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EFFECTIVE CLIMATIC FACTORS IN MOUNTAINOUS REGIONS OF IRAN FOR URBAN PLANNING: A CASE STUDY IN RUDBAR QASRAN IN THE CENTRAL ALBORZ

(Faktor Efektif Cuaca di Wilayah Pergunungan Iran Bagi Tujuan Pengurusan Bandar. Kajian Kes di Rudbar Qasran, Tengah Alborz)

Saeid Kamyabi & Shadi Farahani

ABSTRACT

Natural features of a place are considered as a bed for creation and extension of habitat, recognition of living system capabilities will be helpful as a guideline in future planning and elimination of limits and obstacles. The region of our study is situated on the high level of central Alborz. This region is extended from 51˚, 225' to 51˚, 43' in eastern wing of Greenwich Meridian and also 35˚, 47' to 36˚ in the north of equator. Above position includes special climate because of height effect, some of its features are semi mild summers and cold winters and also its variation slope is lower than 1 degree. However Jajorod and Ahar valleys have a great effect on region's ecology but this region is a combined area of mountain and valley. So, height differences affect on temperature variation and slope effects are quite obvious in this region. Besides Jajorod river, earth slope is various from 5 to 51% and a town, Darkia, around this complexity. Generally Geographical directions related to warm and cold slopes ,extended in all four main direction(south, west, east and north), can influence on town construction. This study presents the initial ecological studies in this field, moreover, people are more sensitive in weather changes and ecology situation, so the more we inform about these effects, the better we can manage daily activities. This research attempts to identify the role and impact of natural environmental factors, particularly climatic elements such as effective temperature, rainfall and topography on the physical development , physical cities, particularly cities in the region like Rudbar, Qasran, Oshan and Fasham. In this article, analytical methods, field and library have been used and the results show the most important factors which affect normal physical development such as temperature, ice, rainfall and topography.

Keywords: climate, Environmental consideration, mountain, Rudbar Qasran, Iran

ABSTRAK

Ciri semulajadi di sesuatu kawasan yang menjadi habitat kepada sistem kehidupan adalah amat berguna sebagai garis panduan kepada pengurusan masa hadapan. Wilayah yang dikaji terletak di altitud tinggi di tengah Alborz. Wilayah ini menganjur dari 51˚, 225' ke 51˚, 43', timur dari Meridian Greenwich dan 35˚, 47' ke 36˚ utara daripada garis khatulistiwa. Di bahagian utara mempunyai iklim yang istimewa dengan ciri separa panas dan cuaca sejuk di bawah 1 darjah. Namun begitu, di lembah Jajorod dan Ahar, kedua-duanya mempunyai ciri ekologi yang unik hasil gabungan lembah dan pergunungan. Justeru itu, perbezaan ketinggian ke atas variasi suhu dan kesan cerun merupakan ciri lazim di wilayah ini. Di samping itu, Sungai Jajorod terdiri daripada cerun yang berbeza daripada 5 ke 51 % dan terdapat bandar Darkia di wilayah yang kompleks ini. Secara umum, aliran Geografi berkait dengan suhu yang hangat dan sejuk yang boleh mempengaruhi aktiviti di bandar Darkia. Kajian ini mempersembahkan kajian awal ekologi lebih-lebih lagi dengan masyarakat tempatan yang amat sensitif kepada situasi ekologi dan perubahan cuaca. Kajian ini cuba untuk mengenalpasti peranan dan kesan kepada faktor alam sekitar semulajadi, terutamanya elemen cuaca seperti suhu efektif, hujan dan topografi dan ciri fizikal bandar terutama di wilayah seperti Rudbar, Qasran, Oshan dan Fasham. Artikel ini mengaplikasi metod analitikal, kerja lapangan dan kajian perpustakaan dengan hasil kajian

menunjukkan faktor-faktor yang mempengaruhi pembangunan fizikal di kawasan berkenaan khususnya cuaca, air batu, hujan dan topografi.

Katakunci: Cuaca, Pertimbangan Alam Sekitar, Pergunungan, Rudbar Qasran, Iran

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INTRODUCTION

Natural features of a place are considered as a bed for creation and extension of habitat, recognition of living system capabilities will be helpful as a guideline in future planning and elimination of limits and obstacles, Rudbar and Qasran regions have three urban areas and twenty-two villages affiliated with Fasham located at 30 km north of Tehran. This region is also located in the northeast of the Yalu and Baladeh in Mazandaran province. The region is limited from the south to Shemiranat (Darabad), from the west to Shahrestanak and Karaj and from the east to Lavasanat. This region has several faults like Mosha - Fasham and other natural processes such as erosion and several river branches confluence, like Ahar River and also the northern side of Ltyan river, in Jajrod, is located in this region too. Rivers and high level area up to 3000 meters altitude and the valleys extended from the northwest to the southeast have provided an attractive environment for human activities. General morphology, physical aspects of the city and the surrounding residence have played an important role in the existing cities and villages like Mygoon,Oshan, Fasham and some subsidiaries. Economic role and public willingness has provided a great situation for construction, especially villas, and also population growth. This unique circumstance can endanger some natural features in the region too.

STUDT AREA

The region of the study is a high level area at central Alborz (Table 1 and Figure 1). This region is extended from 51˚, 225' to 51˚, 43' in eastern wing of Greenwich Meridian and also 35˚, 47' to 36˚ in the north of equator. Height effect on this climate is obvious. Some of its features are semi mild summers and cold winters and its variation slope is lower than 1 degree. Also Jajorod and Ahar valleys have a great effect on region's ecology. This region is a combined area of mountain and valley so the height difference effect is demonstrated as temperature difference and falling arte. Slope effects are completely obvious in this region. Besides Jajorod river, earth slope is various from 5 to 51% and around this complication, there are some towns like Darkia. Geographical directions are effective in eco system's quality and generally geographical directions from warm to cold. This situation can lead town construction process.

Table 1: Altitude of cities in the study area (Fasham area)

The name of area	Oshan	Fasham	Meygon	Hajiabad	Emame	Ruteh and Zaygan
Altitude (m)	1900	2000	2350	1850	2200	2300

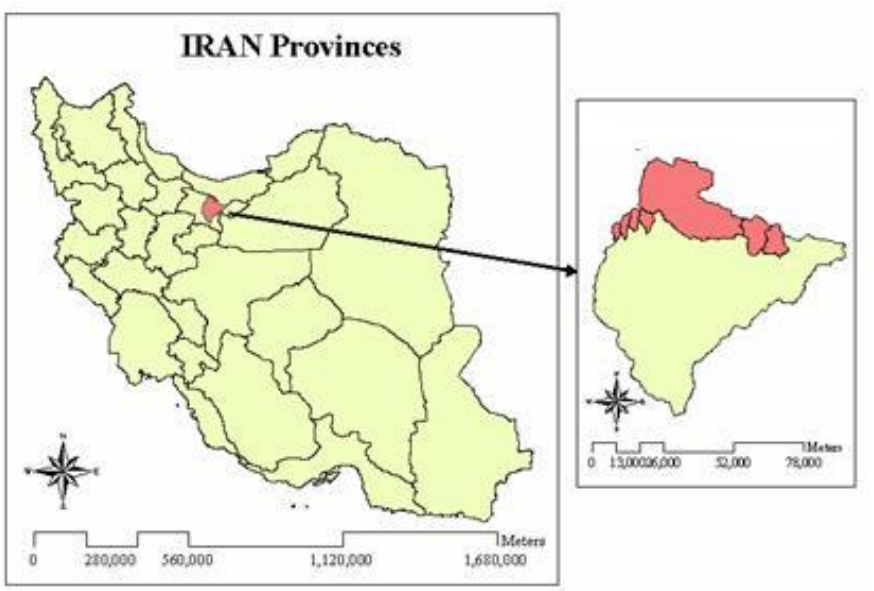

Figure 1: Location of case study in Iran

METHODOLOGY

In order to define an optimal method for confronting the Rudbar Qasran region, it has been tested several methods like analytical method, field and library. Details are as follow. Generally, Meteorological stations are belonged to different organizations in Iran (Table 2), such as:

i. Meteorological stations belong to Power ministry
ii. Meteorological stations belong to Meteorology organization (related to transportation ministry)

There are 91 synoptic, climatology and evaporateology stations in Tehran's water closet basin and its surroundings, and there are totally 110 hydrometric stations, that just 31 stations have been shared with Tehran. In this evaluation we used following stations' information.

Table 2: Climatology stations in study area (Rudbar qasran)

Station	Latitude	Longitude	Altitude (meter from sub sea depth)	Station Type	Establishment year	Establisher Organization
Darakeh	35 49	5123	1700	Hydrometry	1968	Water organization
Kan	35 47	51 18	1570	Hydrometry	1972	Water organization
Farahzad	35 47	51 20	1520	Hydrometry	1972	Water organization
Mehrabad	35 41	51 19	1391	Synoptic	1972	Meteorology organization
Abali	35 45 N	51 53 E	2462	Synoptic		Meteorology organization
Geophysics	35 47	51 18	1360	Climatology	1972	Meteorology organization
Firozkoh	35 B47	52 48	1900	Synoptic	1974	Meteorology organization

Sadabad	35 49	51 21	1700	Climatology	1972	Meteorology organization
karaj	35 55	50 54	1312	Synoptic	1995	Meteorology organization

Regarding to statistic limitations and more data application at some Meteorological stations, it has been selected a set of high quality meteorological stations (Table 3). In this process, it is been tried to use enough and appropriate station for better data such as indicator station. After evaluation of these stations' data, the best statistic period was determined between 1986 to 2004, and also we tried to reconstruct some ordered stations' statistics for next applications.

Table 3: Statistical reconstituted station with to take advantage of base station

Base station	Reconstituted station
Abali	Oshan
Hamband absard	Meygon
Abali	Fasham
Firozkoh	Hajiabad
Davamand and Hamand	Rodehen and Bomehen

RESULTS AND DISCUSSION

a) Annual Temperature

Average of daily temperature in any region's temperature indicator has a special meaning, although this parameter does not interfere directly, but because of several average databases, there is a bit frequency in various statistic periods. At the same time, comparison of 10, 20 and 35 average years of Tehran synoptic station can admit the above presumption. Table 4 shows comparison of weather's annual averages at different statistic periods.

Table 4: Comparison of annual average temperature in Tehran stations (^{o}C)

Statistical period	Average of maximums	Average of minimums	Average
10	22.5	12.1	17.3
20	12.4	11.5	17
35	22.5	11.2	16.8

According to this table , the difference between weather's annual averages at different statistic periods is about 0.5 centigrade degrees. In the statistic scope field, this difference is very impressive. In Table 3, we have presented annual weather's temperature parameters at selected stations. It has seen that average daily weather is differing from at least 13.6 degrees at Darakeh station to 16.8 degrees at Tehran synoptic station. Regarding to stations height, presented in the Table 5, we found that heights' changes do not have any influence on temperature frequencies in spite of its significant role. The other parameters such as highways, vegetation, locating around industrial regions, residential complex concentration and etc have been added to temperature's changes process with height.

Table 5: Annual weather temperature in study area (Fasham) stations

Station	Altitude (meter)	Averages			Absolute Temperature	
		Maximum	Minimum	Daily	Maximum	Minimum
kan	1570	21.9	11.2	16.6	36	-14.5
Mehrabad	1191	22.5	11.9	17.2	36.8	-14.8
Soleghan	1700	18	7.7	12.8	31.6	-13.1
Sadabad	1700	19	8.2	13.6	36.5	-15.5
Tehran exhibition	1541	19.8	9	14.4	39	-16.5
Geophysic	1360	20.1	10.2	15.1	39.5	-15.5
Abali	2450	12.5	3.2	8.2	39.4	-21.5
Oshan Fasham	1950	16.7	3	8.5	39.3	-23.5
Latyan	1560	21.1	8	14.5	41	_
Meygon	2400	13.2	0.2	7	35	-30

b) Temperature of the region

In order to have correct comparison among mentioned region's temperature and roughness effect around Fasham city, new regions, like Bumehen, Abali and Roodehen have been added to previous database. The average of region's temperature at different heights was measured monthly and continually these measurements were reconstructed based upon current information and statistic methods. In the statistic period between 1986 to 2004, the average of annual temperature for Fasham city was 8.3 centigrade degree and 11.8 centigrade degree for Bomehen. The comparison shows that ,the weather is warmer around 3.5 centigrade degree (Tables 6 to 8).

Table 6: The monthly Alterations of the temperature in Fasham and Bomehen cities (1993-2003)

Month	Average temperature (Fasham)	Average temperature (Bomehen)	Month	Average temperature (Fasham)	Average temperature Bomehen)
January	-1	1	July	20.01	24.8
February	-0.6	-0.2	August	20.1	23.7
March	-0.8	4.5	September	15	19.6
April	8.1	11.4	October	9.1	12.7
May	10	15.4	November	3	6.5
June	21.1	17.1	December	0.9	1.3
Annual average				8.3	11.8

Table 7: the monthly Alterations of the temperature in Rodehen and Abali cities (1993-2003)

month	Average temperature (Rodehen)	Average temperature (Abali)	month	Average temperature (Rodehen)	Average temperature (Abali)
January	-0.8	-3.7	July	20.2	20.1
February	-0.6	-3.2	August	20.3	20.55
March	-0.7	0.1	September	15.1	16.5

April	8.2	7.2	October	9.2	10
May	10.2	11.9	November	3.2	3.65
June	17.2	17.6	December	1	1.3
Annual average				8.5	8.2

Table 8: The monthly Alterations of the temperature in Meygon and Oshan cities (1993-2003)

month	Average temperature (Meygon)	Average temperature (oshan)	month	Average temperature (Meygon)	Average temperature (Oshan)
January	-5	-0.7	July	18.5	20.1
February	-4.8	-0.5	August	18.3	20.2
March	-0.7	-0.6	September	14.6	15
April	5	8.1	October	8.8	9.1
May	11.1	10.1	November	3.9	3.1
June	15.8	17.1	December	-1.5	0.9
Annual average				7	4.8

The average of changes slope in monthly temperature at Fasham city had an interval between min -0.6 (February) to max 20.1 (August), however at Bomehen the minimum of temperature at February was -0.2 and the maximum temperature was 24.8 at July. Based on approved definition, the lowest temperature of climate decreases to zero centigrade degree or lower. Number of freezing days it should be say that based on information of meteorological organization is presented in the Tables 8 and 9. Fasham has 141 freezing days and this duration in Bomehen is 125 days.

Table 8: Average Glacier day

Month	Number of Glaciations days average								
	Tjrish	Exhibition	Mehrabad	Rodehen	Geophysic	Sadabad	Bomehen	Soleghan	Fasham
Annual	69	71	52	139	49	87	125	92	141

Table 9: Average of weather temperature in different seasons (1993-2003)

Station	fall	winter	spring	summer
Meygon	2.8	-4.3	11.2	17.2
Latyan	12.4	3.1	17.1	25.7
Oshan and Fasham	5.2	-0.9	14.4	20.8

c) Atmosphere fallings

Generally, the most important air masses of the region are divided into two categories, summer and winter. West-east currents exist until mid of spring continually, but they are stopped on summer partly. Topographic condition of our case study causes plain-mountain winds and also topographic element at northern mountains of these two cities affects on the rate of resulted winds. This region belongs to basin of Jajorood Olia and formation of each

region's ecology has a great influence on falling rate. According to present statistic data, annual falling of Fasham and Boomehen are 421.6mm and 319 mm respectively (Tables 10 and 11).

Table 10: Annual alterations of precipitation regimen in the Fasham and Bomehen cities (mm)

month	Fasham city	Bomehen city	month	Fasham city	Bomehen city
January	48.5	42.2	July	1.6	2.5
February	66.8	43	August	4.1	2
March	73.1	48	September	7.5	2.1
April	55.1	37	October	14	18.2
May	36.9	36	November	32.6	32.2
June	9.6	11.1	December	71.4	44.7
Annual average				421.6	319

Table 11: The annual alterations of precipitation regimen in the Rodehen and Abali cities (mm)

month	Rodehen city	Abali city	month	Rodehen city	Abali city
January	70.2	61.5	July	3.9	8.4
February	62.3	70.6	August	2.1	8.6
March	60.1	102.5	September	3.1	7.1
April	39.1	62.5	October	16.3	23.6
May	37.2	47.6	November	18.5	51.8
June	15.1	10.7	December	23	70.8
Annual average				350.9	525.20

Changes slope of most rainy month at Fasham has been changed from max: 73.1mm (March) to min: 1.3 mm (June). It has been reported that the rainiest month of Bomehen was at March (48mm) and the lowest rainy time is at August (2mm). Seasonal falling percentage in these two cities during autumn and winter is different from each other. Based on information in Table 12, around 44.75% of Fasham fallings is occurred during winter and Bomehen's atmosphere fallings percentage is around 48.73% during this season. It is interesting that; fallings amount in Bomehen during autumn is 0.44% more than Fasham city.

Table 12: Division of seasonal rain percent in Fasham and Bomehen cities

Rainy season	winter	spring	summer	Fall
Fasham city	44.75	24.13	3.13	23.3
Bomehen City	48.73	25.1	2.7	23.47

Changes slope of rainiest month of Meygon city has been differed from max: 103 mm March to min: 45.1 mm (September).while the rainiest month of Oshan (March) has reported 48 mm and the lowest time of falling during August (with 2mm). Seasonal falling percentage distribution in these two cities during autumn and winter is different with together.

With observance to more than 30 ecological categories, we preferred to use of Demarten and Ambrege categories in this study which their results are summarized at Tables 15 and 16 In formation process of each region's ecological face, there are various factors which some of them are recognized as manufacturing factors of ecology. In the studied region, the most significant manufacturing factors are height, latitude and immigrant air masses.

a) Domarten approach

In this approach, the ecology of the region is assessed based on following drought indicator.

$$AI = \frac{P}{T+10} \qquad [1]$$

Where:
P: the average of annual falling in terms of mm
T: normal rate of annual temperature in terms of centigrade degree

After measuring drought indicator, by using of Table 13, the type of ecologies of the region will be determined.

Table 13: classification of different types climates in Demarton classification

Climate	Classification index Demartone
arid	0-10
Semiarid	10-20
Mediterranean	20-24
Semihumid	24-28
Humid	28-35
Most humid (A type)	35-55
Most humid (B type)	> 55

b) Ambregeh Approach

This approach is a useful bioclimatic system. This classification is executed based on moisture coefficient (Q) and using of empirical ecology meter. Moisture coefficient (Q) is measured as following:

$$Q = \frac{2000P}{M^2 - m^2} \qquad [2]$$

Where:
P: the average of annual falling in terms of mm
M: the average of daily maximum temperatures at the warmest month of the year based on centigrade degree
m: the average of daily minimum temperatures at the warmest month of the year based on centigrade degree

After measuring of certain coefficient, we can detect region's ecology by using of climograph.

c) Kopen ecological classification system

Based on this system, if monthly highest temperature in a region is more than 10 centigrade degree and coldest temperature in a month is between -3 to 18 centigrade degree, this region belongs to ecology of Type C. Fasham has this characteristic. In addition, the falling amount in the wettest month of winter is between 1 to 3 times more than the driest month of summer.

In this system, there are two ecologies for Fasham city, wet and Mediterranean.

i. Region, lower than 2000 m height, belongs to Mediterranean climate.
ii. Region, more than 2000 m height, belongs to wet climate.
iii. In this system, Fasham has Mediterranean climate.
iv. various stations results and coefficients are illustrated in the following tables (Tables 14 to 17).

Table 14: Demarton and Anberge's climatological coefficients

Station	Average of annual precipitation (mm)	Average of temperature annual (Degree centigrade)	Demarton coefficients	Maximum temperature average in the hottest month (Kelvin)	Minimum temperature average in the coldest month (Kelvin)	Amberge coefficients
Mehrabad	263.3	17.2	10.1	309.8	272.2	23.7
Soleghan	385.2	12.8	16.7	304.8	270.8	39.3
Geophysic	309.9	15.1	12	312.5	271.7	26.5
Tehran Exhibition	367.9	14.4	15.5	301.2	271.6	31.5
Sadabad	389.4	13.6	16.8	309.5	264.8	30.8
Farahzad	385	12.9	16.8	309.5	264.8	30.4
Darakeh	426	14.22	15.61	312	269.6	44.9

Table 15: the table number 15 completion that show results to assign the climate types

Station	Average of annual precipitation (mm)	Average of annual temperature (Degree centigrade)	Demarton	Kopen	Amberge	Amberge coefficients
Mehrabad	263.3	17.2	arid	Bsk	Arid cold	23.7
Soleghan	385.2	12.8	Semiarid	Csa Mediterranean	Semi humid cold	39.3
Geophysic	309.9	15.1	Semiarid	Csa	Semiarid cold	26.5
Tehran exhibition	367.9	14.4	Semiarid	Csa	Semiarid cold	31.5
Sadabad	389.4	13.6	Semiarid	Csa	Semiarid cold	30.8
Farahzad	385	12.9	Semiarid	Csa	Semiarid cold	30.4
Darakeh	426	14.22	Semiarid	Csa	Semiarid cold	44.9

Table 16: Demarton and Anberge's climatical coefficients

Station	Average of annual precipitation (mm)	Average of annual temperature (Degree centigrade)	Demarton	Kopen	Amberge	Amberge coefficients
Mehrabad	263.3	17.2	arid	Bsk	Arid cold	23.7
Soleghan	385.2	12.8	Semiarid	Csa Mediterranean	Semi humid cold	39.3
Geophysic	309.9	15.1	Semiarid	Csa	Semiarid cold	26.5
Tehran exhibition	367.9	14.4	Semiarid	Csa	Semiarid cold	31.5
Sadabad	389.4	13.6	Semiarid	Csa	Semiarid cold	30.8
Farahzad	385	12.9	Semiarid	Csa	Semiarid cold	30.4
Darakeh	426	14.22	Semiarid	Csa	Semiarid cold	44.9

Table 17: The table number 17compelition that show to results of classification

Station	Average of annual precipitation (mm	Average of annual temperature °c) °	Demarton coefficients	Maximum temperature average in the hottest month (Kelvin)	Minimum temperature average in the coldest month (Kelvin)
Oshan	415	8.4	22.55	312.4	251.5
Fasham	421	8.3	23.00	312.3	249.5
Meygon	525	7	30.8	308	243
Hajiabad	400	10	20	313	_

Table 18: Climatic classification based on the method Demarton,Kopen, Amberg

station	Demarton	kopen	Amberge
Oshan	Mediterranean	Csb	Semiarid cold
Fasham	humid	Csb Mediterranean	Semiarid cold
Meygon	Mediterranean	Dsb	Semi humid cold
Hajiabad	Mediterranean	Bsk	Semiarid cold

CONCLUSION

Following a brief review of recent climatic factors trends in mountain areas in centeral Alborz of Iran, an overview is given of the principal effects of these changes on temperature and precipitation. overall, there are two ecologies for Urban areas in this region For example Fasham city, wet and Mediterranean.Region, lower than 2000 meter height, belongs to Mediterranean climate.Region, more than 2000 meter height, belongs to wet climate.Among the studied stations, mygoon had the most Coldest degrees of temperature and Haje abad had the calmest conditions. Therefore, Residents in this area and tourists should use warmer

clothes and covers in cold seasons in mygoon incomparison with other studied regions, in order to protect themselves from the negative effects of sudden cold and occurrence of intense wind chills.condition for the urban planning include direct effects of the changes on water resources and hydropower generation, on slope stability and on hazards relating to avalanches and glacier lakes. Indirect effects include economic and social costs for winter tourism based on skiing and associated sports; and impacts on agricultural, industrial and consumptive use of water that is strongly influenced by the annual cycle associated with snow and ice melt runoff & the most important factors which affect normal physical development such as temperature, ice, rainfall and topography.According to the results, the following statements should be considered in urban planning:

i. choosing appropriate and optimal position.
ii. using elements in buildings adapted to climate circumstances.
iii. considering strength of materials to endure weather factors.
iv. have a suitable plan, shape and design for buildings in order to climate changes.
v. coefficients of a comfort-based architecture should be compatible with the climate.
vi. The most effective elements of climate and effective urban planning area are rainfall, temperature and ice.
vii. The other effective and efficient climate factors in urban planning are altitude and slope.

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Dr. Saeid Kamyabi & Dr. Shadi Farahani
Islamic Azad University, Semnan Branch,
Iran.
Email: saeidkamyabi@gmail.com