Sustainability & Tourist-crowding Trade-off at Wildlife Based Tourist Spots in Dooars Region of North Bengal: A Study on Ecotourism Carrying Capacity of Chapramari Wildlife Sanctuary in Dooars, Jalpaiguri (W.B)

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ABSTRACT

Having realized the proliferated growth of ecotourism, forest based wildlife tourism in sub-himalayan Dooars belt of West Bengal has opened up a new milestone for socio-economic development of this economically distressed region. Such protected areas are capable enough to generate more revenue in terms of tourism, biodiversity conservation, improvement of climate, purification of water and air, storage and supply of fresh water and flood control but without any physical exploitation. This article highlights existing scenario of wildlife tourism in the Dooars area for promoting it as one of the hottest wildlife tourist destinations of India. This article attempts to ventilate the glaring impacts of tourist congestion on the carrying capacities of the various forest tourist sites with reference to Chapramari Wildlife sanctuary of Dooars in Jalpaiguri district. For assessing trade-off between carrying capacity on both ecological & effective dimensions and ecotourism prospect, visitors were interviewed with semi structured questionnaire. Finally the paper concludes by showcasing the maintenance of sustainable carrying capacities to eliminate ecological imbalances which would otherwise hinder the growth of wildlife tourism.
Keywords: Carrying capacity, Ecotourism, Ecological carrying capacity, Wildlife tourism, Tourist congestion

1. INTRODUCTION

In India, Dooars region of the northern sub-Himalayan West Bengal acts as a treasure hunt for the nature bound wildlife lovers of India and abroad, offering a rich biodiversity in the dense forests with diverse collection of wild species and ethnic tribal cultures. But sustained preservation of nature and its wild habitat is severely affected by mushrooming of private resorts causing tourist congestion & thereby hampering the physical & ecological carrying capacity of the wildlife safari parks both at visitor's and host resident's level. According to the report of UNEP 1998, an optimal number of visitors' footfall may enhance the quality of visitors' satisfaction without deteriorating the physical, economic, socio-cultural environment. The tourist carrying capacity has been defined as the ability of a natural or man-made system to absorb population growth without significant degradation (Schneider1978) assuming that an increased level of contact could produce large reductions in visitor satisfaction (Lucas and Priddle 1964). Wildlife itself is often disturbed by tourist influx leading to loss of habitat. Usually people flock together to wildlife sanctuaries and national parks in Dooars to spend an enjoyable vacation in the midst of pristine wilderness. In Dooars, Chapramari forest possesses the backdrop of serene beauty with stark mental and physical calmness where forest lovers get themselves involved in bird-watching, safaris and nature-walk. Heavy tourist traffic in this type of protected areas for enjoying serene natural beauty amidst wilderness together with wildlife safaris promotes ecotourism and socio economic upliftment of the adjacent tribal communities. This article attempts to assess the trade-off between ecological carrying capacity and ecotourism potential of such wildlife tourism spots. Within the purview of this paper a number of issues regarding sustainable management of ecotourism are analyzed in relation to optimal carrying capacity of such wildlife tourist attractions.

2. LITERATURE REVIEW

As per Schneider (1978) carrying capacity of a forest safari park is its capability to absorb population growth without hampering environment. In the year 1983, Pigram defined carrying capacity in physical dimension in terms of accommodation and in ecological context, a limit up to unacceptable or irreversible decline in ecological values and in societal background it speaks of maximum recreational usage level. Under the constraint of space in such areas the physical capacity can be increased if some management parameters are developed for complete or efficient utilization

(Shelby and Heberlein 1984). McCool and Lime in 2001 developed a variety of planning frameworks such as Visitor Experience and Resource Protection and Limits of Acceptable Change to address issues of visitor impact.

Saveriades along with others writers, planners and scientists in 2000 prescribed to use numerical capacities so that the environment, tourism experiences and the adjoining social community do not suffer unwanted consequences. In case of degradation various managerial actions are executed to restore the area back to its numeric carrying capacity. Price (1999) advocated a consolidated summary of a variety of research on carrying capacity by stating it as a self validating belief and flawed matter. But other authors like Dhondt in 1988, Mcleod in 1997 added additional arguments on practical utility of carrying capacity and its scientific foundations. In this respect Brown and Turner in 1997 defined actual carrying capacities in terms of specific numbers of tourists. Ecotourism fundamentally aims at the protection of natural area, revenue generation and local participation and capacity building apart from rendering an enjoyable experience (Pedersen 1991).

3. ISSUES RELATED TO WILDLIFE TOURISM IN DOOARS

(a) As a Product for Marketing & Promotion: As per Cristoller (1963), Stanofield (1978), Butter (1980), tourism development follows the same four phased life cycle (i.e. origin, growth, maturity and decline) which necessitates traffic-building initiatives to enhance and upgrade the attractiveness of such tourist destinations even for Dooars region also so that visitors can spend an enjoyable vacation in the midst of pristine wilderness. This way such wildlife tourist sites find its identity as a marketable product-offering to tourists.

(b) As a Profit-center/Wealth creator: Profit from wildlife tourism is directly related to the per head tourist consumption and the volume of tourist flow. This tourist flow and their consumption are the function of serene nature herself with wildlife being her part and the tourist-services. As by frequent safaris natural beauty depletes more and wild habitat gets disturbed, attractiveness of wildlife tourist sites prevails till rate of such negative externalities remains within its accepted tolerance limit,. So Profit or Wealth here is subject to the constraint of the average life of these tourist destinations or sum total of tourist-services and public-spending for sustainable wildlife tourism.

(c) Effect of Heavy Tourist congestion: Sustainable growth of wildlife tourism calls for the responsibility towards local community-development and compatibility with sustained preservation of nature and its wild habitat. Large number of private resorts causing tourist congestion hampers the social carrying capacity (optimum number of visitors/tourists tolerated per day) of the wildlife tourist sites both at visitor's and host resident's level. Thus the Net Benefit from Wildlife tourism = Net private benefit accrued – Social loss – Environmental loss. The positive ratio of marginal social loss to tourism-benefit necessitates justified taxing (Pigouvian) of the tourist community for internalizing the social and environmental losses arising out of tourist-crowding at various wildlife tourist destinations across the Dooars region.

4. OBJECTIVE OF THE STUDY

1. To identify the various burning issues related to marketing/promotion of sustainable wildlife based tourism in Dooars belt.
2. To estimate the Effective as well as Ecological Carrying Capacity of Chapramari Wildlife Sanctuary of Dooars region of North Bengal.
3. To Assess Impacts of heavy tourist footfall on sustainable ecotourism in Chapramari forest.

5. CARRYING CAPACITY AT WILDLIFE BASED TOURIST SITE

According to the World Tourism Organization the Carrying capacity in relation to environmental sustainability, denotes maximum number of tourists visiting a tourist destination without hampering the physical, economic, socio-cultural environments. As per Cifuentes (1992) Carrying capacity has three dimensions (a) Physical carrying capacity (PCC), (b) Real carrying capacity (RCC) and (c) Effective carrying capacity (ECC). PCC is the maximum number of tourists that can physically fit into or onto a specific area, over particular time and given by $PCC = A \times (V/a) \times R_f$; Where, A = available area for public use; V/a = Visitor Density (one visitor / M^2); R_f = rotation factor (number of permissible visits per day) or No. of Daily hours the area is open to Tourists/Average Time of Visit. RCC is the maximum permissible number of visits to a site, and expressed by the following general formula: $RCC = PCC \times [(100 - C_{f1}) / 100] \times [(100 - C_{f2}) /100] \times \ldots \ldots \times [(100 - C_{fn}) / 100]$ Where the corrective factor, $C_f = (M_l \times 100)/ M_t$; Where: M_l = limiting magnitude of the variable; M_t = total magnitude of the variable. Effective carrying capacity (ECC) displays the maximum number of visitors that a site can sustain, subject to the management capacity (MC) available and given by $ECC = RCC \times MC$. MC is the sum of Forest's administrative conditions necessary to carry out its functions at the optimum level. The limiting factor on the part of forest department's administrative sector that lowers RCC may be like staff shortage and basic communication- infrastructural demerits.

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6. RESEARCH METHODOLOGY

(a) **Approach:** Questionnaire based Survey Method using Random sampling.

(b) **Duration**: Three months: March – May'14 (Summer Peak season)

(c) **Venue of Study**: Chapramari Wildlife Sanctuary (Meteli Block of Jalpaiguri District; W.B)

(d) **Sampling Unit & Size**: 500 day-visitors of jungle safari by Jeep (Gypsy)

(b) **Data Collection**

a) Primary Data through semi structured interviews with day-visitors

b) Secondary Data through the records of the Forest Department, Review Papers, Journals, travel magazines, recent publications and Internet

(c) **Data Collection Instrument**: A semi-structured questionnaire made in three languages, Bengali, Hindi and English.

(d) **Tourist profile**: Individuals, Couples, Group of friends, Family groups, Educational groups seeking adventure of wildlife sighting at forests.

7. THE ARCHITECTURE OF STUDY

(a) **The Study Area**: The Chapramari wildlife sanctuary is located off the NH 31 in Jalpaiguri district under Jalpaiguri Wildlife Division II of Directorate of Forests, Govt. of West Bengal at an around 20 kms away from Gorumara National park, 10 km from Chalsa. In 1998, it was declared as Wildlife Sanctuary. Chapramari lies at 26°53'N latitude and 88°51' E longitude covering 9.60 sq. km area. This sanctuary cum safari park was chosen purposively for abundant wildlife spotting chances especially wild elephants and Indian bisons or Gaurs.

(b) **Methodology adopted**: A questionnaire survey through interviewing nearly 500 day-visitors on-site randomly during the peak season (March to May 2014) in both morning and afternoon safari trips. Here carrying capacity assessment is done in two perspectives (A) Method advocated by Cifuentes (1992) and (B) Limits of Acceptable Change (LAC) framework to identify the ecological capacity of Chapramari for analyzing the present ecological condition of this forest.

Table No: 1 Showing Visitors' Category in Chapramari Forest for Jungle - safari

Sl No	Category of Visitors	Composition = ∑No of Group x Group size	Total size of a category	%	Duration of Stay	Average Duration of Stay
1	Educational group	2x30 + 2x50	160	32%	3-4 hrs.	3.5 hrs
2	Group of friends	2x15 + 5x8 + 1x20	90	18%	2-4 hrs	3 hrs
3	Group of families	13x8 + 3x12 + 5x11	195	39%	4-5 hrs	4.5 hrs
4	Individuals (single)	1 x 25	25	5%	5-6 hrs	5.5 hrs
5	Couple	2 x 15	30	6%	2-3 hrs	2.5 hrs
6	**Total**		**500**	**100 %**		

Table:1 indicates that family-group shared the major portion (39%) of the total tourist visiting the forest followed by educational groups (32%) while single-individuals were the least.

8. CARRYING CAPACITY ASSESSMENT FOR CHAPRAMARI FOREST/WILDLIFE SANCTUARY

The practical facts considered

1. Only vehicular movements within the sanctuary are permitted.

2. For safe movement & less dust, minimum 500 m space to be kept between 2 vehicles.

3. Minimum 2 hours are needed for a single safari & average visitation time 4 hours a day.

4. The Chapramari forest is open to tourists for 9 months in a year and average 8 hours per day.

5. Total linear safari-length within Chapramari sanctuary (to & fro) is 3800 meter (As per estimate from Guide & jeep driver).

[A] Cifuentes (1992) Method

(a) Rotation Factor (R_f): Using Table: 1 the Average Duration of Visit is calculated as $[(3.5 \times 160) + (3 \times 90) + (4.5 \times 195) + (5.5 \times 25) + (2.5 \times 30)]/500 = 3.84$ or approx. 4 hours. Considering average daily safari trip time is 4 hours (Morning & Afternoon) & daily visit of 8 hours; thus the value of Rotation factor $R_f = 8/4 = 2$ visits.

(b) Physical Carrying Capacity (PCC): The total required trail length for two & fro safari trips for 33 total groups is $(33 \times 50) + (32 \times 50) = 3250$ m with maximum group size 50 & 50 m intervening space between any pair of groups. Thus sanctuary can accommodate 33 groups within its 3800 m safari trail length. The available linear area for all the visitors is 1650 m (33×50). The Physical Carrying Capacity (PCC): $1650 \times 1 \times 2 = $ _3300 visitors/day_ which is literally impossible to allow in a day.

(c) Real Carrying Capacity (RCC): The key site specific corrective factors (C_f) limiting smooth visitation/safari to the sanctuary include scorching heat in day-time, incessant rainfall, stormy climate and disturbance to wildlife.

[i] C_f^{Heat} for day-time scorching heat: March – May 2014: Considering 17 excessive heated days (temperature > 35°C) on an average in a summer month (March to May) along with 4.5 heated hours (10:30-15:00) and 12.5 hours daily sunny period (06:00-18:30) the Limiting magnitude hours/day (M_l) of scorching heat = $[17 \times 4.5] = 76.5$ hours/month and total magnitude (M_t) of excessive heat = $[17 \times 12.5] = 212.5$ hours/month. $C_f^{Heat} = $ (76.5 x100)/212.5 = 36 %

[ii] C_f^{Rain} for incessant rainfall during March – May 2014: Considering average 12.5 incessant rainy days (> 2 mm rainfall); 1.5 rainy hours in a day; effective 92 tourism days with 8 hours in a day of two shifts the limiting magnitude hours/day (M_l) of heavy rainfall = $(12.5 \times 1.5) = 18.75$ hours and Total magnitude (M_t) of heavy rainfall = (8 hours a day x 92 days) = 736 hours. $C_f^{Rain} = $ (18.75 x100)/736 = 2.55 %

[iii] C_f^{Stormy} for stormy climate during March – May 2014: Considering average 10.5 stormy days (wind speed > 17.2 m/sec) and 7 hours (10:00-17:00) effective average period of wind during safari limiting magnitude hours/day (M_l) of stormy weather = $(10.5 \times 7) = 73.5$ hours and the Total magnitude (M_t) of stormy weather = (8 hours a day x 92 days) = 736 hours. Therefore, the $C_f^{Stormy} = $ (73.5 x 100)/736 = 9.98%

[iv] $C_f^{Wildlife}$ for disturbance to wildlife during March – May 2014: Considering nesting & peak breeding time is extremely sensitive to disturbance due to tourist rush and Usual peak breeding period for Indian Gaur (bison) last 2 weeks of May (½ month), peak courtship activity for spotted deer for one month before the onset of regular monsoon from June (½ month), for the birds mid April to mid May (1 month), limiting magnitude (M_l) of wildlife disturbance is $(1 + ½ + ½) = 2$ months. Total magnitude (M_t) of wildlife disturbance is 3 study months (March to May). Thus the $C_f^{Wildlife} = (2 \times 100)/3 = 66.67\%$.

[v] $C_f^{Maintenance}$ for maintenance related restriction on visitation during March – May 2014: In Chapramari, an average value of 14 hours are spent for maintenance & other managerial works during the study may be considered as limiting magnitude (M_l) out of Total magnitude (M_t) of restricted visitation for maintenance of (4 hrs/day x 90 days) = 360 hours. Thus $C_f^{Maintenance} = (14/360)$ x 100 = 3.89%. Real Carrying Capacity (RCC) = PCC $\times$ [(100 - C_f^{Heat}) / 100] $\times$ [(100 - C_f^{Rain}) /100] $\times$ [(100 - C_f^{Stormy}) / 100] x [(100 - $C_f^{Wildlife}$) / 100] = **584 visitors/day**

[d] Effective Carrying Capacity (ECC): The administrative/management plan of Chapramari Sanctuary suggests allotment of 17 staffs including Beat officer, chiefs, drivers, forest guards and workers there. However, only 7 staffs are in charge of administrative part. So, the management capacity (*MC*) is 41% and ECC= RCC$\times$ MC = 584 visitors/day x 0.41 = **240** *approx.* number of day-visitors /day (240/6 = 40 Safari-vehicles/day).

[B] Limits of Acceptable Change (LAC) framework:
For determining Ecological Carrying capacity, 12 indicators and Parametric Importance Unit (PIU) for each indicator with values of High (H with 3X), Medium (M with 2X) and Low importance (L with 1X) were selected by five wildlife and forest experts. Final PIU$_{Indicator}$ = Mean of summated ratings of experts. Then Indicator Quality Unit (IQU) being inversely proportional to the percentage of people agreeing is assigned to each indicator ranging from 0 to 1. Carrying Capacity Impact Unit (CCIU$_{indicator}$) = PIU$_{ndicator}$ x IQU. Ecological Carrying Ccapacity$_{Chapramari}$ = $\sum$CCIU$_{indicator}$. The following table shows CCIU-standards for assessing total impact on ecological carrying capacity of Chapramari:-

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TABLE NO: 2 Showing CCIU Value Range as Standardized by 5 Experts

Serial No	Carrying Capacity Impact Unit (CCIU) Value Range	Implications
1	0 - 20%	Extremely high negative effect on Ecology of Chapramari Wildlife Sanctuary in Dooars (Jalpaiguri).
2	21- 40%	High negative effect on Ecology of Chapramari Wildlife Sanctuary in Dooars (Jalpaiguri).
3	41- 60%	Medium negative effect on Ecology of Chapramari Wildlife Sanctuary in Dooars (Jalpaiguri).
4	61- 80%	Less negative effect on Ecology of Chapramari Wildlife Sanctuary in Dooars (Jalpaiguri).
5	81-100%	Extremely Less negative effect on Ecology of Chapramari Wildlife Sanctuary in Dooars (Jalpaiguri).

The 12 indicators for ecological impact assessment for Chapramari as suggested by the concerned experts:
1. Safari vehicle's (Gypsy) queue at the entry gate of Chapramari.
2. Damages of roads inside the forest by safari vehicles.
3. Degree of Air Pollution inside the sanctuary.
4. Degree of Noise Pollution inside the sanctuary.
5. Storage of Solid wastes inside the sanctuary.
6. Destroy/Damage of vegetation inside the sanctuary.
7. Noisy movement of visitors crowded at the solar fencing around the swamp (with salt-peats) near Eagle Watch Tower.
8. Disturbance of Wild animals by the presence of day visitors two times a day.
9. Aggressive animal behaviour towards visitors' crowd and/or Gypsies on the way.
10. Professional attitude & interest level of Guides in explaining the animal behaviour to the visitors.
11. Extent of awareness on wildlife & forest developed among the tourists/visitors
12. Less animal-sighting instances & probability.

The following Table No 3, represents the PIU for each indicator, as rated by the team of five experts.

TABLE NO: 3 Showing Calculation of PIU Values

Sl No	Description of Indicators	Ratings given by 5 Experts (L/M/H)					PIU Value (Mean of summated Rating)
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	
1	Safari vehicle's (Gypsy) queue at the entry gate of Chapramari	H	H	L	M	H	9.2
2	Damages of roads inside the forest by safari vehicles.	L	L	M	L	L	4.6
3	Degree of Air Pollution inside Chapramari	H	L	M	M	H	8.5
4	Degree of Noise Pollution inside Chapramari	M	M	H	L	H	9.9
5	Storage of Solid wastes inside the sanctuary	H	L	M	H	M	8.5
6	Destroy/Damage of vegetation inside Chapramari	M	M	L	L	L	5.4
7	Noisy movement of visitors crowded at the solar fencing around the swamp (with salt-peats) near Eagle Watch Tower	H	L	M	H	H	9.2
8	Disturbance of Wildlife by the presence of day visitors two times a day	M	L	H	L	L	7.7
9	Aggressive animal behaviour towards visitors' crowding and/or Gypsies on the way	H	M	M	M	M	8.5
10	Professional attitude of Guides in explaining the animal behaviour to the visitors	L	L	L	L	M	4.6
11	Extent of awareness on wildlife & forest developed among the tourists	M	M	H	L	M	7.7

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12	Less animal-sighting instances & probability	M	L	L	L	M	5.4

Calculation of IQU (0<EQU<1) is preceded by recording visitors response on indicators using Likert Scale (agrees & disagrees). The next Table No: 4 shows the indicator-wise IQU calculation for the Chapramari forest visitors:-

TABLE NO: 4 Showing Calculations of IQU Values

Sl No	Details of Indicators	Agree	Disagree	% of agreement	IQU	PIU	CCIU
1	Safari vehicle's (Gypsy) queue at the entry gate of Chapramari	200	300	40%	0.6	0.9	5.52
2	Damages of roads inside the forest by safari vehicles.	130	370	26%	0.7	4.6	3.4
3	Degree of Air Pollution inside Chapramari	125	375	25%	0.75	8.5	6.3
4	Degree of Noise Pollution inside Chapramari	75	425	15%	0.85	9.9	8.5
5	Storage of Solid wastes inside the sanctuary	25	475	5%	1	8.5	6.3
6	Destroy/Damage of vegetation inside Chapramari	-	500	0%	1	5.38	5.38
7	Noisy movement of visitors crowded at the solar fencing around the swamp (with salt-peats) near Eagle Watch Tower.	-	500	0%	0.93	9.2	8.5
8	Disturbance of Wildlife by the presence of day visitors two times a day	35	465	7%	0.94	7.77	7.2
9	Aggressive animal behaviour towards visitors' crowding and/or Gypsies on the way	30	470	6%	1	8.46	8.46
10	Professional attitude of Guides in explaining the animal behaviour to the visitors	-	500	0%	0.66	4.6	8.46
11	Extent of awareness on wildlife & forest developed among the tourists	170	330	34%	0.66	7.7	5.07
12	Less animal-sighting instances & probability	170	330	34%	1	5.38	5.38
13	Ecological carrying capacity of Chapramari forest/sanctuary (∑CCIUs)						78.47%

[Note: IQU will be 1 if 0% agrees, if 1-10% agrees then IQU will be 0.9, for 11-20% it will be 0.8 etc. and if 91-100% agree then IQU for that indicator will be 0]

9. THE DATA ANALYSIS & FINDINGS

As per Annual Report 2013-14, of Directorate of Forests, Govt. of West Bengal, total arrival of tourists in Chapramari forest was 11030 (Indian) + 4 (foreigner) = 11034. Thus during study period of March – May'14 average tourist arrival here for jeep safari was approx. 284, little more than calculated ECC of 240 as per Cifuentes (1992). The study indicates a preliminary warning to the Effective Carrying capacity of Chapramari forest and signals to initiate remedial actions immediately.

The Table 3 along with explaining the PIU for each indicator indicates pollution (air & noise), solid waste accumulation, crowding of vehicles at the solar fencing around the swamp & at the entry gate are affecting the ecology of Chapramari Sanctuary. Next, the Table 4 displays Carrying Capacity Impact Unit and Indicator Quality Unit for each indicator and points out that the immediate negative impact of increased tourists crowding is aggressive animal behaviour towards visitors' crowd. The other major factor hampering the ecology of Chapramari forest happen to be the damages of roads inside the forest by safari vehicles, crowding of safari vehicle at the entry gate of Chapramari and pollution inside the sanctuary. The study reveals Ecological carrying capacity of Chapramari forest is **78.47**% thereby creating less negative effect on Ecology of this sanctuary as per standards set by experts (Table 1).

10 CONCLUSION

On account of detrimental effects of heavy tourist congestion at forest tourist sites, the need for Carrying Capacity Assessment at those sites are adopted and their compatibility with actual figure are evaluated so as to ensure a balanced & acceptable level of tourist density from ecological perspective. For Chapramari wildlife sanctuary of Dooars region of northern sub-himalayan West Bengal, though CCIU based Ecological carrying capacity shows less negative effect on ecology of this sanctuary, Effective carrying capacity estimation indicates an alarming situation for future so far as sustainability is concerned. In this context, time has come to protect its unique ecosystem by safeguarding both the forest and also the eco-tourism industry that may bring a sustainable balance between these two. This article attempts to initiate the process of assessing all sorts of tourist carrying capacities for the Chapramari Wildlife Sanctuary for sustainable tourism development.

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