



*Geography and human relationships*

## ***Assessing the carrying capacity of tourism areas (village, town, region) of the Sistan plain***

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### ***Abstract***

*Tourism as one of the sources of income and creating jobs at the national level can be a strategy for economic development in the national territory. When profits are falling in other sectors of economy, tourism is a possible alternative and strategy for development. Based on this, the main reason for the development of tourism, overcoming low wages and provide new employment opportunities and social developments in the local community. The aim of this study, showing the carrying capacity (receive tourists) in parts of Sistan tourism and which way did the actions to improve its capacity. Methodology in this study was a descriptive – analytic study. In order to calculate the ecological, according to the formula provided by the international union for conservation of nature and natural resources and to estimate the carrying capacity of natural and cultural areas for tourism purposes, two types of physical carrying capacity and real bearing was calculated. To analyze the information and provide tourism development strategy of Sistan plain, above data analysis were used. To as a management agent was a complementary study to the planning and development tourism in the region. Storm is a limiting factor in the study area and impact a lot on the tourist area of the burned city. The results make it possible to planners which according to our purest of areas such as wetlands, Chahnimeh, natural areas and historic surrounding, stimulate tourism to provide Sistan plain.*

***Key words:*** *carrying capacity, tourism, tourist reception, Sistan plain.*

### ***Introduction***



*Today tourism should move in a direction that the end of this road lead to stability. The concept of stability is defined by the world commission of Environment and development, as the following: development which meets the needs of the current generation, without undermining the ability of future generations to meet their needs (Ziaee. 2009, 127). As a result, the emergence of the theory of sustainable development and subsequently sustainable tourism in the 1990s was the opinions offered in order to avoid the effects of tourism and management areas. In this view, used of the different essential and functional models and techniques, one of these techniques is the capacity to receive tourists. The carrying capacity of a tourist area, meaning the number of tourists the area can receive in a given time within (day, month, year). This capacity depends on size and topography, soil type, animal species, the amount and quality of tourism facilities in the region (Zahedi, 1385). Reception capacity attempted to understand the social constraints and ecological land use and its effects, performance management framework and planning (Tabibian et al, 2007, 18). in other words, many tourists will destroy the resources and tourist attractions, so the analysis of target reception capacity will be necessary. Determine the reception capacity of tourism is an essential policy in planning that usually based on the analysis of the characteristics and location of sites where development and used by tourists is not done and also is a feedback for analyzing tourism markets. (Pooraahmmad et al, 2012: 137). talk to estimate the carrying capacity of the land, from the second half of the 1980s, with economic methods to evaluate of land resources as a new way to measure the use of the land and its resources for certain population of farmers and beneficiaries of land at certain times of the plan extended and in a variety of urban and regional planning, planning industrial development and agriculture, forestry, tourism development and the park has been widely used (same source). By the late 1980s tourism as an activity without the risk introduced and always had favorable outcomes and economic benefits. Since the 1980s, various research findings and reports, environmental consequences, poor social and cultural tourism were approved (Rahnamaiee et al 2008: 33).*

### **Theoretical foundations**

*With the advent of the concept of sustainable development in the early 1970s and the formation of economic and environmental sustainable development in the 1990s that the three basic indicators of well – being, economic efficiency and healthy environment as a key element of sustainable development proposed, the concept of carrying capacity as a useful tool to estimate each of the above three indicators were considered along with other development indicators (Tabibian et al, 2007, 2). Carrying capacity as a way of thinking about programming is useful. Attention on the natural environment's ability to support the growth centralized and shows that development must respect the environmental performance of natural processes. Often carrying capacity of tourism as a way to control the process and the consequences of development has been mentioned (Hall, 1999: 388). Consider the carrying capacity of resources for development otherwise is not only disadvantageous activity but also in terms of economic potential untenable and is considered failed. in this sense tourism in the region shall be meet the needs of leisure and recreational tourism in the region and meet the needs of the present generation living in the area and guarantee*



*of belonging and benefit of the next generation from them .in addition, due to its holistic nature of many aspects of sustainable development and therefore sustainable tourism, its formation at the regional level requires indicators that crystallize in the practical measures. So search the entire system to achieve suitable indicator have many importance. The index should be holistic and overall included the main characteristics that exist in the substrates system. An important landmark in the field of tourism at the regional level is the bearing capacity that is used in the threshold concept of tourist. this index based on environmental accounting of nominal capacity area marked and guidelines are provided on the base .environmental accounting can be defined as the bearing capacity, measures the gains and losses resulting from the settlement of certain activities in the geographical areas including environmental damage. This is while tourism management taking into account the sustainability with region and avoid from its drop, within the framework of these indicators be a key factor in achieving sustainable tourism. For this reason and for environmental planning, understanding and knowing the social impact of tourism on the environment is very important. (Saghaiee, 2002: 19) tourism to be able to reach a stable equilibrium between the needs of local communities ,environmental protection and promoting quality of life and tourism experience and form sustainable tourism activities, requires to a strong management system. A management regarding the issue of tourism productivity in the regions and in accordance with a systematic approach, where in the context of supply and demand dynamics with an emphasis on sustainable development is concerned, is formed. Such management can boost regional ties and improve the development of knowledge and skills of personnel in the sector. It can also cause cooperation between interrelated sectors to perform tasks (Dasvil, 2008: 267). Each region or country has limited ability to attract tourists and filed activities related to it. These restrictions are explained often with carrying capacity techniques in the content of sustainable tourism development theory. But before all this noteworthy be that to define and understand the carrying capacity of tourism need to review it as a process within the planning process of tourism development. This category has two parallel and complementary processes which can be a general framework to guide local community planners (Coccosis and Maxa, 2002). the carrying capacity is a basic concept to policy – making , however the terms of debate in relation to calculating the capacity ( threshold level ) is raised , that these problems stems from the multidimensional aspects concept and limitations inherent in the estimation of human and natural ecosystems .today’s trend in the use of carrying capacity of thresholds determining has already switched to creating a favorable situation in the optimal policy for decision – making and planning and the replacement of other concepts in the management objectives is proposed . Also used tools that can be facilitate the work of planners and policy makers in order to controlled development tourism are growing and developing. However, not only there are limitations on the use of carrying capacity, but also exists in its estimation (Coccosis and Maxa, 2012, Schwartz, 2002). In particular, bearing capacity for maintaining and sustainable developing of environment is a basic necessity. Bearing capacity is the maximum use that we can take from each region that without such use, causing negative effects on resources or reduces level of satisfaction of visitors or has adverse effects on society, economy and culture of that area (Rezvani, 2008, 138). Determine the carrying capacity*



of a destination is need to attention to the attitudes and value judgments of residents and tourists. In fact, in dealing with this complex concept is used of subjective assessment of the capacities. Admission tourist destination generally using subjective indicators actually reflect the attitudes and judgments of individuals. the concept of carrying capacity of a tourist destination is based on the assumption that sooner or later a tourist destination point will be reached , since then destination will be on the decline is expected. In other words, many tourists will destroy the resources and tourist attractions therefore analyze the capacity will be necessary. Determine the capacity of tourism is an essential policy in planning that usually based on the analysis of characteristics, development and places by tourists is done, as well as feedback for analyzing tourism markets. Capacity is calculated by creating development constraints and the number of tourists in the required location (Hasanpoor et al, 2011: 180 – 181). In estimating the carrying capacity of tourism and tourism strategy suggested three types of indicator. According to the type of place and tourism abject, priority and importance of each of the indicators is different.

1. Physical ecological indicators

2. Socio demographic indicators

3. Political economic indicators

It is worth noting that all three indicators have a close interrelationship with each other , and at the same time, it should be noted the link between, continuously evaluate and review each step in order to achieve sustainable development ( same source ). The carrying capacity is utmost importance, because if the carrying capacity is calculated correctly and standards, better planning can be done in the field of tourism (Saveriades, 2000: 147).

### **Background research**

Tourism carrying capacity has been investigated by various researchers. But it can be briefly noted some of these resources.

Scientific research in this field can point to estimation the carrying capacity of tourism attractions in Alcatraz Island (manning, 2002) and model for predicting maximum daily visits and its application in tourism management in two rivers in Puerto Rico (Santiago, 2008). Makhdoom embroidery industries were estimated psychosocial carrying capacity of tourism in Solomon's throne 150 people per day in the summer. This shows charm and pristine areas more than other region. Abass Zadeh Tehrani (2008) has learned carrying capacity as a significant variable in urban planning to maintain a healthy urban environment. Nahrli and Rezaiee (2002) went to investigate and introduce recreational capacity. Dr. Tabibian et al ( 2007 ), in the case of environmental carrying capacity of Ganjnameh valley- Abbas Abad Hamedan tried that the principles of carrying capacity presented within the framework of planning process of sustainable development. Mohammad Taghi Rahnamaiee et al (2008), check the carrying capacity of GPS surveys conducted in the field of tourism destination. Also the physical range, real and effective



check in centralized residential complex of Chahoo located in the resort area Geno was done by Parvaresh et al (2010). Arman sheikh et al, (2012) assess the tourism capacity of protected area Caesar in Chaharmahal and Bakhtiari province. in this article tried to investigate ecological carrying capacity and estimate the number of visits allowed, so while the exploitation of tourism potential minimizing damage to the region. Sarabi, Ghafari ( 2014 ), assessing the carrying capacity of tourism in the city of Mashhad, examined and evaluated with an emphasis on the concept of carrying capacity. Results show that due to the facilities, services and required infrastructure, tourism has the appropriate level and is desirable. Mahmoodi et al (2013) assess the actual physical carrying capacity for tourism activities in the region's Oshtorankoo. Results show the relationship between protected areas and tourism is as old history itself in protected areas. Protected areas need tourism and tourism needs protected areas.

### **Research hypothesis**

Tourism carrying capacity of each region has its coordinates, from one region to another is different and affected by area, conditions and restrictions of the area and its management capabilities. In this research the rainfall impact in estimation of tourism carrying capacity in Sistan region studied. The hypothesis test is that: it seems that management capabilities are an important factor in increasing the carrying capacity of tourism. Features such as infrastructure facilities, security, health, services, vegetation, for tourists are the actual management capabilities. For example, the more financial resources to manage and maintain the region or better management policies to be adopted, capacity increases the effective range of area and **utility area in terms of tourists increases.**

### **Research method**

The aim of the present study, among the applied research and containing method, is in the category of descriptive – analytic study. Library studies, statistics and related organs information were used in data collection. In this study in order to estimate the carrying capacity of tourism, two types of capacity, physical range and the actual range was recognized. Data needed to estimate the carrying capacity of tourism using statistical field and study climate weather station of Zahedan is gathered. In the second part, research done to analyze the information and provide tourism development strategy in Sistan plain.

### **Location of the study area**

Sistan and Balochestan province in the far southeast of the country, in terms of geographical location at the coordinates 25 degrees 29 minutes north and 58 degrees and 3 minutes to 31 degrees and 29 minutes north and 58 degrees and 51 minutes to 63 degrees and 20 minutes east longitude has been located. The province is contiguous from north with south Khorasan province and from the east with a length of 1100 Km frontier, from the walls of neighboring Iran with Afghanistan and Pakistan. From west reach to Kerman and Hormozgan provinces and its south is the strip of 300 Km Arabian Sea. The area encompassing the city of Zabol in Sistan area is located

in the far eastern part of Iran. This area is part of the vast province of Sistan and Baluchestan and placement in the north of the province, a large and important part of the province is allocated.



Map 1: location of Sistan and Baluchistan and Sistan in Iran map.

Source: Negarandegan, 2016

### **Tourist attractions**

*International lake and pond of Hamoon: this lake covers an area of 4000 square kilometers in Sistan plain in high water seasons is the country's largest freshwater lake which is located in the north and northwest of the plain, Puzak Hamoon in the northeast, Saberi in north and Helmand is in west of Sistan.*

*Koohkhajeh: (Kooh Oshida) or (Kooh Rostam), the only natural condition in Sistan plain is located 30 kilometers from southwest of the city of Zabol. The mountain takes its name from the tomb of Khwaja Mehdi, a fan of the Always dynasty, whose tomb is located on top of the mountain.*

*Chahnimeh: in the near village of New Castle which is a huge natural hole that Helmand River surplus water flows through the channel in it and the tank capacity is 700 million cubic meters than as an artificial lake, and accordingly, supply drinking water of Sistan and part of the agricultural water in times of drought.*

*Burnt city: apparently is a new name and have not the ancient history. On the basis of existing texts, the history of the name dates back to the late 19th century. At the time, colonel Bit visited the area and local tips and used this name. The city is abundantly visible burn marks.*

### **Research founding**



**Physical carrying capacity (PCC):**

Physical carrying capacity, express the number, capacity and actual physical volumes without regard of ecosystem function. It includes part of a region or district that arises beyond those changes, confusion or environmental issues. In other words, the maximum number of visitors in a given time and place can have a physical presence. This number is calculated by the following equation appropriate for the area:

$$Pcc = A \times \frac{V}{a} \times Rf$$

Area (A) is the Zone that appropriate for tourists, V to a, is a value of space that every visitor needs to be able to easily displaced and not interacts with other physical phenomena or people. This value is normally enough for a normal person with an horizontal area of 1 square meter. In a tourism activity group, according to a group barriers, natural barriers, sensitive area or safety considerations is variable and its set will be the responsibility of tour guide and Rotation factor (RF): the number of daily visitors of a place and on this basis is calculated as:

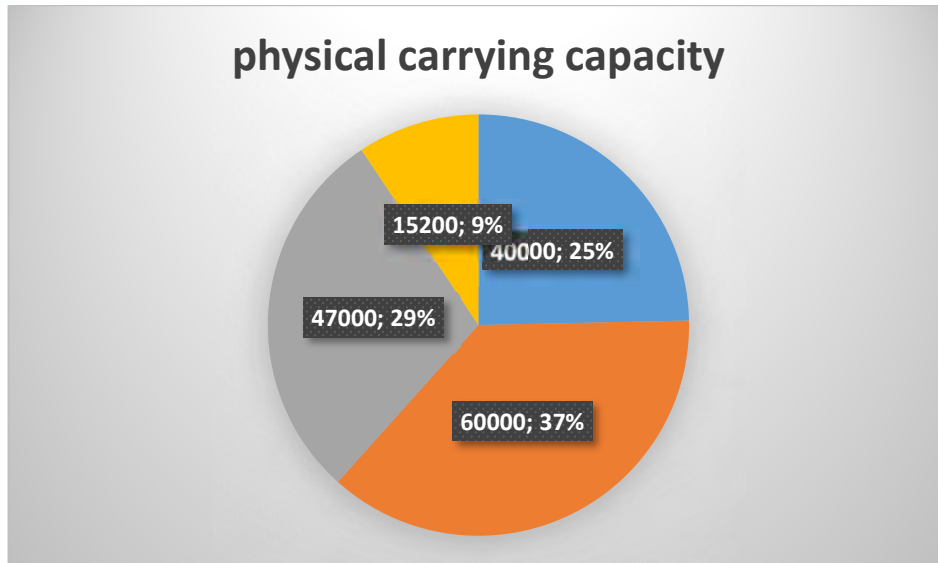
For example, if the average length of usability premises 12 hours a day and an average of visitor presence is a place is 12 hours, (RF) Rotation factor is equal to 1.  $RF = \frac{12}{12} = 1$

**Table 1: calculating physical carrying capacity in tourism indicator areas of Sistan plain**

Hamoon international lake and wetland	Khaje kooh	Chah nime	Burnt city	Name of the place
40000	60000	47000	15200	adopted area(M)10% of total area
1/5	1/6	1/7	1.4	V/a
1/5	1/9	1/8	1.6	RF
1600	1/066	1/295	633	Physical carrying capacity (person per day)

Source: research founding, 2016

Figure (1): physical carrying capacity in Sistan tourism areas (blue part: international lake and wetlands of Hamoon. Orange part: Koohkhaje. Gray part: Chahnime. Yellow part: burnt city)



(Source of research, 2016)

The results of the physical carrying shows that in studied region according to its environment and the area are suitable for different tourism Zone and the total area of the site may be unavailable and 10% of total area devoted to tourism and overuse, disturbs its ecological balance.

*Real carrying capacity (RCC): real carrying capacity is the maximum number of visitors to a tourist spot due to limiting factors resulting to the special circumstances of that location and the impact of these factors on the physical carrying capacity are allowed to visit the site on their behalf. The limiting factors with regard to the conditions and variables of biophysical, ecological, social and managerial are obtained (Tabibian and others, 2009: 23).*

REC calculated base on the following equation: 
$$RCC = PCC * \frac{100 - cf1}{100} * \frac{100 - cf2}{100} * \frac{100 - cfx}{100}$$

It is a limiting factor that express to percent. Limiting factors of studied area are: CF: CF 1 – environmental, CF 2 – social – cultural, CF 3 – facilities and services.

Limiting factors express to percent and achieve on base of this formula:  $CF = M1/M \times 100$

CF: limiting factor, M1: limiting number of each variable and Mt is the total number of one variable.

The most important factor in Sistan plain that the region's environmental challenges is the 120 day winds of with dust and server storms cause restrictions on tourism in the region .

Table 2: calculating physical carrying capacity in tourism index areas of Sistan plain

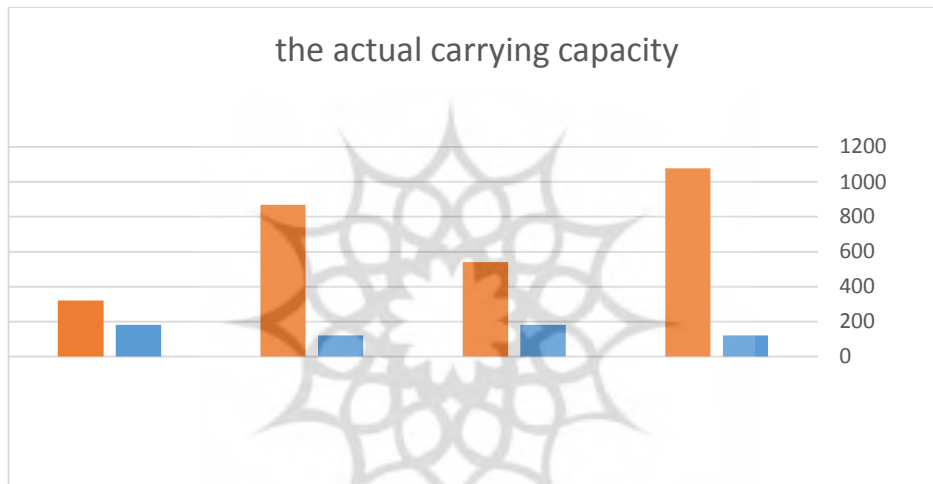


<i>Hamoon international lake and wetland</i>	<i>Khaje kooh</i>	<i>Chah nime</i>	<i>Burnt city</i>	<i>Name of the place</i>
120	180	120	180	<i>Limiting factor of storm(day)</i>
1076	540	869	320	<i>Real capacity(person)</i>

Source: research founding, 2016

If the area is dry and without water, duration of the storm wind increased to 180 days.

Figure (2): real carrying capacity in Sistan tourism areas (from left to right respectively: burnt city, chahnime, Koochkhaje, international lake and wetlands of Hamoon. Blue part: storm limiting factor (day). Orange part: actual part).



(Source: research founding, 2016)

According to the above calculations, storm factor in tourist areas has a significant impact and by increasing and decreasing storm this factor is the cause of the problem and according to physical and actual capacity is reduced.

### Conclusions

In this article tried to offered principles doctrines and practices to determine appropriate zones tourism and estimating the carrying capacity in Sistan region in the context of sustainable development planning process. Also to be examined the hypothesis of reducing the environmental carrying capacity of the region. in this regard and after identifying the tourist zone and calculate the area of each of them, taking advantage of existing bases , real and physical carrying capacity was estimated separately for each of the activities . the results indicate that although the current situation of tourism activities in the Sistan tourism area for reasons such as lack of standard of sustainability in tourism , such as lack of skilled manpower situation , lack of training for the local population as the host community and their lack of involvement in the programs of attract tourists



as well as its revenues , the quality of services to incoming tourists, incomplete development of monuments , inadequate access roads in some areas and etc compared with its carrying capacity is at a lower level; but if it continues increasing tourist arrivals to the region and the lack of comprehensive and specific tourism programs in the future , it is likely that environmental carrying capacity is reduced and the ecology of Sistan be subject to further destruction. As a result, need to be emphasized and regional capabilities to be used in planning future strategy .due to the storm and remain unknown tourist areas of Sistan, reduce tourism on our area and recognized tourist area should seek a comprehensive program to reduce human destruction in the region and it is desirable to be used. There are monuments and tourist attractions, reflect the ability of the region to attract domestic and foreign tourists. This can cause a lot of economic interests and to achieve these benefits requires careful planning and management. On the other hand, Sistan plain with its special landscape, nature and beautiful environment, the specific characteristics of climate and diverse tourist attractions can satisfy every tourist expectations. Certainly due to the carrying capacity of any planning and strategy development in Sistan plain can be relied on tourism as the key feature. Expected results in the development of sustainable tourism in the region include: dedicated funding for tourism promotion in the country and international level, planning to increase the number of tourist compared to pervious years, providing the perfect platform for job creation and the elimination of unemployment, strengthening the tourism infrastructure and eliminate the problems associated with it.

### **Solutions**

In terms of management also can be used the following strategies:

*Use reservation systems*

*Control the number of tourists by charging higher fees or license fees – zoning the area so that at any time only one group allows to visit.*

*Various recreational capacities should be considered. In addition, although aspects such as distribution use, type of use and time of use should be considered but the recreational impact reduction due to management measures, expectations of people and norms are different.*

### **Limitations**

*The following restrictions apply: Restrict general access: through the issue of the problem in access or with managing capacity of facilities prevent unwanted Visitors. For example reservation, queuing, lottery, price or selection is used.*

*Restrict access to sensitive sites, zoning, channel specific routes for passing tourists*

*Limiting tourism development through environmental taxes*

*Giving economic incentives to shape the behavior of tourists*



*Simulations and other techniques as well as reduce the time per visit sites to increase capacity*

*Use of technology to reduce pollution, noise, traffic, etc (Garrigos simon, 2004, 273 – 283).*

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