# Managing Sustainable Eco-Tourism in Van Vihar National Park

**Ravi Shanker Kanoje**

Sitanadi Wildlife Sanctuary, India

ravi_s_kanoje@yahoo.com

*Key Words: Sustainable eco-tourism, tourism carrying capacity, physical carrying capacity, real carrying capacity, effective carrying capacity, management capacity.*

Abstract: Tourism Carrying Capacity determines as to what extent the influx of tourists may be allowed to manage the sustainable eco-tourism in a protected area. The concept of tourism carrying capacity is easy to perceive in theory, but in actual practice it is very difficult to quantify. Tourism carrying capacity is rarely estimated. Van Vihar is a unique combination of safari and zoological park. Its legal status is national park. White tiger and albino Sloth Bear are the main attraction to the tourists. In the winter season migratory water birds take refuge. It is situated at the bank of Upper Lake of Bhoj Wetland, The Ramsar Site; Wetlands of International Importance, in the Central Indian. More than 35 thousand tourists visit Van Vihar annually. The three levels of tourism carrying capacities i.e. physical carrying capacity, real carrying capacity, and effective carrying capacity were estimated and compared. Implications on management of eco-tourism were discussed.

## Introduction

Tourism Carrying capacity determines as to what extent the influx of tourists are allowed to manage the sustainable eco-tourism in a protected area. The concept of tourism carrying capacity is not very difficult to perceive in theory, but it is very difficult to quantify (Ceballes-Lascurain 1996). The National Wildlife Action Plan 2002-2016 recommends conducting tourism carrying capacity studies to gauge extent of tourism in most visited protected areas (Anon, n. d.). Tourism carrying capacity is rarely estimated. However Ceballes-Lascurain, (1996) has illustrated its calculations. Rajesh Gopal & Shukla (n. d.) estimated the tourism carrying capacity of Kanha Tiger Reserve. Bhattayachar (2005) presented an exhaustive documentation of the eco-tourism of Van Vihar National Park. Tourism carrying capacity of Van Vihar has not been worked out so far; therefore the author has attempted to quantify it and discussed implications of management of eco-tourism.

## Methods

General observations were made in the Van Vihar National Park for a week in June 2004. Available information and literatures were analysed. Tourism carrying capacity of the Van Vihar was estimated by following the methodology as given by Cifuentest (1992) and illustrations given by Ceballes-Lascurain, (1996). Some criteria were established and assumptions were made based on the biophysical, ecological, social and climatic factors that influence the public use of the site. The three levels of tourism carrying capacities i.e. physical carrying capacity, real carrying capacity, and effective carrying capacity were estimated and compared. Implications of management of eco-tourism were discussed.

## Study site

Van Vihar National Park is spread over 445 hectares at the bank of Upper Lake of Bhoj Wetland more popularly called of "Bhopal Kaa Tal" in the rugged hilly terrain at the heart of the capital city Bhopal of Madhya Pradesh State in the Central India. The altitude varies from 450 meters to 650 meters above mean sea level in the Plateau of Vindhaychal Hill Ranges. It is situated at the 23° 13' 48" N latitude and 77° 23' 24" E longitude. Van Vihar is basically a combination of safari park as well as zoological park but it enjoys the legal status of a national park under

Wildlife (Protection) Act 1972. Intention notification was issued in 1983 and finally declared as a national park in 1984.

The committed conservation efforts rehabilitated the habitat with 12 species of mammals (table 1). The carnivores are kept in captivity in large enclosures in the natural environmental conditions whereas the herbivores are let free ranging in their natural habitat. The Marsh Crocodile *Crocodylus palustris* (Lesson) is reared in pools. The animals are fed in the evening.

White tiger and albino Sloth Bear are the main attraction to the tourists. Some ponds have been developed where water birds may be observed at close quarters. In the winter season migratory water birds take refuge there. The Bhoj Wetland is a Ramsar Site: a wetland of international importance. It is a unique, near natural, man-made wetland, representative of the Central Indian Plateau region. The Bhoj Wetland is spread over an area of 3201 hectares supports a wide variety of flora and fauna, including 160 species of birds, regularly supporting over 20,000 birds including migratory species in winter (Ramsar Sites Directory and Overview September 2005).

The park is equipped with a battery operated bus for tourists which provides an environmental friendly atmosphere. Excursion on the five kilometres long nature trail following the bank of the Bhoj Wetland in the early morning and late in the evening provides ample opportunities to witness the wild animals. The rising sun in the morning and setting sun in the evening behind the hills and its reflection on the lake is an unforgettable, delightful experience. The interpretation centre is a place to appreciate the value of the nature conservation.

Its superb natural environment and typical situation makes it a major tourist destination in India About 35 thousand tourists visit Van Vihar National Park each year, http://envfor.nic.in/cza/vanvihar.htm (15 March, 2006).

## Results

Tourism carrying capacity is a specific type of carrying capacity and refers to the carrying capacity of the biophysical and social environment with respect to tourist activity and development (Wolters 1991). It represents the maximum level of visitor use and related infrastructure that an area can accommodate. Following the methodology of Cifuentest (1992) and illustrations of Ceballes-Lascurain (1996), calculation of the various tourism carrying capacity of the Vanvihar National Park is as below.

Physical carrying capacity is defined as the maximum number of visitors that can physically fit into a defined space, over a particular time. It is given by the formula;

$$Pcc = A \times (V/a) \times Rf$$

Where  Pcc = Physical Carrying Capacity,
A = Length or Area of a nature trail,
V/a = One visitor or group per unit length or area of nature
Rf = Rotation factor (number of group of visitors per day).

The Rotation Factor is the number of permissible daily visitor to a site. It is given by the formula:

Rf = Opening period / average time per visit.

For the calculation of Physical Carrying Capacity the following basic information are used and assumptions are made:

1. Tourists are allowed to enter with all types of vehicle. They may move freely on the 5 km long all weather nature trail.

2. Tourists visit individually or in a group and the minimum distance between the individuals or groups may be 50 meters.

3. Average size of group is of 10 members.

4. Van Vihar National Park remains open throughout the year for tourists.

5. The visiting hours are as follows:

| March to September | 06.00 AM | to 10.30 PM |
|---|---|---|
| | 03.30 PM | to 06.30 PM |
| October to February | 06.30 AM | to 11.00 AM |
| | 03.00 PM | to 06.00 PM |

6. Minimum time required to visit the site is 1 hour and 30 minutes.

Here "A" is the total length of the nature trail which is 5 Km. or 5000 meter, where the tourists are allowed to make observations.

One visitor or group per unit length of nature trail V/a =1 / 50.

Each day available visiting hours are 4.30 hours in the morning and 3.00 hours in the evening, the Rotation factor for morning and evening are calculated by dividing the available visitor hours by the time required for one visit.

Rotation factor in the morning hours: Rf = 4.30 hours / 1.30 hours = 3

Rotation factor in the evening hours: Rf = 3.00 hours / 1.30 hours = 2

Therefore the total rotation factor "Rf" is 5, three in the morning and two in the evening.

Now by using the formula of the Physical Carrying Capacity "Pcc" may be calculated as:

| Pcc = | A× (V/a) ×Rf |
|---|---|
| or Pcc = 5000 meter × (1/50meter) × 5 | |
| or Pcc = 500 | |

The physical carrying capacity will be 500 groups visit per day or 5000 visitors a day with the average group size of 10 visitors.

Real carrying capacity is defined as the maximum number of visits to a site, once the correction factors or reduction factors derived from the particular characteristics of the site have been applied to the Physical Carrying Capacity (Pcc). The corrective factors are obtained by considering biophysical, environmental, ecological, social and management variables.

Real Carrying Capacity is given by the formula:

| Rcc = | Pcc × | $\frac{(100\text{-}Cf_1) \times}{100}$ | $\frac{(100\text{-}Cf_2) \times}{100}$ |
|---|---|---|---|

Where Rcc = Real Carrying Capacity,

Cf = Corrective factor.

Corrective factor are expressed in percentage, it is given by the formula:

| Cf = | $\frac{M_1 \times 100}{Mt}$ |
|---|---|
| Where M1 = | Limiting magnitude of the variables, |
| Mt = | Total magnitude of the variables. |

Consideration of the environmental, ecological, management social variables for the calculation of corrective factors:

(1) Excessive sunshine: Sunshine is intensive in the following periods making visits to the site uncomfortable during the opening hours.

| March to September | 09.00 AM | to 10.30 AM |
|---|---|---|
| | 03.30 PM | to 05.00 PM |
| October to February | 9.30 AM | to 11.00 AM |
| | 03.00 PM | to 04.30 PM |

Each day available visiting hours are 4.30 hours in the morning and 3.00 hours in the evening, thus total available visiting hours is 7.30 hours. Whereas each day excessive sunshine are 1.30 hours in the morning and 1.30 hours in the evening thus total excessive sunshine is 3.00 hours.

Corrective factor for excessive sunshine is calculated by using the formula:

| Cf1 = | $\frac{M_1 \times 100}{Mt}$ |
|---|---|
| = | $\frac{3.00 \times 100}{7.50}$ |
| = | 40% |

(2) Rain fall: Rainy season is for 4 months from July to October and winter rain occurs in December and January. In the evening hours usually hail storm occurs in months of February and March, Pre-monsoon rain is experienced from 15th June. Thus there are 90 rainy days per year and rain fall may occur for one and half hours during visiting hours which may hinder the visitation. Thus the total rainy hours each year are 90 × 1.50 and considering 360 days in a year visitation hours are 360 × 7.5.

Corrective factor for excessive rain fall is calculated by using the formula:

| Cf2 = | $\frac{M_1 \times 100}{Mt}$ |
|---|---|
| = | $\frac{90 \times 1.5 \times 100}{360 \times 7.50}$ |
| = | 5% |

(3) Disturbance to wildlife: Migratory birds occur in the Bhoj Wetland and in ponds especially created for water birds and forests. The nature trail follows the bank of Bhoj Wetland and ponds in the Park, migratory birds may get disturbed for six months from October to March in the winter and spring

season. The wild animals may remain unaffected because the tourists are not allowed to leave the nature trail. Wild animals are provided with food close to the road side in the evening at the peak tourist hours. Tourists see the wild animals at close quarters. Wild animals are accustomed with the presence of visitors and do not scare or escape.

Corrective factor for disturbance to wildlife is calculated by using the formula:

| $Cf_3 =$ | $\dfrac{M_1 \times 100}{M_t}$ |
|---|---|
| $=$ | $\dfrac{6 \times 30 \times 100}{12 \times 30}$ |
| $=$ | $50\%$ |

(4)      Temporary closing of the site: Van Vihar National Park remains closed on Tuesday and certain holidays. There are 52 weeks in a year therefore there will be 52 Tuesdays and there are 8 holidays on religious festivals in a year. Thus there will be total 60 days in a year when the Van Vihar National Park is closed to the tourists.

Corrective factor for excessive rain fall is calculated by using the formula:

| $Cf_4 =$ | $\dfrac{M_1 \times 100}{M_t}$ |
|---|---|
| $=$ | $\dfrac{60 \times 100}{360}$ |
| $=$ | $16.66\%$ |

(5) Erosion: Correction factor for soil erosion has not been taken in to account as the nature trail is all-weather road lined with bitumen, waterproof and resistant to soil erosion. Tourists are not allowed to drive off the road.

(6) Accessibility: It is the measure of the difficulty due to slope of the trail experienced by visitor in moving about freely. The entire length of the nature trail is easily accessible therefore accessibility factor has not been taken in to account.

Thus following corrective factors have been calculated:

(1) Excessive sunshine:        40.0 %

(2) Rainfall:        5.0 %

(3) Disturbance to wildlife:        50.0%

(4) Temporary closure of site:     16.6%

Now the Real Carrying Capacity "Rcc" may be calculated by using the various corrective factors in the formula as follows:

| $Rcc =$ | $Pcc \times$ | $\dfrac{(100-Cf_1) \times}{100}$ | $\dfrac{(100-Cf_2) \times}{100}$ | ---------------- | $\dfrac{(100-Cf_n)}{100}$ |
|---|---|---|---|---|---|
| $=$ | $Pcc \times$ | $\dfrac{(100-Cf_1) \times}{100}$ | $\dfrac{(100-Cf_2) \times}{100}$ | $\dfrac{(100-Cf_3) \times}{100}$ | $\dfrac{(100-Cf_4)}{100}$ |
| $=$ | $500 \times$ | $\dfrac{(100-40) \times}{100}$ | $\dfrac{(100-5) \times}{100}$ | $\dfrac{(100-50) \times}{100}$ | $\dfrac{(100-16.66)}{100}$ |
| $=$ | $118.275$ | | | | |

The physical carrying capacity estimated to be 500 groups visit per day or 5000 visitors a day, whereas the real carrying capacity is 118.275 group visits per day or 1183 individual visitors per day.

Effective carrying capacity is defined as the maximum number of visitors that a site can sustain, given the management capacity available with the administration. Management Capacity is the sum of conditions that the protected area administration requires if it is to carry out its function and objectives. Effective carrying capacity is obtained by comparing real carrying capacity with the management capacity.

Van Vihar National Park does not have sufficient infrastructure and adequate number of efficient personnel or guide to handle large number of visitors. A large array of tourists arrive here on Sunday and holidays, it becomes over crowded in the evening and very difficult to manage. Tourists congregate in large number to observe the tigers at the time of feeding in the evening. Ninety percent of visitors could not get a guide for escorting and remain unattended to get any information about flora and fauna of the Park (Bhattacharya 2005). The management capacity would be only 10 % therefore the effective permissible carrying capacity would be only 12 group visits at a time and 120 individual visitors at a time. Limitations in management capacity constitute one of the most serious problems confronting protected areas in developing countries (Ceballos-Lascurain 1996).

Seventy five percent visitors are willing to pay a fee for the guides during their visit (Bhattacharya 2005). Forest guards or personnel for security purpose may be deployed at strategic point to keep

regular vigil over the activities of tourists. Eighty percent of visitors showed interest in the park management if they are given a chance to do so, 10 % of local people visit more than 10 times year (Bhattacharya 2005). Therefore, orientation programmes may be conducted for some visitors to train them as guides and may be given opportunities for their part time volunteer services to the park in the peak hours in the tourist seasons. Sixty percent of visitors do not know anything about code of conduct that is to be observed in the Vanvihar National Park (Bhattacharya 2005). Signposts carrying necessary information may be placed at vantage points and a brochure may be distributed. Very few visitors, only 4 %, liked the interpretation centre from where they could have obtained most of information about Vanvihar and wildlife (Bhattacharya 2005). Therefore the interpretation centre may be equipped with audio-visual aided models to make it more informative and attractive. Films on wildlife may be displaced in the evening. Diesel and petrol driven vehicles create noise and air pollution therefore only electric and bio-diesel driven vehicle may be allowed to enter. Tourists may also be allowed with the cycle rickshaw. A cycle rickshaw is a two seated manually operated vehicle. Training in eco-tourism may be imparted to the cycle rickshaw puller, they may be provided with a pair of binoculars and wild animal and bird indicator booklets. This will spread awareness for nature conservation to the common people and employment too.

The disturbances may be diminished by rigidly observing rules and regulations. Commitment to some restrictions and obligations may be taken from the visitors before their entry into the park. Thus management capacity may be increased by employing adequate number of personnel and imparting environmental education to make the staff more efficient, and developing improved infrastructures.

Each subsequent level constitutes a corrected capacity level of the level which precedes. Physical Carrying Capacity is always greater than Real Carrying Capacity and Real Carrying Capacity is greater or equal to Effective Carrying Capacity. Anyhow, effective carrying capacity will never be greater than real carrying capacity even in the most favourable conditions (Ceballos-Lascurain 1996). If it is exceeded, deterioration of the areas resources, diminish visitor satisfaction and adverse impacts upon the society, economy and culture of the area can be expected to ensure (McIntyre & Hetherington 1991).

Carrying capacity depends on place, season and time, user's behaviour, facility design, pattern and level of management and the dynamic character of the environments (Ceballos-Lascurain 1996). Therefore estimation of carrying capacity may be revised from time to time with the changes in the factors that influence carrying capacity.

The physical carrying capacity gives the maximum number of visitors that can be physically accommodated, real carrying capacity gives the maximum number of visitors that can be permitted without causing loss or destruction to the ecosystem and effective carrying capacity gives the maximum number of visitors that can be sustained with the present management capacity. Eco-tourism is sustainable if the tourism activity is within the effective tourism carrying capacity. However

Table 1: Mammals of Van Vihar National Park.

| S. N. | Common Name | Scientific Name | Habit |
|---|---|---|---|
| 1 | Spotted Deer | *Axix axix* (Erxleben) | Herbivores |
| 2 | Sambar | *Cervus unicolor* (Kerr), | |
| 3 | Blue Bull | *Boselaphus tragocamelus* (Pallas) | |
| 4 | Black Bock | *Antilope cervicapra* (Linnaeus) | |
| 5 | Four-horned Antelope | *tetracerus quadricornis* (Blainville), | |
| 6 | Wild Boar | *Sus scrofa* (Linnaeus) | |
| 7 | Common Languor | *Presbytis entellus* (Dufressne) | |
| 8 | Tiger | *Panthera tigris* (Linnaeus) | Carnivores |
| 9 | Panther | *Panthera pardus* (Linnaeus) | |
| 10 | Asiatic Lion | *Panthera leo persica* (Linnaeus), | |
| 11 | Sloth Bear | *Melursus ursinus* (Shaw), | |
| 12 | Hyena | *Hyaena hyaena* (Linnaeus) | |

tourism activity should never be allowed to exceed the real carrying capacity. A ceiling on the number of tourists/tourist vehicles permitted to enter the protected area should be laid down, keeping in mind each protected area's individual characteristics (Anon, n. d.). Once the different levels of carrying capacities are estimated suitable strategies should be planned to increase the tourism carrying capacity. Otherwise the number of tourists may be restricted by increasing the entry fee and imposing strict rules and regulations.

## Acknowledgement

## References

Anon (n. d.). National Wildlife Action Plan (2002-2016). New Delhi.

Bhattacharya, A. K. (2005). Ecotourism and Livelihoods Capacity Building for Local Authorities. New Delhi.

Ceballos-Lascurain, H. (1996). Tourism, Ecotourism and Protected Areas: The State of Nature- Based Tourism around the World and Guidelines for its Development. Gland and Cambridge

Cifuents, A. M. (1992). Determination de Capacidad de Carga Tourism en Areas Protegidas. Costa Rica.

McIntyre, G. & A. Hetherington (1991). Sustainable Tourism Development: Guidelines for Local Planners. Madrid.

Rajesh G. & Shukala R. (n. d.). Management Plan for Kanha Tiger Reserve for the Period 2001-02 to 2010-11 Vol. I Text. M. P. Forest Dept. Mimeo.

Wolters, T. M. (1991). Tourism Carrying Capacity. Paris.