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DETERMINE CARRYING CAPACITY OF HISTORICAL CITY OF MASOULEH

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ABSTRACT

Determine carrying capacity of destination area is a planning procedure for optimize quality and facilities of area. The purpose of this research is providing appropriate solutions with investigate and determine carrying capacity of historical city of masouleh.

The main purpose of this study is determining carrying capacity of historical city of masouleh. In other word, be sure to get enough to satisfy tourists. To optimize exploiting of village sources, determine carrying capacity can be used as a management control tool. This purpose could be achieved by determine appropriate strategies. Historical city of masouleh due to the pleasant climate and its unique architecture, receives domestic and foreign tourists every year. Statistics results according to MASOOLEH council in 2014 showed Total domestic and foreign tourists approximately 1,400,000 people.

The results show that daily carrying capacity of city is 2,796 people and annual carrying capacity is 1,020,540 people. According to tourism statistics in recent years (1,400,000 in 1393) show that number of received tourist is more that capacity of city. Due to lack of monthly statistics of tourists, can't investigate which month, number of tourists is more or less than determined carrying capacity. But census of Cultural Heritage and Tourism Organization of Guilan in

Norouz (264,886 people in March 2015) declared that the number of tourists in Norous and summer is more than carrying capacity. This could lead to reduction of city's potential and it is not in line with sustainable development at all.

Keywords: Sustainable development, sustainable tourism, tourist areas, carrying capacity, historical city of masouleh

INTRODUCTION

Tourism resources often establish based on natural features in each area or at least is a major factor to determine an area as a promenade. It's obvious in this condition, maintaining the quality and quantity of natural resources, to have a continuous efficiency is necessary as well as providing an acceptable level of tourism experience to visitors.(Nigel, C., (1994))[1].

Estimate the land carrying capacity, in the second half of the 1980s with modern methods of economic evaluation of land resources has been widely used to measure the usage of areas and its resources for a specific population at certain time intervals of extended planning and different types of planning such as Urban and regional planning, industrial and agricultural development planning, forestry and tourism development. (Tabibian et al., 2008)

According to the importance of proper utilization (in his capacity) of the environmental resources with preserve its natural beauty, evaluation Leisure requirements (demand) and capability of

resource (supply) to provide appropriate tourism opportunities is necessary. So that this has an important role in promenades planning and provides required opportunity for tourism based on minimum impact of users on resources. (Nahrly and Rezai, 2009) [3]

Carrying capacity has different definition; one that used in this study is the practical concept of carrying capacity defined by World Tourism Organization as below:" The maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic, socio-cultural environment and an unacceptable decrease in the quality of visitors' satisfaction" (Tabibian et al., 2008)

In tourism development planning, for carrying capacity, two basic elements considered; behavior element that shows the quality of experience that tourist gains from site and biophysical element that determines natural and physical quality of area according to tourist's behavior. Accordingly, to estimate the carrying capacity of natural

areas for tourism purposes ,the methodology presented by the International Union for Conservation of Nature and Natural Resources considered three types of physical carrying capacity (pcc) ¹, real (Rcc) ² and effective (Ecc) ³ (Tabibian et al., 1386) [2].

Due to the fact that MASOOLEH's domestic tourists are more than one million during a year (Cultural Heritage, Handicrafts and Tourism Organization of Gilan) Consequences of traffic due to the large number of domestic tourists, lack of knowledge and failure to comply with tourism customs and culture could have positive and negative effects on environment. Considering that could be helpful for national, regional and local planning during sustainable development and tourism; also with exact planning must try to maintain the structure and potentials of it. Masouleh because of its pleasant weather and attractions receives a large number of tourists during the year that lead to economic, social, cultural and environmental interactions. At the end consequences of tourism reveals environmentally.

LITERATURE REVIEW

¹Physical carrying capacity

²Real carrying capacity

³Effective or permissible carrying capacity

Tourism carrying capacity have considered in different studies for instant: consider tourism carrying capacity according to various recreational activities, type of Promenades and their relative capabilities. (Nahrly and Rezai, 2002) [3], estimate tourism carrying capacity of Anahita Temple in Kangavar city of Kermanshah (FARHOUDI and Shorcha, 2004), estimate physical and real carrying capacity of Abbas Abad- Ganjnameh valley in Hamadan as a Tourism development strategic plan (Tabibian et al., 2007) [2], consider physical, real and effective carrying capacity of Chahoo Residential complex in centralized recreation zone of Geno protected area (Parvaresh et al., 2009) [4], Research to Estimate and Manage Carrying Capacity of a Tourist Attraction: A Study of Alcatraz Island, Sustainable Tourism (Manning et al., 2002). [5], Tourism Monitoring System Based on Concept of Carrying Capacity-The Case of The Regional Natural Park Pfynges, Proceedings of the (Clivaz et al., 2004). [6] A Model for Predicting Daily Peak Visitation and Implications for Recreation Management and Water Quality: Evidence from Two Rivers in Puerto Rico, Environmental Management. (Santiago et al., 2008)[7],Recreation Carrying Capacity Estimates for Protected Areas: A Study of

Termessos National Park (Sayan and Atik, 2011) [8].

Carrying capacity

Bovy Baud (1977) suggested a definition of carrying capacity: "the number of periods of use that an area can offer for recreation (each year) without causing permanent biological and natural destruction of the ability of the area to support the recreation and without a significant weakening of the quality of the recreation experience."

Effective or permissible carrying capacity

Mathieson and Wall (1982) with considering physical impact on site according to environmental and experience aspects define carrying capacity as "the maximum number of people who can use a site without an unacceptable decline in quality of experience gained by visitors." Must add this phrase to Mathieson and Wall's definition: "without causing unpleasant negative effects on society, economy and culture of tourism area".

Carrying capacity analyses are using at every level of tourism planning. Carrying capacity generally determine at the national and area scale. But in lower levels we must consider carrying capacity with more details. According to carrying capacity reconsidering target markets might be necessary. The carrying capacity can be determined for

developing, developed and saturated goals. (Rakhshmah, 2008)[9].

In this regard, many start to develop tourism without accurate plan to adopt themselves with large number of visitors, at the same time evidences showed that tourism can destroy the social and physical environment especially in the Mediterranean region. This fact revealed that unplanned development, changes and even destroys the characteristics of natural and cultural resources and leads to a decrease in tourism demands. Although planners at national and local levels are familiar with the concept of carrying capacity, developing some of plans caused a social cultural and environmental decline or a decrease in tourist experience quality.

Sustainable development as the dominant paradigm of the twenty-first century is arised as only fundamental solution for existing global problems, particularly environmental problems in statements and literatures of experts. The concept of sustainable development is so important; because that involves principles that understanding and accomplishing them makes us a bright future and ignoring them leads to degradation and destruction of the environment and humanity. Economic growth and reaching standards of better life without losing the natural scarce resource are considered in sustainable

development at the same time insists on social justice in using heritage of humanity and protecting natural resources. (Zahedi, 2006) [10].

One of methods that development of area planning based on it, is estimate carrying capacity. Carrying capacity can estimate for undeveloped, developing and saturated areas. (Ranjbarian and Zahedi, 2000) [11].

Two aspects should be considered in determining carrying capacity:

1. Native environment (economic, social and physical): involve both natural and man-made environment and it is the capacity that could be achieved without causing damage to the natural and man-made environment or social, cultural and economic problems for local people. At the same time establish a proper balance between development and environmental protection.
2. Image and tourism product: refers to number of tourists that fits tourism product image and experiences that tourist look for it. If the area of tourism development saturated may attractions that tourists will want to experience it, be destroyed or be hurt and gradually loses its quality and popularity. (Rakhshmah, 2008) [9].

Aspects of carrying capacity:

Carrying capacity determined in different aspects, some of them shown below:

a. Physical aspect:

Physical aspect of carrying capacity refers to physical space and infrastructure of tourist destination. In addition, the quantity and quality of accommodation facilities, transportation, water supply, energy and other tourist requirements are considered in this aspect.

b. Social aspect:

Social aspect of carrying capacity refers to Social and cultural aspects of tourism. The number of tourists, tourist activities and the demands of tourists can affect the formation of social and community integration. Evaluation of the effects on the social and cultural patterns, the scope of social tolerance are related to capacity are concerned in this area.

c. Economic aspect:

Economic aspect of carrying capacity refers to tourist destination capacity to adopt with new and growing economic activities related to tourism in the area. Tourism effects on traditional economic activities of the host community, seasonality of

tourism, labor composition, and such issues are considered in economic aspect.

d. Political aspect:

Political expectations, organizational capacity, public-private partnerships and public participation in making country decisions are considered in this aspect.

e. Ecological

Capacity to cope with the effects of tourism and ecotourism environment is considering in this aspect. Plants, soil, air, water and other ecosystem components, both alone and in conjunction with other components of ecosystems and Biodiversity are considered in this aspect.

f. Carrying capacity of site:

Many of ecotourism destinations have a fixed capacity, size and scope, facilities and amenities, available places and... are factors that determine capacity limits. This subjects must be considered in determining Carrying capacity.

g. Host community

h. The acceptance of the local community, their approach to ecotourism, their tolerance to the

changes caused by the increasing number of ecotourism and ... are considered in host community capacity and must be measured with appropriate indicators. (Zahedi, 2006) [10].

i. Cognitive/perceptual (mental).

Is the number of tourists that their presence is positive before the quality of the tourist experience effected by unpleasant events. This number is quite subjective and almost any two observers won't reach same number in this case. (Rakhsh May, 2008) [9].

DATA AND METHODS

The study area

Historical city of Masouleh located in 36 km Fooman and in the extreme southwest of the province of Gilan , at the junction of three provinces of Gilan, Zanzan and Ardebil.

The city with an area of 160,000 m² and at an altitude of 1050 meters to the north and northeast imits to Masal city. From the west limited to the Khalkhal of Ardebil, and from the south limited to Poshtkooh Khamseh of Zanzan and from the east limited to fooman plain. Also this city located along the river called "Masouleh Roudkhan".

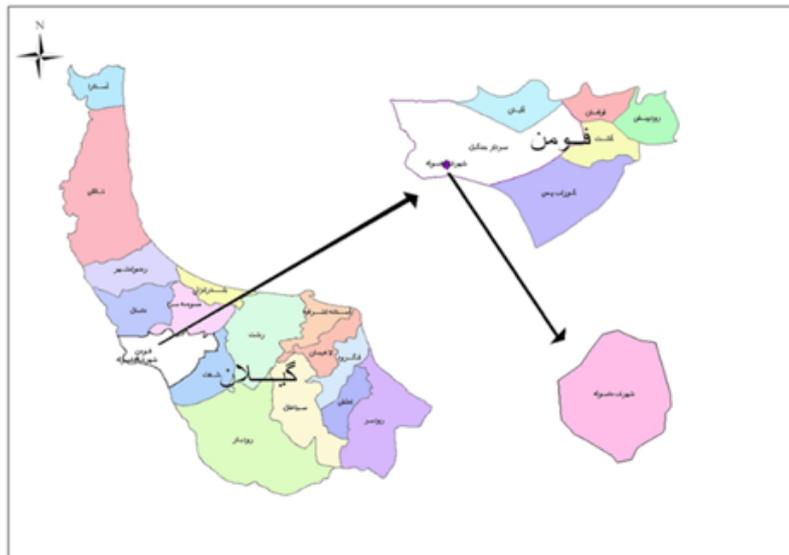


Figure.1 Geographical location map of the Masouleh

The natural state of masooleh is in aa that connected to the mountains from all the three directions and from the east directed to a beautiful valley. From other aspects of this town e can mention house’s roof, alleys and streets that are in stair form. This town also have handcrafts and souvenirs which can attract tourists.

Physical carrying capacity (PCC):

The guide line is the maximum number of visitors who can be at a specific time in specific place.

This number can be calculated for the suitable tourism one through the formula:

$$Pcc = A \times \frac{v}{a} \times Rf(1)$$

That A⁴ is the suitable area for tourism, $\frac{v}{a}$ ⁵ is amount of space that every visitor needs to easily move without any conflict with

physical phenomena or other people and Rf⁶ is the daily visit of a place that calculates through this formula:

$$Rf = \frac{\text{timethatplaceisusable}}{\text{averagetimeofavisit}}$$

Real carrying capacity (RCC):

It is the maximum number of visitors who allowed visiting a place considering the limiting factors arising from the particular circumstances of the place and the impact of these factors on the physical carrying capacity.

The limiting factors achieved b considering biophysical, ecological, social and managerial variables . (Tabibian et al., 1386)

[2]

RCC is calculated by the following formula:

$$Rcc = Pcc - cf1- cf2-....cfx (3)$$

⁴Area

⁵Visitor/Area

⁶Rotation Factor

That cf^7 is a limiting factor that t is expressed as a percentage. So the formula can be expressed as follows:

$$RCC = Pcc \times \frac{100-cf1}{100} \times \frac{100-cf2}{100} \times \frac{100-cfx}{100} \quad (4)$$

We should notice that limiting factors in each area can only be in that area. For instance: flood can be restrictive factor in one area while in other area its not. in other words, limiting factors are completely related to the state and aspects of each area. Limits are measured in percentage and evaluated through this formula:

$$CF = \frac{m}{M} \times 100$$

That CF is limiting factor, m limiting value of a variable and M total amount of a variable.

Effective carrying capacity:

The maximum number of visitors that existing management system able to manage them sustainably. Management capabilities (MC)⁸ include a numbers of factors that a manager of an area needs to achieve their desired goals and performances. The quantitative estimates of these capabilities; many variables are involved such as guidelines and policies, laws and regulations, facilities, infrastructure and equipment, manpower, financial resources

and so on. Lack of management skills is one of the most serious problems in the management of tourist areas in developing countries. However, it should be noted that the effective carrying capacity does not exceed the actual carrying capacity. And management capabilities help use actual carrying capacity of a area and not more. (Tabibian et al., 1386) [2].

Effective carrying capacity calculated as below:

$$Ecc = Rcc \times MC \quad (6)$$

$$Ecc = RCC \times \frac{100-fm}{100} \quad (7)$$

$$FM = \frac{Imc - Amc}{Imc} \times 100 \quad (8)$$

Imc= Ideal number of human resource for sustainable management

Amc= available human resources

FINDINGS

Estimated carrying capacity:

year type	Norouz visitors ⁹	Annual visitors ¹⁰
1388	169592	1.200.000
1389	150445	1.250.000
1390	181542	1.300.000
1391	201870	1.350.000
1392	271042	1.500.000
1393	258441	1.400.000
1394	264886	-

Physical carrying capacity (PCC):

⁷Contraint Factor

⁸Management capacity

⁹ According to the Cultural Heritage and Tourism Organization of Gilan

¹⁰ According to the village council

As mentioned above is the maximum number of visitors who can be at a specific time in specific place.

A = suitable area for tourism is 160.000m²

Rf = daily visiting hours are 18 hours and average time of visiting whole city is 5 hours so:

$$Rf = \frac{18}{5} = 3/6$$

Rea Rakhshmah in a study entitled "The capacity of tourism" expressed standards of capacity that based on those standards of rural and recreational activities; the In the area of study:

$$Rcc = Pcc - cf_1 - cf_2 - \dots - cf_x$$

Limiting factor rainy days: Average of rainy days during the year is 180 days.

$$cf_1 = \frac{180}{365} = 49/31 \%$$

Limiting factor snowy days: Average of snowy days during the year is 58 days.

$$cf_2 = \frac{58}{365} = 15/89 \%$$

Limiting factor frost days: Average of frost days during the year is 54 days.

$$cf_3 = \frac{54}{365} = 14/79 \%$$

According to calculated cfs, the actual carrying capacity is estimated as follows:

$$Rcc = Pcc * \frac{100 - cf_1}{100} * \frac{100 - cf_2}{100} * \frac{100 - cf_x}{100}$$

$$Rcc = 11520 * \frac{100 - 49.31}{100} * \frac{100 - 15.89}{100} * \frac{100 - 14.79}{100}$$

$Rcc = 11520 \times 0/50 \times 0/84 \times 0/85 = 4112$ person per day

$Rcc = 4112 \times 365 = 1500880$ person per year

maximum number of low density was 200 persons per hectare per day. Thus, for each people 50 square meters of space is needed.

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

$Pcc = 160.000 \times 0/02 \times 3/6 = 11520$ person per day

$4.204.800 \times 365 = 11520$ person per year

Actual carrying capacity (RCC):

Actual carrying capacity of an area due to the limitations of existing climate is calculated as follows:

Effective carrying capacity (ECC):

The maximum number of visitors that existing management system able to manage them sustainably.

Carrying capacity of the region according to the staff number of Cultural Heritage, Handicrafts and Tourism Organization in the historical city of Masooleh, is 10 people and it is ideal number of human resources is needed for managing and protection city of Masooleh. Determine ideal staffing levels according to the experts and the needs of area are required.

$$Ecc = RCC \times \frac{100 - fm}{100}$$

$$FM = \frac{Imc - Amc}{Imc} * 100$$

$$\frac{v}{a} = \frac{1}{50} = 0.02$$

Imc is Ideal number of human resource for sustainable tourism management.

Amc is number of available human resources of area.

$$Ecc = 4112 \times \frac{100 - 33}{100}$$

$$ECC = 4112 \times 0.68 = 2796 \quad \text{person per day}$$

$$ECC = 2796 \times 365 = 1020540 \text{ person per year}$$

CONCLUSION

Human uses as a major factor in the damage of tourism areas must be controlled and in this regard the estimated carrying capacity can be used as an effective measure. So carrying capacity must be accepted as a part

of each management plans in the tourism area.

In this stud have been tried to provide a reliable quantitative basis for planning and decision making of sustainable development for designers and planners with determine physical, real and effective carrying capacity of Masooleh city.

For this purpose in order to have quantitative evaluation of physical carrying capacity, by heading to Masooleh municipality the area of city was in hand. As well as through studies, the density of people in rural tourism area was achieved and the average time of a visit calculated by a questionnaire, and finally, physical carrying capacity, calculated in terms of people per day.

According to mayor of Masooleh in this city has an average of one million four hundred thousand visitors and tourist. Based on Statistics of Gilan Cultural Heritage (1394) during Norouz of 1394 hundred and sixty thousand people visited the city. However, the population of Masooleh according to 1385 census is five hundred and fifty-four (Iran Statistical Center, 1385). It is obvious that the current management with this number of visitors is completely different from managing population of Masooleh (based on researchers it's not good for

Masouleh and mass tourists should be replaced by Special tourism).

Statistically, there are some carrying capacity standards according to the number of visitors that use facilities, services and tourist attractions. These standards is different from one place to another and in terms of tourism development, environmental characteristics, types of tourism target market and the local community perception of different levels of saturation. Determined standard for rural activities with high density is between 300 and 600, and for low-density is between 60 to 200 person per hectares per day. In this study, the maximum number of low density was considered; according to the calculations is 50 square meters space for every tourist.

The result of research showed that Masouleh carrying capacity is 2796 people per day and 1,020,540 people per year. The number of tourists in year 1393 was more than capacity. . Due to lack of monthly statistics of tourists, can't investigate which month, number of tourists is more or less than determined carrying capacity. But census of Cultural Heritage and Tourism Organization of Guilan in Norouz (264,886 people in March 2015) declared that the number of tourists in Norous and summer is more than carrying capacity. This matter shows that historical city of Masouleh attract tourists more than it's capacity during the year and this could lead to reduction of city's potential and it is not in line with sustainable development at all.

negative consequences	The positive consequences	
<ol style="list-style-type: none"> 1. lack of adequate parking 2. exist of stray rock in the river of city and lack of removing activities 3. The lack of wastewater treatment system 4. Lack of proper waste collection in the city 5. Lack of adequate health service 6. traffic and air pollution caused by vehicle 7. crowd of tourists at holiday time 8-placing on earthquake fault line 9-impact of Chinese products on handicrafts 10-no easy access to drinking water 11-flood prone area 12-accumulation of garbage along river 13. The lack of appropriate environmental awareness and sensitivity of tourists and residents in hygiene 14- bustle of the city because of tourists 	<ol style="list-style-type: none"> 1. The attention of tourists to the value of the city 2-preserved traditional architecture 3. The value of weather and climate Area 4. attention of authorities to tourism of city 5. The existence of the countryside 6. knowing culture of residents 7. Understanding the biological and landscape value of the area 	<p>Masouleh</p>

SUGGESTS

According to the results, for the welfare of residents and tourists, observing capacity, as

well as guiding tourists to stagnant months of the year, suggests that:

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- Various festivals, the festival attracts tourists and can lead them to the stagnant months of the year.
 - Control and limit the number of tourists and distribute them in different times and places and targeting suitable tourist.
 - Factors Such as average length of residence, the tourists and the host community features, the geographic concentration of tourism, the degree of seasonality, type of tourism activities, access to certain sites, the use of infrastructure and excess capacity may have to be considered.
 - Increased fees in busy months
 - Getting Parking fee per hour to limit the time of visit in the Masouleh city
 - Training tourists increases the carrying capacity.
 - Having contact with tourists, especially foreign tourists; with communicate with the tourists, they can be encouraged to have a trip back to city. For example, by indicating Email in hotel registry cards can be easily connected with the passengers. To attract foreign tourists can send them occasional e-mail to encourage spending the Christmas holidays in Masouleh.
 - Informing about Serious risk of harm to the environment; with distributing brochures or CD to tourists, with pictures that shows transforming usable places to unusable one because of being inattention about principles of environmental protection.
 - Tourists with environmental information feel responsible about environment and they want to have a positive impact on the visited environment. Management can use the following strategies:
 - Control the number of tourists through higher entry demand or a license fee.
 - Zoning so only a group could visit the site at the same time.
 - Various recreational capacities should be considered.
- In addition, although aspects such as using distribution, timing of use should be considered, however, to mitigate the effects of recreational use can apply following limits due to management actions and different due to difference of people's expectations and norms:
1. Restrict general access: with b being hard to access or with managing capacity of backup facilities to avoid unwanted increasing. for instance saving place, drawing, queuing, price or selection should be used.

2. Restrict access to sensitive sites (providing opportunities for restoration of sensitive or vulnerable areas or considering physical and ecological capacity). Zoning and passing tourists from certain directions.
3. Limiting the development of tourism through environmental taxes.
4. Targeting tourists who follow environmental issues as well.
5. Setting economic incentives to shape the behavior of tourists.
6. Simulation sites and other techniques to increase capacity and reduce time per visit.
7. Using technology to reduce pollution, noise, traffic and.....
8. Implementing projects like assistant of police as collaborators with rangers.

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