



Evaluating tourism carrying capacity of Dakor and bilateral relation to climate change

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ABSTRACT

Tourism is fastest growing industry in 21st century. This development and increasing travel will directly leads to changing climate. Tourism and climate are binded as leisure tourism is totally dependent on the environment. India is also receiving good part of foreign income through tourism industry. Gujarat is aiming to be in top 5 tourist destination by the end of third decade of 21st century. This aim is leads to promote pilgrimage tourism broadly in Gujarat. Dakor is a small town in central Gujarat with its historical pilgrimage importance. This research evaluates PCC and RCC for the destination.

Keywords: Climate change, Tourism Carrying Capacity, Sustainable tourism.

1 INTRODUCTION

Anthropogenic activities and technological advancements are forcing climate change. Climate change has started affecting social structures, Industrial setup, Coastal and inland areas globally. Transportation advancement and ambition to travel around the world leads tourism as one of the fastest growing industries of 21st century. Travel & Tourism is considered as world's largest economic industry with good employment opportunities. Second decade of 21st century records 1.4 international footfall globally and expected to grow by 3.3% till the end of third decade of the century (UNTWO, 2016). Estimated employment generation from the sector is around average 2.5%-4% of total employment by 2027 (WTTC, 2017).

According to WTO, the world 'tour' is derived from the Latin word tornus, meaning 'a tool for describing a circle'. Tourism can be defined as the gesture of the people from their native or normal place of residence to another place for a minimum period of twenty-four hours to the maximum of six months for the sole purpose of

leisure and pleasure. In other words, tourism is the process of spending time far from home in pursuit of recreation, relaxation, and pleasure or business (Schwartz, 2005).

In current scenario tourism industry is considered as one of the fastest-growing industries and a major asset for foreign exchange with widespread of employment generation for many countries. It is one of the most remarkable socio-economic phenomena. Contemporary increasing air travel, stress on natural resources, physical stress on destination leads negative impression of the sector (Nghie et al., 2007).

LCA (Limiting capacity assessment) and TCC (Tourism carrying capacity) are two major approaches to study the impacts of tourism environment and limit the growth of unsustainable development. Carrying capacity assessment was primarily used for programming of recreational areas in the later part of 19th century. Basically, TCC of a destination is associated with threshold footfall limit of any tourist destination (Zacarias et al., 2011).

Tourism carrying capacity (TCC) of a destination can be defined as the maximum number of individuals that can sustain at any destination with optimum utilization of both renewable & nonrenewable resources. Complex tourism industry is composed of Social, Economic and ecological parameters (Nghie et al., 2007; Zacarias et al., 2011; Lagmoj et al., 2013). Considering that this research aims to identify following:

Therefore, three kinds of carrying capacity have been contemplate including physical carrying capacity (PCC), Real carrying capacity (RCC) and Effective carrying capacity (ECC) in introduced methodology by International Union for Conservation of Nature and Natural Resources to evaluate carrying capacity of natural areas for tourism purposes (Fennel, 1999).

This paper evaluates Physical carrying capacity and real carrying capacity of the holy city of Krishna Dakor. Dakor is located in central Gujarat in Kheda district. This destination is pilgrimage tourist site with high seasonal domestic & international tourist footfall. Bilateral impacts of tourism and climate change are also taken into consideration during the study.

2 Research Objectives:



3 Study area

Geographical co-ordinates of Dakor are 22° 75' N to 73° 15' E. Elevation of Dakor is 49 meters from MSL (Mean Sea Level). Dakor is semi-arid zone of aridity index. Rainfall at destination varies from 293mm to 1658mm with average annual rainfall of 758mm annually. Temperature variation at destination is 12° C in winters to 34° C in summers (Falling Rain Genomics, 1996). Each year 70 Lack day time and 15 Lack overnight tourist observed during Falgun Poornima at Dakor (India Census Board, 2011). Ranchhodraiji Temple, Gomti lake, and Mahalakshmi temple are main tourist attractions at tourist destination.



Figure 2 Map of Dakor

4 Methodology

- Google Earth image used as reference data during the classification and validation phases of the analysis.
- Field work was conducted to determine ambiguous land-cover classification and to visit area of major change to determine causes of the changes with both observation and filling the questionnaires by local people and tourists. This also provided a secondary validation of the classification accuracy for the most current image date and estimation of different types of carrying capacity. Total 180 surveys will be covered during this research. This was further fragmented in 40% responses are from visitors and remaining 60% are from stake holders and host community. Samples were takes randomly from and surroundings of he tourist destination.
- $PCC = A \times V/a \times Rf$
 Where: A = available area for public use
 V/a = area required per user
 Rf = Open period / Average time of one visit
- $RCC = PCC \times 100 - Cf1/100 \times 100 - Cf2/100 \times \dots 100 - Cfn/100$,
 where $Cf = (M1 / Mt) \times 100$
 Cf1- Cfn are the corrective factors, they are expressed as a percentage
 M1 = limiting magnitude of variable
 Mt = total magnitude of variable

5 Results

- Physical carrying Capacity

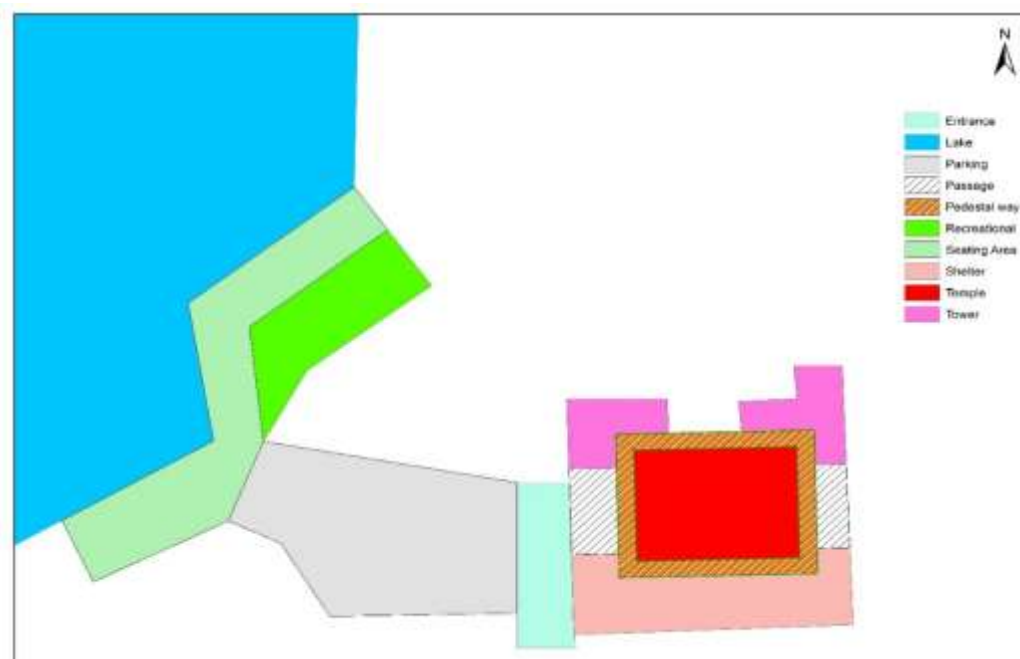


Figure 3 Map of Dakor tourist destination

The map of Dakor pilgrimage site was downloaded and analyzed using various classes available at pilgrimage destination. Dakor is famous for Ranchhodraiji temple. Main temple area covers the area of 871 m² and it remains open for 9 hours a day. Also, sitting area and passage for movement occupies 1467.71 m² and 323.96 m² area respectively. Gomti lake opposite to temple is also now recreated by local administration which occupies 676.97 m² area. This recreational area started attracting more tourists. Temple remains close during afternoon period and shelters & markets developed at Gomti lake are the center of attractions during this period. Temple, seating area and passage which are part of temple remains open for 9 hours a day were as open period of lake is taken as 13 hours as per IUCN guidelines.

Class	Area(sqm)
Pedestal way	493.342
Temple	871.826
Tower	530.228
Entrance	438.595
Parking	1791.69

Seating Area	1467.71
Lake	17414.8
Recreational	676.966
Passage	323.964
Shelter	816.26

Table 1 Map of Dakor tourist destination

Destination	Class	Area (m²)	Area required per person	Rotation factor	PCC
Dakor	Ranchodraiji Temple	871.83	2.5	20 minutes	9415
	Seating Area	1467.71	2.5	15 Minutes	21135
	Gomti lake	676.97	10	30 minutes	1760
	Passage (seating and movement)	323.96	2.5	15 Minutes	4665
	Shelter	816.26	2.5	30 minutes	8489
	Total	4156.73			45464

Table 2 PCC of Dakor

Dakor is showing total diurnal carrying capacity is 45,464. PCC generally indicates maximum capacity of an individual with total availability of total land mass. PCC of main temple is 9415 where as seating area at temple and Gomti lake are showing maximum physical carrying capacity of the destination.

- **Real Carrying Capacity**

Real carrying capacity equation includes identification of correction factors. During this research following correction factors was taken into consideration.

Correction factor	Alias	Dakor
Rainfall	<i>Cf1</i>	13.42
Temperature	<i>Cf2</i>	16.98
Infrastructure	<i>Cf3</i>	19.67
Accessibility	<i>Cf4</i>	20.64
Accommodation	<i>Cf5</i>	23.22

Table 3 Cf value for each destination

- Calculation of Real Carrying Capacity

PCC of Dakor	45,465
Cf1	0.86
Cf2	0.83
Cf3	0.8
Cf4	0.79
Cf5	0.76
RCC	15,587

Table 4 Evaluation of RCC

Table 4 gives us the exact carrying capacity of the destination which is 15,587. This was calculated on the basis of data collected from GSDMA for natural parameters and from the data the correction factor value of each natural parameter is 0.86 and 0.83. Likert scale data collected from tourist and host community will be used for evaluation of anthropogenic correction factors whose values are 0.8, 0.79 and 0.76.

6. CONCLUSION

Sustainable tourism is best indicator for tourism and surroundings. Carrying capacity is an important tool to identify the spatio-temporal condition of destination. Dakor is one of the important domestic as well as national center of attraction since last two decades. Frequency of in-situ tourism is increased dramatically in past couple of decades. This specific very high footfall of the destination leading negative impact on the spot and environment. Such events are also creating hate tourism stories also. During this research we analysed PCC and real carrying capacity of the Dakor pilgrimage site. This research indicates high possibility of physical carrying capacity and comparatively very low RCC. Developments in past five years shows remarkable initiatives for sustainable energy destination, Water conservation, cleanliness, Management of cloud situations are steadily adding value to sustainable tourism. On the other hand increasing energy and infrastructural initiatives also provides wide pathway for the development of renewable energy resources as well as organic farming.

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