

## **A Survey on Planning Human Bioclimatic Comfort for Ecotourism(Case Study:Gilan,Iran-South West of Caspian Sea)**

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### **Abstract**

The recognition of Human Bioclimatic Comfort in geographical area is an importance for planning of Ecotourism. It can also help planning of Building and housing, Architectural patterns and using natural attraction of Ecotourism in Environment planning, such as, Integrated Coastal Zone Management and Integrated Mountainous Zone Management (ICZM,IMZM). The aim of this paper is recognition of monthly human bioclimatic comfort by climatologically and by Beiker model and submit its maps by GIS (Geographical information system) software in main project. Biker is model for recognition of Human Bioclimatic Comfort which has been used for main research Projects as well as this paper.

The result of this research has shown that Eastern area has more Comfort than Western area. Rasht has 4 months and Ramsar has 6 months and this factor reduced with distance from coastal area to ward plain. All area has about 4 months warm conditions in summer and 3 months cold in winter and data analysis focuses on Anzali wetland and Anzali Meteorological Station. It could help planners for timing uses and environmental capability of ecotourism.

**Keywords:** *Biker Bioclimatic, Caspian Sea Gilan, Human Bioclimatic Comfort*

### **1 Introduction**

Bioclimatology or Vital Climatology is a science for studying and evaluation of the weather and climate effects on the life of creatures including botanic or zoological creatures (Jahanbakhsh, 1998, p. 67). Human Comfort Bioclimatology is a collection of those conditions

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that the humans feel comfortable in 80% in the view of environmental conditions (Temperature, Relative humidity, wind, sunshine), in such a way that the relation between human and atmosphere (relation between blood and air-pressure, relation between heatstroke and water vaporization from the skin of the body) is naturally geographical and regional that is classified in the human climatology science (Kaviani, 1993, P78). With consideration of the wide researches among the climate facts, temperature and humidity have the most important roles in human health and comfort, and in examination models for human comfort, these two facts have been used more (Alijani, 1994, p63). In touristy plannings, especially in ecotourism plans that relaxation and comfort of human is the main objective of the planning with consideration to environment preserving, determination of time and place limitations in using the considered locations, is one of the most important aspects in ecotouristic plans.

With consideration to this point that the ecotourism attractions are from the unique resources of each geographical boundaries, and nowadays, most of the tourists have been attracted (in the year 1990, sum of 450 million persons have had environmental tourism through expenses in sum of 257 billion Dollars in the world (Iaft, 1978, p.3). It is predicted that at the end of the future decade, numbers of these tourists will be more than 20% of the entire tourists (Ramezani, 2006, p11). Also in a field inquiry in the northern side of Iran, about 57-80% of all responders, have replied that they repeat nature touring, especially visiting the coasts and the wetland, every year. Also, annually, about 4-5 million local and foreign tourists enter Gilan province, generally in the warm period of the year, from all parts of the country, and generally they visit the nature (coasts, mountains, wetland and rivers). The Necessity of favourite time planning for attractive regions has a high importance and this planning may make the environmental potentials of tourism safe by decreasing the environmental damages arising from human attacks in coasts and mountains (Ramezani, 2007, p160).

Nowadays, in order to recognize a favourite sample from Human Comfort Bioclimatology of different models such as psychometric Tables (Kasmaei, 1990 and Bari, 1992, p345), Olgay (1973 & 1976), Givoni (1977, 1969), Avanz (1980), Beiker, Lankester, Karsten and so on are used

that the results of these models may lead to planning for Integrated Management of Environment (IME). The present research is an attempt to plan for Integrated Management in Gilan with focus on Anzali Wetland. It is necessary to mention that without an accurate evaluation, tourism may be developed as an irrational aspect and cause destruction of the same thing that it has been formed for (Hosseinzade Dalir, 2003, pp33-47). The objective of the present research is the recognition of favorite time limitations for regional life comfort, on the basis of Beiker and Lankester-Carston Bioclimatic Method in Such a way that with consideration to these time limitations (maximum and minimum of comfort), planning for usage of the potentials of the wetland will be required and may be performed with consideration to preserving the environmental facts and elements. The results of this research may be used as a primary important strategy for designing and environmental planning with the ecotourism objective.

## **2 Methodology**

At first, regional norm of the required climate parameters for Beiker and Lankester-Karston Bioclimatic Method, consisting of temperature, wind velocity and relative humidity, has been prepared. Then with usage of Beiker and Lankester-Karston model, bioclimatic comfort limitations and bioclimatic stimulations were determined and presented in the aspect of climogram. Beiker Method (Kaviani, 1992, p63 from beiker-1972) was used. Selection of this method is because of this point that wind and temperature are more suitable among all regional parameters, related to the human bioclimatology stimulations (Jahanbakhsh, 1998, p68). In this method the following relation has been used:

$$cp = (0.26 + 0.34 * v^{0.632}) * (36.5 - t) \text{ mcal/ cm}^2 \text{ /sec}$$

In the above relation:

V: Wind velocity (m/sec)

T: Daily average temperature (degree C)

CP: Cooling power of the environment, cooling power of the environment in this relation is the difference between body and air temperatures (micro calorie/square cm per sec). Becker presented the

cooling power of environment and human bioclimatology combination limits, as the following table:(table1)

**Table1: Cooling power of environment and bioclimatic limits on the basis of Becker study**

Environment cooling power	Air situation	Type of bioclimatic stimulation
Cp = 0-4	Hot, warm, humid and undesirable	Bioclimatic pressure
Cp = 5-9	Warm, tolerable	Bioclimatic comfort
Cp = 10-19	Moderate and desirable	Bioclimatic comfort
Cp = 20-29	Cool	Moderate stimulation
Cp = 30-39	Cold	Middle to intense stimulation
Cp = 40-49	To cold	Presser in middle aspect
Cp = 50-59	Undesirable cold	Intensively presser
Cp = 60-70	Intolerable too cold	Intolerable

Reference: (Kaviani, Geographical Researches Journal, issue No: 29)

### 3 Results and discussion

According to Beiker study, if cp will be less than 10, it will cause the bioclimatic pressure and undesirable conditions that is because of high temperature. If cp will be more than 20, because of high coldness, it will cause the mild stimulation, bioclimatic pressure and lack of human comfort. Table 2 show H.B.C in monthly for Gilan Stations. (Table 2).

**Table 2: Evaluation of the Cooling Capacity of Gilan Stations Using Beiker Bioclimatic Method, for the perid 1951-95, C=Comfort**

Station	Jan	Feb	Mär.	Apr	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
						C	C	C	C			
						C	C	C	C			
						C	C	C	C			
						C	C	C	C			
							C					
			C	C	C	C	C	C	C			
						C	C	C				
				C	C	C	C	C	C	C		
			C	C	C	C	C					
				C	C	C	C	C	C	C		
					C	C	C	C	C	C		

considering the table, we see that the maximum comfort is in eastern area of Gilan and the minimum comfort is in central area of Gilan. For more explanation of this phenomena, for example in Anzali Wetland Station there is a calm stimulation and bioclimatic pressure in Jan., Feb., Mar. and Dec. months, and a moderate and desirable weather with bioclimatic comfort in Apr. May until to Oct. months. June is on the boundary condition of bioclimatic comfort (numbers of those days that are in human bioclimatic comfort conditions). July and Aug. months have a little warm and tolerable weather together with bioclimatic pressure. Figure1, indicates the status of Anzali Station in the view of bioclimatic stimulations conditions through Becker method. The area between (10-20) in Beiker index is human bioclimatic comfort conditions (figure1).

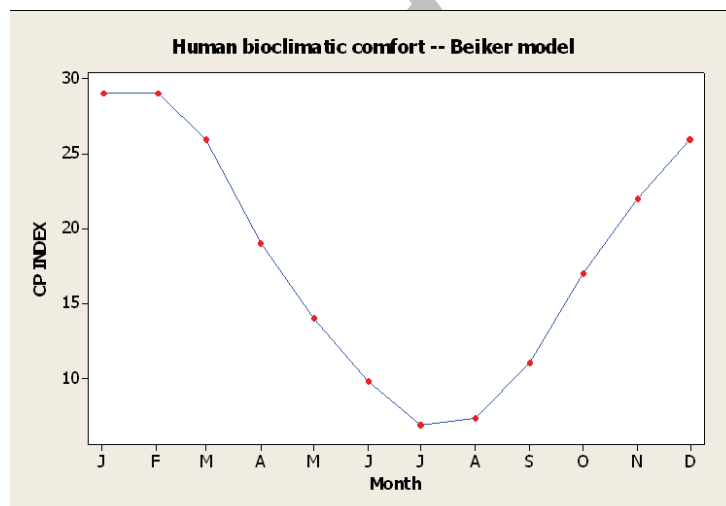


Figure 1: Monthly conditions of human bioclimatic comfort in Anzali Station by Beaker Method

The effect of regional conditions on human organism and fall of comfort conditions depend on the collection of heat effects on human organism. Human body temperature is 37 degree centigrade and when the temperature is more, it will be with high humidity (as Anzali Wetland), which causes heat beating. It causes increase in the blood pressure and sweat glands start to ooze and we feel humidity. Vice

versa, in the case of high coldness, because blood circulation to the external layer of skin would be limited we feel intense tremor for recovering the lost heat. On the basis of this point the heat limitations in different geographical widths are as table 3. With consideration to statistic data, Anzali Station temperature that is an indicator for Anzali Wetland, it is clear that this region is cold in winters and does not have a desirable winter temperature (20 degree centigrade).

Considering the average temperature of winter, average of the minimum temperature equals 4.8 degree centigrade and average of maximum temperature equals 10.2 degree centigrade. It can be seen that heat equipment in winter is not provided, and even considering the average temperature, in the current regional normal conditions that is 7.5 degree centigrade, this important view would not be provided.

In summer, the average of minimum temperature is 21 degree centigrade, and maximum 28.1 centigrade, and it conforms to a desirable degree (22 degree) which indicates that summer temperature of the Wetland is at heat limitation of human comfort that may be planned. If this desirability will be compared to the other seasons, it can be seen that spring has high temperature desirability but autumn is cold (table 3).

**Table 3: Heat limitations for human comfort**

Latitude/D	Max.	Desirable	Min.	Season
50-60	2	17	14	Winter
	22	18	-	Summer
25-50	23	20	15	Winter
	26	22	18	Summer
Tropical	27	25	22	-

Reference: Zahidi, 2006, p74

Different status and internal changes of human against reduction and increase in temperature is as table 4:

**Table 4: Different status of human and its internal heat changes**

Heat status	Temp.	Different status of human body
Warm	More than 43	Mental irreparable problems
	40-42	Felling of dizziness and epilepsy
	37-39	Start sweating
Desirable	37	Normal status
Coldness	34-37	Felling of coldness-start shivering
	29	Lack of speaking ability
	25	Muscles flexing
	15-17	Death start and minimum temp. of alive body

Reference: Zahidi, 2006, p76

Sun shines on the earth surface in three bands of ultra violet, visible radiation and infrared radiations. Ultra violet radiation has a lot of bad effects although it is a little intense. One of these two effects in (0.28 - 0.315 micron) wavelength causes intense sunburn and the other effect in (0.315-0.4) micron cause brownness of the skin and may cause irritation.

Reflex radiation from the atmosphere has an effect on temperature comfort feeling in the body. This reflex radiation is fulfilled from water vapour and Co<sub>2</sub> molecules that have important roles in recovering the energy lack in body through metabolic processes of body.

In order to determine the comfort limitation and human bioclimatic irritations, recognition of the following items has vital importance. The ratio of oxygen is suitable on the sea surface but in high levels, its lack causes some problems. Another item is ozone, that if its increasing destruction would be continued, it causes increase in dermatological diseases. The other existing combinations in the air are natural and artificial aerosol, such as salts, ions and dusts as natural type. The Salts are originated from the sea surface and is effective for pulmonary and thyroid diseases at coasts. But artificial aerosol consists of types of pollutions that enter to the atmosphere and cause pulmonary, vascular and cardio diseases, asthma and heart attack (Sefidi, 2004, p124). Physicians have classified the bioclimatic irritations items of regional stresses into three classes (Kaviani, 1992, pp. 61-2):

#### **A- Bioclimatic irritation facts:**

1 Increase in coldness power (calculated by the present research) and its daily intense fluctuation.

2 High intense of radiation, especially violet radiation

3 Partial decrease in Oxygen, as from 1000 meters and more than that

4 Intense daily fluctuation of temperature

B- Bioclimatic pressure facts:

1 Conditions of humid weather because of high temperature and humidity.

2 Long-time lack of sunshine especially in the ultra violet limitation

3 Continuous air pollution

#### 4 Cold, wet and foggy weather

C- Bioclimatic comfort facts:

-Balanced amount of coldness power of the environment in temperature conditions, between 15-25 degree centigrade and weak to mild wind between 1-4 m/sec.

-Balanced radiations especially in a condition that may be provided because of tree shadows

-Weak fluctuation of temperature during a day, season and year

-Clean air without dust of industrial nucleons and pollution arising from traffic.

According to the map for the region stimulations and considering meteorological, climatologically and medical researches, the bioclimatic stimulations limitations may be presented as table 5 that demarcation of stimulation degrees on the basis of temperature and wind effects is more suitable than the others (Kaviani, 1992, page: 64).

**Table 5: Limitations of the bioclimatic stimulations of the environment based on Becker's study on the regional facts (1972)**

Environmental facts	Fairly presser	Comfort	Stimulations				Scale
			Weak	Mild	Average	Strong	
Coldness power	>10	10-19	20-24	25-29	30-35	>35	Mcal/square cm per sec
Average Temp. in July	>17.5	16.7-17.4	16-16.6	15.3-15.9	14.5-15.2	14.5>	Centigrade
Wind velocity	1.5>	1.6-2.7	2.8-3	3.1-3.5	3.6-4	>4	m/sec
Water vapor pressure	>10.6	10.4-10.6	10.1-10.3	9.8-10	9.7-9.8	9.4>	mmHg

Reference: Kaviani, 1992, p63

Examination of the humidity amount and bioclimatic comfort limitation of Anzali Wetland:

Weather specifications of the region are very low changes in daily and annual temperature, high moisture, local and sea intense winds and high rainfall (Monavari,1990,p56). In summer, because of high air temperature and moisture in coastal regions of the sea, humidity phenomenon happens that causes bioclimatic intense stimulations. In order to examine the months with humidity phenomena and air desirable limitations, Bert Lankester and Karseton Climogram was used(Kaviani,1981,p52). The humidity phenomena in Anzali Wetland and its Bioclimatic Comfort during a 44-year period are: In June, Aug. and Sept. months, it is in humidity limitation and in May and Oct. months is in humidity boundary (days with humidity phenomena),and in Jan.,Feb.,Mar.,Apr.,Nov. and Dec. months, it is in desirable limitation.

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