city (CBD in the region 1) and city center has a 31 percent of the commercial activities. In the next places, regions 6 and 5 possess the most amounts of this land use. Nearly 24 percent of the commercial activities happens in the region 6 and mainly are in form of repair activities in the vicinity of the Khoramshar Street (Diagram 1 & Diagram 2).

At present, per capita of higher education in Ahvaz is 3.24 square meters. The area allocated to public higher education in the city indicates that about 88 percent of the higher education level belongs to the Zone 4. The high percentage of this land use in the region 4 is due to the high area of Shahid Chamran University, in a way that this academic complex includes about 71.5 percent of higher education area in the city. In the next place, region 5 possesses 6.5 percent of this land use (Map 4 & Diagram 3).

Study of distribution state and area of the lands dedicated to religious spaces in the city shows that this land use enjoys relatively balanced distribution in the city. The amount of area and per capita dedicated to religious land use shows that region 1 allocates 33 percent of the whole religious areas of the city.

Surveys show that therapeutic land use distribution among the regions of the city is highly unbalanced. Approximately most of the therapeutic spaces are located in regions 3 and 4. In this regard, these regions per capita are respectively 2.17 and 2.12 square meters that is higher than average per capita of this land use in the city, which is 1.18 square meters.

Evaluation of the athletic land uses in the city shows that the most areas of this land use is located in region 4, which is about 32 percent of the athletic space in the city. Per capita of athletic space in this region is 1.9 square meters that is higher than average city's per capita, which is 2.35 square meters. Despite the fact that region 4 allocates the highest amount of this land use, the most athletic per capita, which is 2.22 square meters, is located in region 8, which is 25 percent of the whole area of this land use in the city. Regions 3 and 7 with per capita 1.13 and 1.05 square meters enjoy a relatively proper amount of per capita. Other regions have very low athletic space per capita (Diagram 4 & Diagram 5; and Map 5).

Distribution of administrative spaces in the city

Ahvaz city has a relatively concentrated administrative center. Area and distribution of the administrative land use in region of city shows that the most administrative activities such as state departments, work offices and companies are concentrated in the Amaniye district, which is located in region 2 (Map 6).

Distribution of green spaces in Ahwaz regions

The maps of the city in terms of green space per capita classification and distribution show that green space in the city has a highly unbalanced distribution. Green space per capita in the city varies from 31.27 square meters in the region 3 to 0.7 square meter in the region 6. For example, region 3 with 32.27 square meters allocates the greenest spaces in the city. In the next place, the most amount of green space is located in the region 8 with per capita of 10.43 square meters (Map 7).

Table 2. Area and per capita of land uses in the city (Ahvaz comprehensive plan).

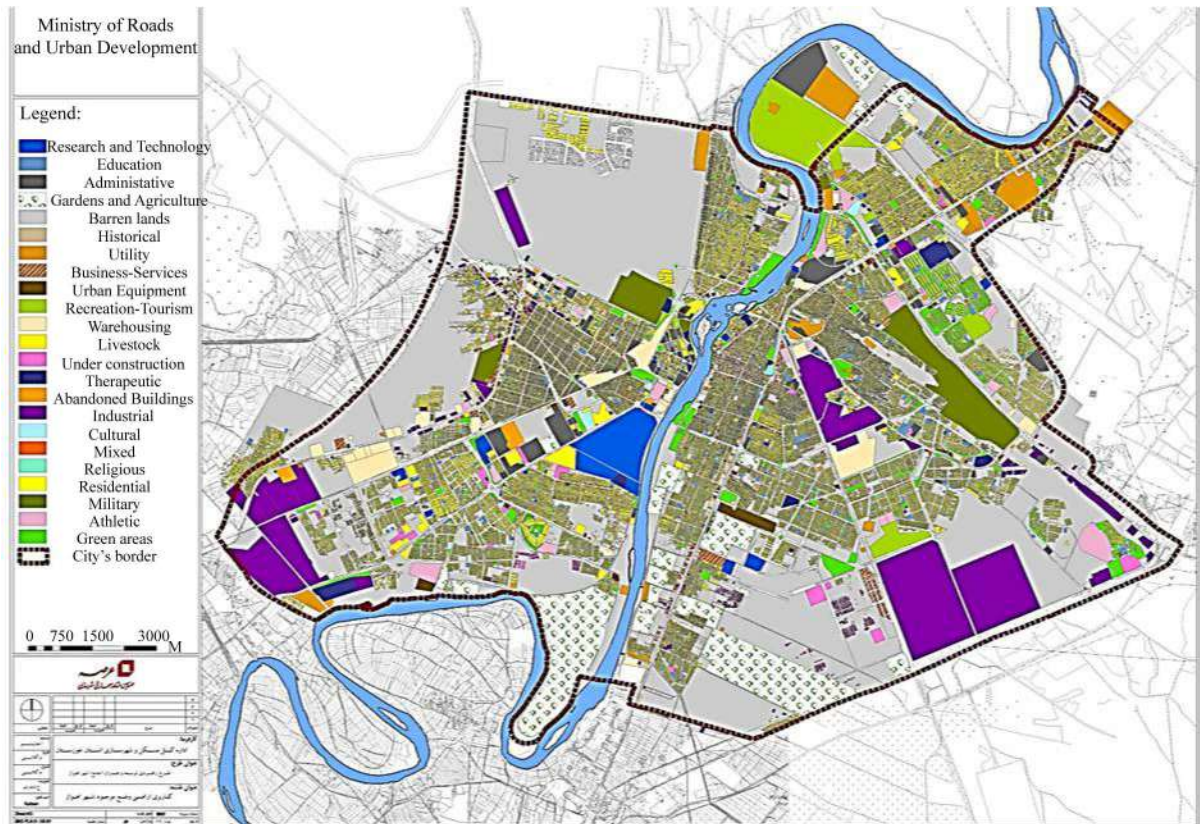
Row	Land-Use	No.	Area (Hectare)	Per capita (Square Meter)	Percentage
1	Residential	151848	3569.66	36.66	16.28
2	Commercial	4048	153.55	1.58	0.7
3	Educational	616	182.36	1.87	0.83
4	Higher Education	41	315.46	3.24	1.44
5	Religious	286	31.29	0.32	0.14
6	Cultural	69	39.6	0.41	0.18
7	Tourism	35	23.06	0.24	0.11
8	Health	106	114.47	1.18	0.52
9	Recreation	1	3.57	0.04	0.02
10	Sports	99	228.74	2.35	1.04
11	Office	333	310.82	3.19	1.42
12	green space	668	741.24	7.61	3.38
13	Military-police	74	2489.25	25.56	11.35
14	Industrial	654	1049.85	10.78	4.79
15	Municipal Facilities and Equipment	89	298.15	3.06	1.36
16	Transport and Storage	1071	487.35	3.06	2.22
17	Unconstructed and Barren	3358	5551.51	5.00	25.32
18	Road Network	0	3597.47	36.94	16.41
19	Public-Social Services	0.56	0.56	0.01	0.00
20	River	1	1109.17	11.39	5.06
21	Agriculture	16	896.57	9.21	4.09
22	Gardens	20	328.04	3.37	1.50
23	Livestock	1	0.32	0.00	1.50
24	Commercial Complex	4895	111.55	1.15	0.51
25	Under Construction	3066	191.71	1.97	0.87
26	Abandoned and Dilapidated	351	90.06	0.92	0.41
27	Other Miscellaneous	0.63	0.63	0.01	0.00
28	Other	36	9.13	0.09	0.04
29	Total	171803	21,925.14	225.15	100.00

Distribution of industrial land use in the Ahvaz's regions

Area allocated to industry land uses and workrooms show that the region 8 along the Imam Khomeini street and the global railroad (Bandar-e-Imam Road) are the main concentration of heavy industry in the city of Ahvaz. This region's per capita amounts to 43.65 square meters that is far more than average city's per capita, which is 10.78 square meters (**Diagram 6 & Map 8**).

Barren lands distribution in the regions of the city of Ahvaz

Evaluation of unconstructed areas in the city indicates that the most barren lands are located in the regions 5 and 8-in a way that barren area per capita in these regions with 256.6 square kilometers and 112.67 square kilometers are several times more than Ahvaz's per capita (56.78 square kilometers). The central region of the city (**region 1**) with 6.65 square kilometers per capita allocates the least barren and unconstructed area among the city's regions (**Map 9**).



Map 3. Current Ahvaz's land uses (Ahvaz comprehensive plan).

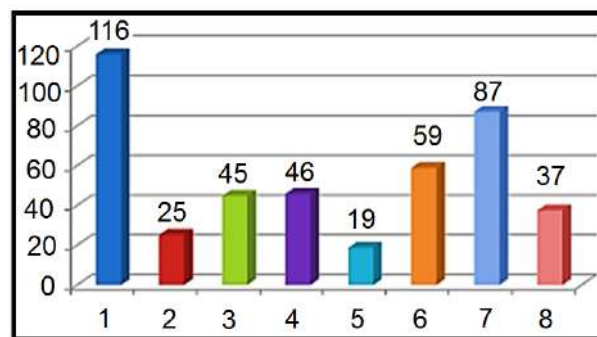


Diagram 1. Population gross density in Ahvaz's regions (author).

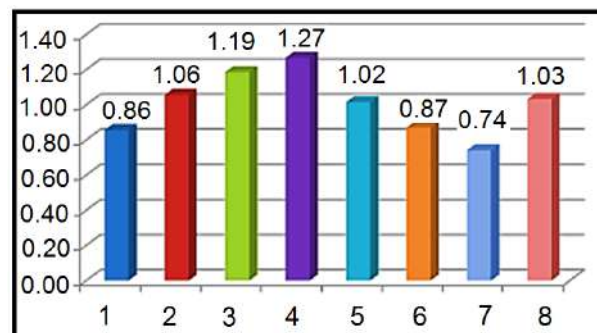
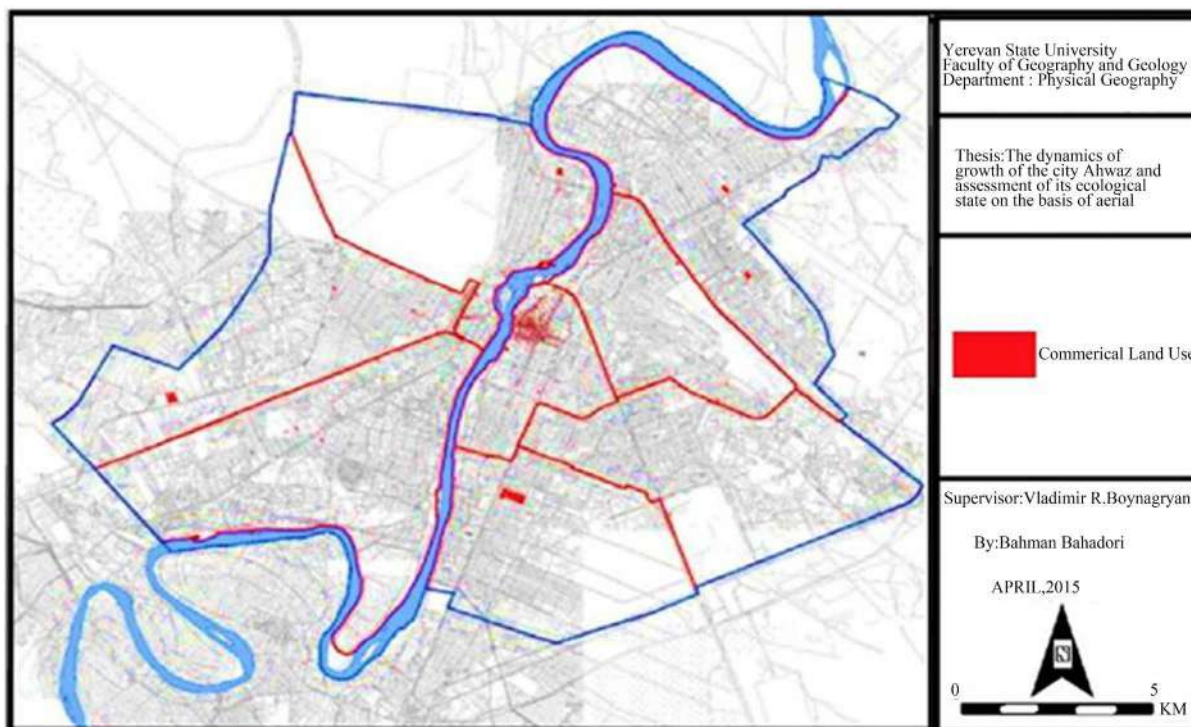


Diagram 2. Residential per capita in Ahvaz's regions (author).



Map 4. Commercial land use distribution in the city Ahvaz (author).

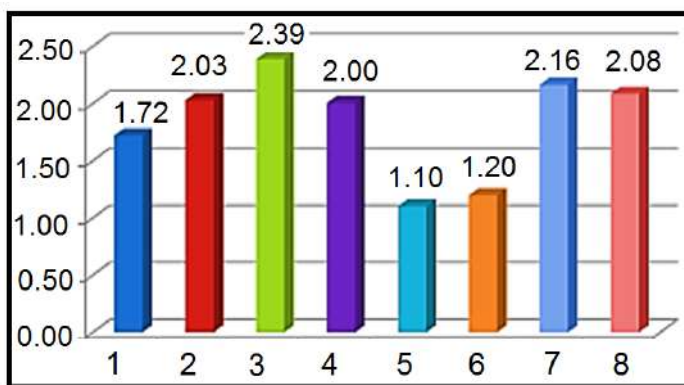


Diagram 3. Educational per capita in the city Ahvaz (author).

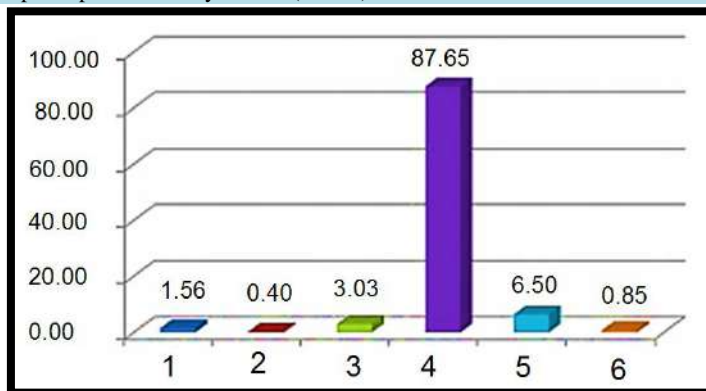


Diagram 4. Higher education per capita of Ahvaz's regions (author).

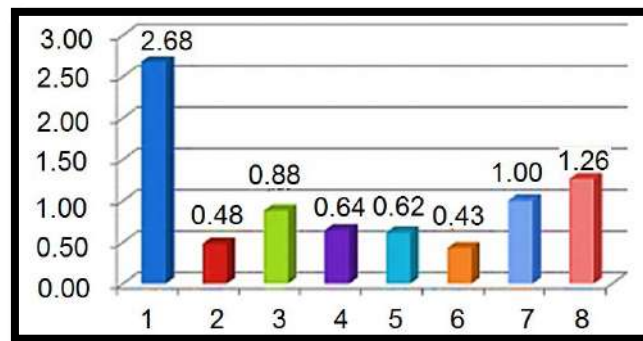
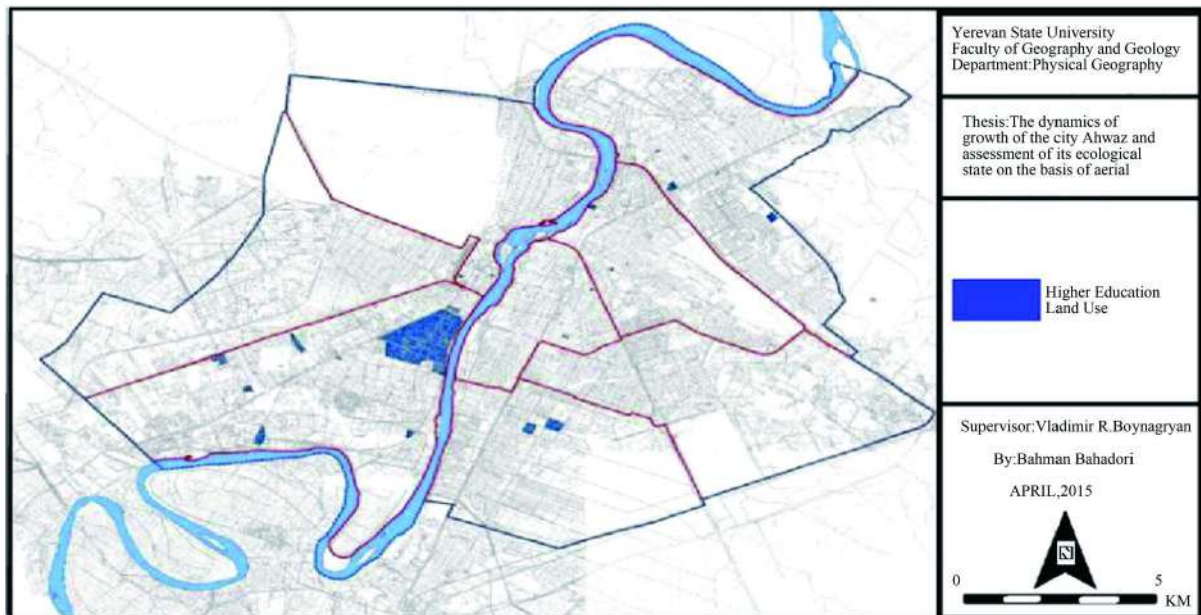


Diagram 5. Religious land use per capita of Ahvaz's regions (author).



Map 5. Higher education distribution in Ahvaz's regions (author).

Distribution of urban infrastructures in the city's regions

Study of the state of area and distribution of allocated lands to the urban infrastructures in the districts of the city shows that the most area and per capita of this land use is located in region 3 with per capita of 10.85 square meters, and region 5 with 9.53 square meters is in the next place (**Diagram 7**).

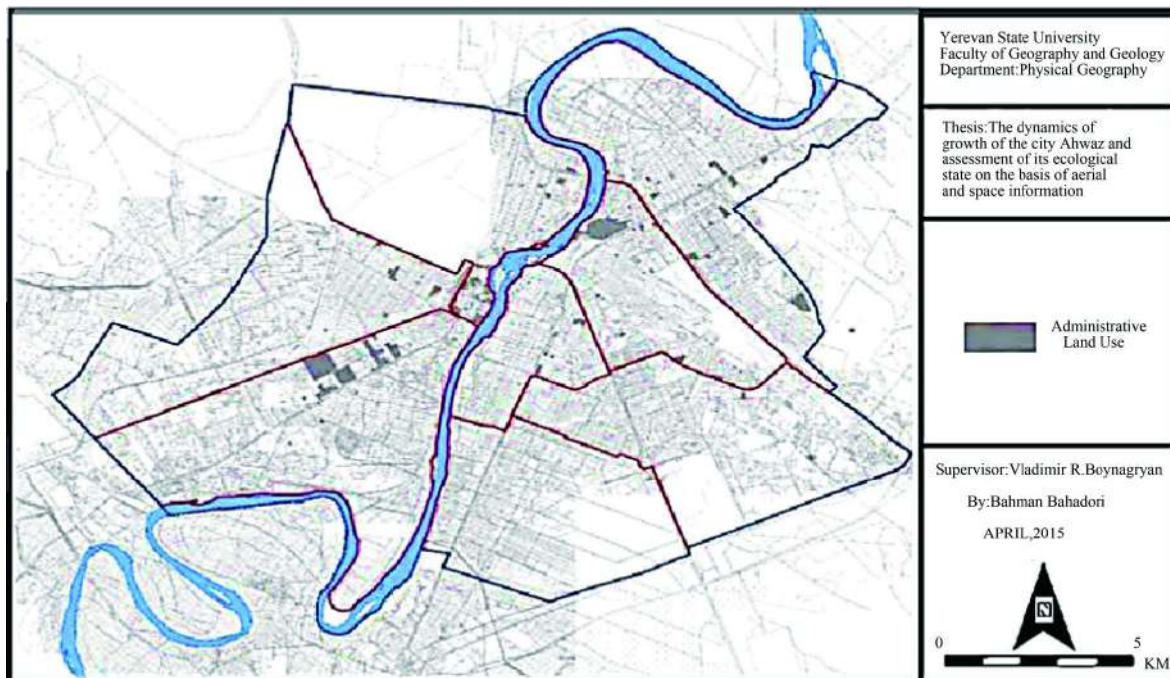
The state of urban wastes and their landfill

Ahvaz city with a population of more than 1,100,000 people and about 222 square kilometers area produces approximately 800 tons of household wastes per day. Each person produces about 730 grams waste per day and municipality collects the waste once per day in residential area and sometimes twice in commercial area.

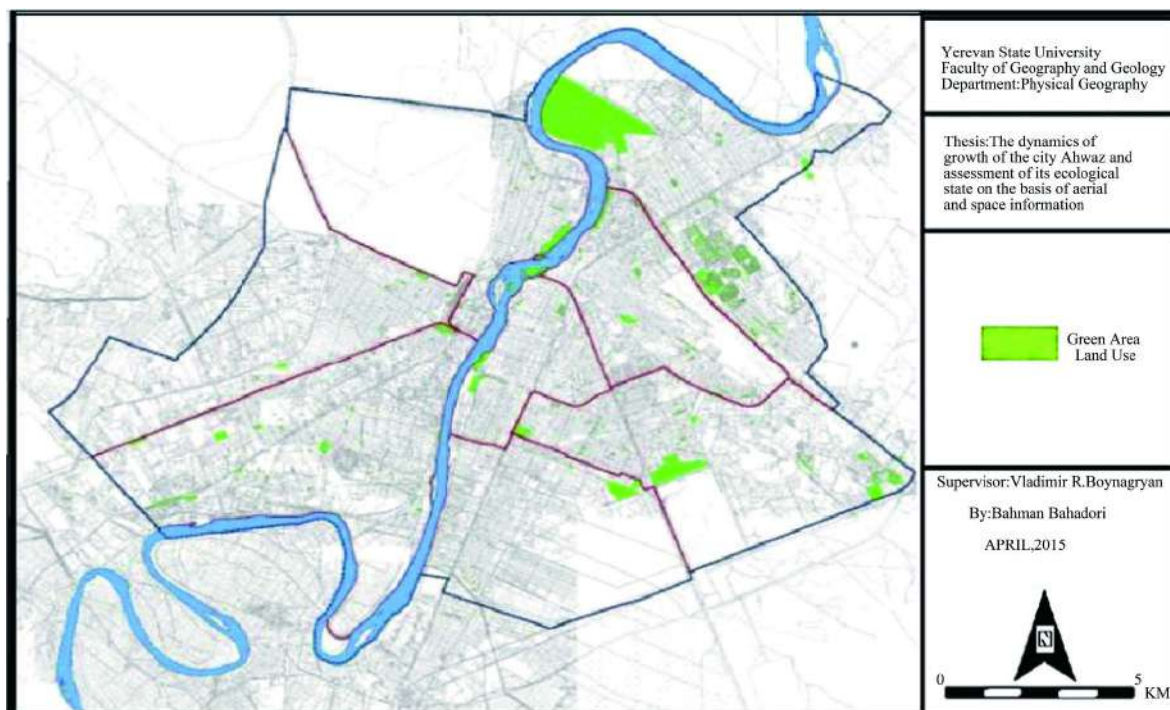
The waste is collected by mechanized vehicles in most parts of the city and by traditional procedures in suburban and rural areas due to the technical consideration of collecting operation. Collected waste in the east of the city are carried to the sanitary landfills of the municipality in the Boroumi area and wastes in the western areas, after conveyance to the temporary places, are carried to the landfills by poisonous trailers (Ahvaz's waste management department, 2015).

The comparison of the current situation and approved Plan of the year 1988

Comparing the current situation of the land uses in the city with the land uses suggested in the approved plan of year 1988 shows that a considerable amount of the plan approvals haven't yet been implemented. For example, 20 square meters was suggested for residential land use in the mentioned plan, while at the moment the number is 17.23 square meters. Compared to the proposed per capita in Comprehensive Plan, commercial performance



Map 6. Administrative land use distribution in the city's regions (author).



Map 7. Distribution of green spaces in the Ahwaz's regions (author).

in the current situation has about 1.22 square meters difference and shortcoming. The same goes to other performances including educational, religious, cultural, therapeutic, green space and industrial land uses and also infrastructures, transit and storage, transportation and public and social services. Regarding other performances including higher education, tourist service, athletic, administrative and military land use, there is no shortcoming compared to the proposed Plan approved in year 1988. Overall comparison of current situation area and per capita

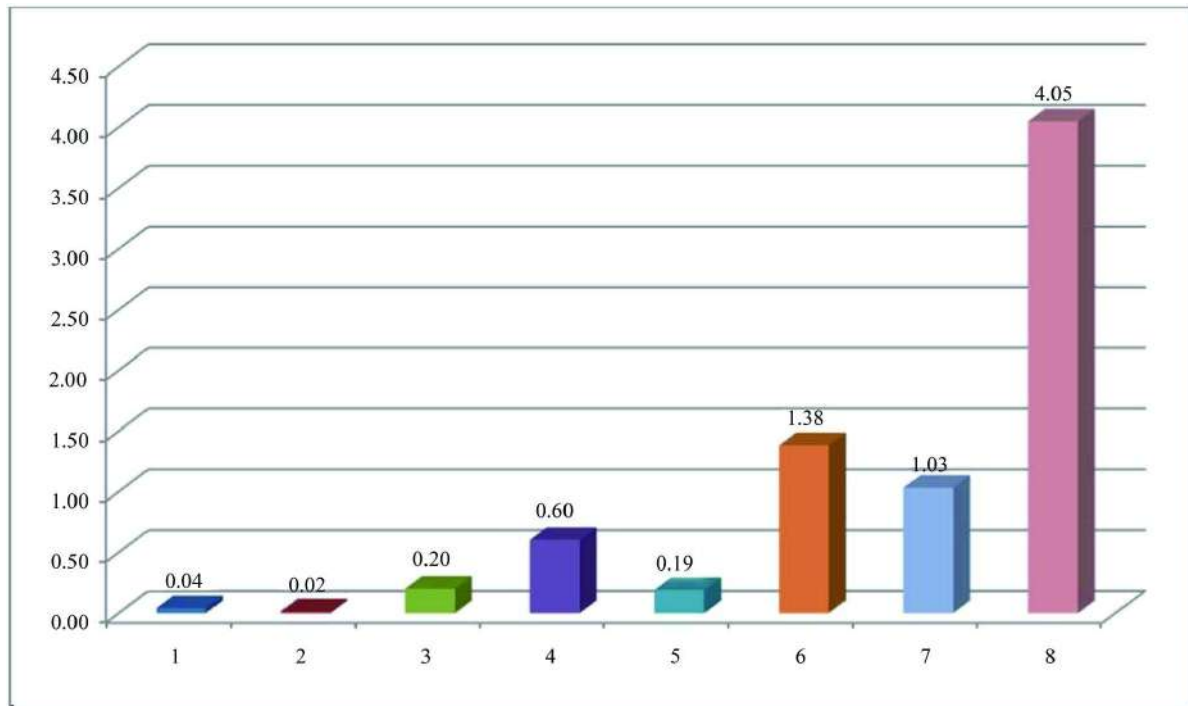
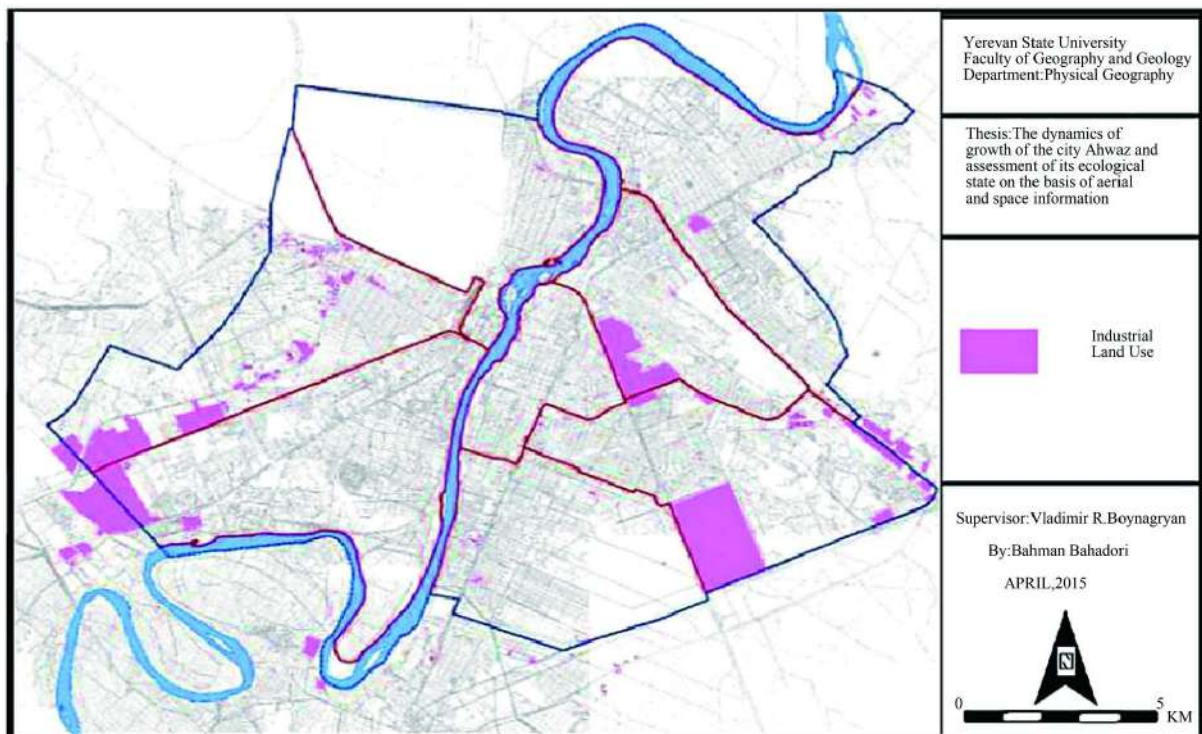


Diagram 6. Industrial land use per capita in the Ahvaz's regions (author).

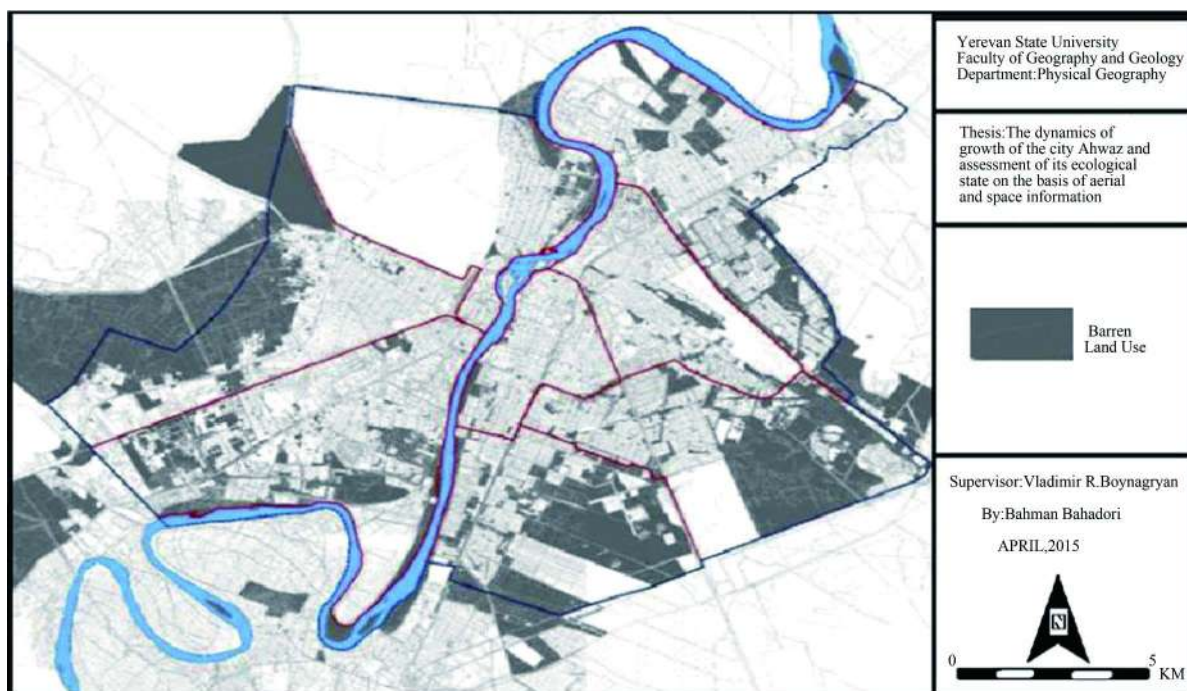


Map 8. Industrial land use distribution in the Ahvaz's regions (author).

with proposed land uses in the Comprehensive Plan approved in year 1388 is presented the table below (Table 3).

Structure and texture of the city

Transportation networks are linear elements in the structure of the city that act as a factor for creating



Map 9. Barren spaces distribution in the regions of the city of Ahvaz (author).

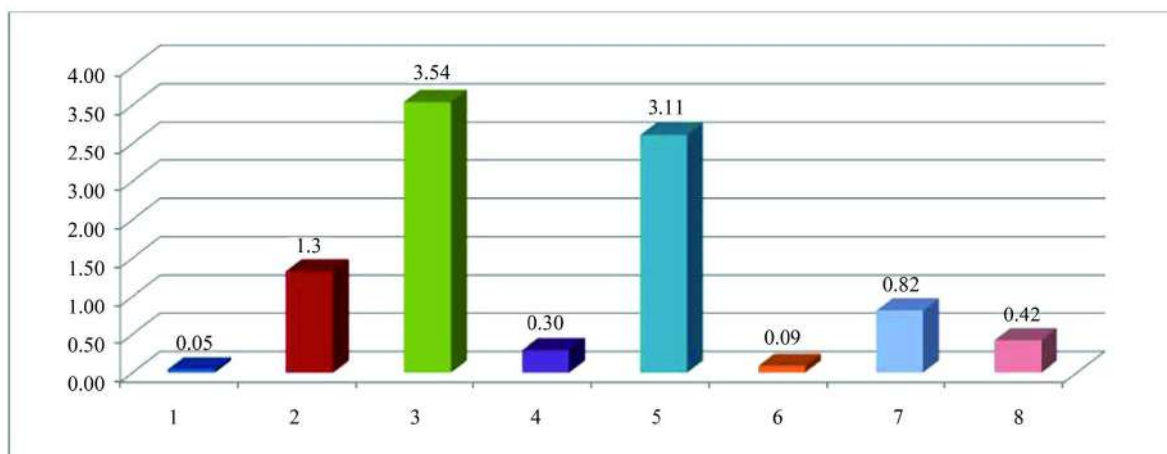


Diagram 7. Infrastructure land use per capita in different regions of the city Ahvaz (author).

consistence between urban spans and centers. The main roads in the city of Ahvaz have relatively a radial structure which goes out of the old center of the city that has an organic structure and spread around that. Except a small part of an old limitation of the city that has this organic texture and has stemmed the main roads, minor roads that define the structure and connecting state of spans and districts mainly follow a checkered pattern.

5. Discussion and Conclusions

The general structure of the city consists of factors each of which separately has a fundamental role in making system of city and a collection of them makes the structure of the city be influenced by effective forces resultant. Ahvaz, due to the special geographical position, Karoun River, oil fields, industries, important major roads, railways and large ranges and specific urban zones, is divided into different districts each of which has a different and specific characteristic. Generally, because of having a one-cored system, Ahvaz structure faces kind of concentration in terms of texture and activity, which despite the fact that river passes through the city, this

Table 3. Comparison of current situation area and per capita with proposed land uses in the comprehensive plan approved in year 1988 (author).

Land Use	Proposed Area	Available Area	Available Area	Proposed Area	Land Use
Residential	2910.27	3569.66	3569.66	2910.27	-2.77
Commercial	271.63	153.55	153.55	271.63	-1.22
Educational	190.95	182.36	182.36	190.95	-0.1
Higher Education	207.40	315.46	315.46	207.40	1.07
Religious	41.04	31.29	31.29	41.04	-0.1
Cultural	88.40	39.60	39.60	88.40	-0.5
Tourist Attract on Area	21.00	23.06	23.06	21.00	0.02
Therapeutic	212.96	114.47	114.47	212.96	-1.02
Athletic	291.02	228.74	228.74	291.02	0.35
Administrative	72.06	310.82	310.82	72.06	2.45
Green Space	1543.92	741.24	741.24	1543.92	-8.31
Military	419.69	2489.25	2489.25	419.69	21.23
Industrial	1683.17	1049.85	1049.85	1683.17	-6.48
Urban Infrastructure	610.00	298.15	298.15	610.00	-3.23
Transportation and Depot	716.92	487.35	487.35	716.92	-2.39
Street Network	3724.27	2384.26	2384.26	3724.27	-12.33
Social and Public Service	223.66	0.56	0.56	223.66	-2.30
Total	108.11	12419.67	12419.67	13228.36	-17.30

concentration along the river hasn't developed, and distribution of the activities and their density is a function of a radial system. It is clear that this concentration will spread more with strengthening river role, and in case of concentration on road leading to the river and also roads along which textures depth passes, this structure will change and develop highly [4].

National resources specialists have based their works in watershed management and Soil Conservation Plans on geomorphology maps and provide erosion maps using these maps. These are result of researches that are drawn out of morphogenic phenomena of a region regarding scale and in form of clear data in terms of topography and using aerial photos [5]. The interpretation of these maps has made locating and sedimentological studies possible and preparing it has many usages and benefits in engineering projects, land use planning and management [6]. Since these maps can be used in many different contexts, being too meticulous over the precise of the methods that should be adopted isn't desirable. In this research after preparation of geomorphology maps, landforms and phenomena are recognized and interpreted. The city of Ahvaz and its suburb analyzed in this research are located in a flat area and is the center of the province. Ahvaz is extended on young sediments of Tertiary and is located 18 meters above the mean sea level and this low elevation causes river stream to flow mildly toward the south and southwest [7] [8].

In different parts of Ahwaz, examples of social problems can clearly be seen; places for buying and selling narcotic drugs, tramp and brawl meeting, and corruption, etc. The censuses show that the social problems are rising in the city. Access to facilities and services is the most important factors that determines the social status of citizens in urban ecology of Ahvaz, while a significant proportion of the urban population of Ahvaz experience failure in urban services. Literacy rate, employment rate, enjoying hygienic, therapeutic and education indexes, having municipal services such as water, gas, electricity, telephone, etc., are among the needs of civil society of Ahvaz, which have been thoroughly considered. In spite of dramatic improvements in urban services, today about 40 percent of the residents of Ahvaz don't have proper access to health services (in terms of infrastructure and superstructure), proper drinking water and optimal training services.

Urban green spaces are an important part of urban ecosystems that have a great influence in the Ahvaz's urban ecology. These places provide a lot of environmental and social services that improve the quality of life in cities. In fact providing suitable areas for development of green spaces in urban areas in order to maintain ecological balance and forecast Ahvaz's green space is essential. Through analysis of land, suitability based on

aerial photos, satellite images and GIS the quantity of green space on the basis of the brink of ecological factor method and using the principle of landscape ecology, organizing Ahvaz's green spaces can be reached. The results of this analysis show that for achieving ecological balance in the city center and other areas, maintenance of green spaces around the city, Karoun River and gardens and green spaces in the city of Ahvaz is needed. Moreover, the higher percentage of green spaces belongs to regions 3, 8, 5, 2, respectively.

The formation of urban heat islands has direct relationship with type of land use in these areas. In this regard, the temperature characteristics of the land uses of Ahvaz are extracted and the results show that the major industrial areas of the city including areas around Karoun, Khuzestan steel industries and manufacturers of pipe at the end of Golestan Blvd. have the highest average temperature.

Examining relationship between type of land uses and the surface temperature of Ahvaz with land uses temperature measured in the city also showed that the land uses of water and green spaces, with a temperature of 27.5°C and 33.3°C, respectively, are minimum and industry land use, street network and wastelands with respectively 2.43°C, 1.41°C and 2.40°C surface temperatures have highest amount of temperature, which shows that the direct relationship between the type of land use and the surface temperature of heat islands.

Uncontrolled migration growth in the recent decades towards Ahvaz and restructuring of landscape ecology caused an important structural difference in the urban and natural landscapes including crashing green and open zones, reduction of open and green spaces, playgrounds, landscape and so on. Since these elements create the environmental advantages for a city, the destruction of them has changed the ecological balance in Ahvaz city. From environmental poverty factors of Karoun River following factors can be noted:

Entrance of untreated domestic and industrial wastewater to the Karoun, lack of attention to animal and plant ecosystems, lack of attention to the water quality and how to use it, intervening in the natural and organic wastes and Karoun River edge and its bed, unprincipled construction in that area, lack of monitoring of environmental conditions of Karoun after subsiding of the great floods, pollution of Karoun river side and river bed and the lack of timely and regular dredging, germination of forests in the river bed, climate change and reduction of rainfall in the recent years and, consequently, Karoun river flow rate reduction.

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