

# **Enjoying Elephant Watching: A Study on Social Carrying Capacity of Kaudulla National Park in Sri Lanka**

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## **Abstract**

The goal of this study was to investigate the social carrying capacity (SCC) of Kaudulla National Park (KNP) in terms of vehicle crowding. Crowding was considered as the social norm to estimate the standards for SCC. The normative theory approach was applied in this study and a social norm curve was prepared. Based on the hypothesis visitor acceptability or tolerance influenced by vehicle crowding, images with different number of vehicles were generated. The crowding standard for SCC was estimated as 9 vehicles within 25 m radius by asking each respondent whether the presented scenarios were acceptable or not. Statistically, it was proven that socio economic status of visitors mainly affect on the acceptability of vehicle crowding. The average visitor acceptability for enjoying elephant watching has decreased with the increasing number of vehicles (crowding). Therefore the results of the present study could be applied in decision making to diversify the tourism activities in order to maintain the visitor satisfaction on enjoying elephant watching.

## **Introduction**

In Sri Lanka, national parks are the only protected areas, which permit recreation. The national parks get more than half a million visitors a year, about 20% of who are foreigners. Presently, tourism is the fourth revenue earning industry in Sri Lanka (CBSL, 2010).

National parks have been charged with the dual mandate of providing for quality recreation opportunities and protecting park resources. Protected area managers in many parts of the world also share similar responsibilities. Tourism management in national parks and other protected areas is done for achieving the objectives of maximizing people's enjoyment of their stay, through education and recreation, minimizing impacts on habitat and wildlife and increasing the visitor's concern for conservation (Sale and Berkmüller, 1988). Therefore, the ultimate goal of tourism management, tourism planning

and visitor services management is protecting natural resources and providing the high quality visitor experience.

In recreational planning, protected area managers are interested in recreational planning based on the results of conducted studies on visitor characteristics and perceptions, and rarely visitor carrying capacities (Sale and Berkmüller, 1988, Eagles *et al.*, 2002). There are complaints found in the visitor complaints books in national parks in Sri Lanka mentioning less visitor satisfaction experience in the crowded national parks, but there have been no studies carried out in Sri Lanka on crowding and quality of visitor experience.

Visitor-induced impacts and resource degradation are highly considered in park and protected area management. Therefore, managing such issues requires information about social impacts and SCC in these protected areas (Burns *et al.*, 2010). Although the issues and settings are often similar in scope, the study goals, methodological approaches, and variables often differ in specific countries because of different legal requirements, circumstances, and challenges.

All over the world, visitor management in nature-based recreational settings has been concerned with the natural resources conservation. For example, according to Arnberger (2006), Cessford and Muhar (2003), Kajala (2007), Sievänen *et al.*, (2008) and Vuorio *et al.*, (2003) the European countries have relied heavily upon visitor monitoring, and several countries have meanwhile established standardized visitor monitoring programs. This approach successfully provides indicators/and or norms to natural resource managers.

The carrying capacity concept was applied to parks and recreation management to address the relationship between visitor use, resource conservation and social conditions. The concept of carrying capacity was first introduced to the field of recreation management in the mid 1930s (Manning, 1999).

Kawdulla National Park (KNP) is a popular tourism destination for elephant watching, where hundreds of elephants could be seen. There are complaints on disturbance for enjoying the elephant watching due to vehicular traffic (crowding) in KNP, especially in weekends and public holidays. The national parks are managed by the Department of Wildlife Conservation (DWC) and so far DWC has not done any study on social carrying capacity to determine standards of vehicle crowding for maintaining the visitor satisfaction. The aim of present study is to determine social carrying capacity (SCC) in terms of vehicle crowding of KNP.

## Literature Review

Further, Burns *et al.*, (2010) mentioned that for developing SCC models variables like trip characteristics, socio-demographic variables, and recreation

activities are highly considered. The variables reflecting the quality of the recreation experience, such as crowding perceptions, have rarely been asked (Arnberger and Mann, 2008). According to Arnberger and Mann (2008), Arnberger and Brandenburg (2007), Hennig (2006) and Kalisch and Klaphake (2008) during the past decade, interest in these variables has increased and recent efforts to provide valid and long-term data on overall visitation, visitor preferences and satisfaction, and even crowding perceptions are reported for several German, Swiss, and Austrian protected areas.

The concept of carrying capacity is often mentioned in the ecotourism literature. Carrying capacity is the maximum number of visitors who can visit an area without leading to severe environmental degradation or serious decline in the quality of the experience gained by visitors (Aylward *et al.*, 1996, Mandziuk, 1995). Marin *et al.*, (2011) also confirmed that the individual visitors are expected to be disturbed by different kinds of noise due to crowding through his studies, and showed that the human-caused noise detracts from the quality of the visitor experience in natural areas.

Carrying capacity can be measured in terms of the natural environment, the host community and the visitor. Factors measured are ecological (e.g., ecosystem health, ecosystem integrity), physical (trail areas, water quality and availability, lodging, sewer systems), social (e.g., over-crowding, traffic, pollution, waste disposal), and economic and managerial (e.g., locally owned enterprises, trained personnel) (Mandziuk, 1995).

SCC in relation to visitor satisfaction has been a long-standing issue in management of parks and protected areas. Contemporary carrying capacity frameworks rely on formulation of indicators and standards of quality to define and manage carrying capacity (Manning *et al.*, 2005).

Visitor crowding and conflict are the two primary social or experiential impacts. Wagar (1964) first reported that crowding can decrease aesthetic enjoyment and diminish opportunities for solitude. Crowding was originally based on physical components measured in terms of visitor density, but later it has been conceptualized as psychological evaluations of visitor density (Gramann, 1982). Early research efforts reported that as user density increased, satisfaction decreased (Shelby, 1980), leading managers to focus on determining the permissible numbers of visitors that would prevent crowding. Visitor expectations, preferences and motives may be more important determinants of perceived crowding than actual visitor densities.

Moreover, natural and cultural resources can be degraded by excessive visitor use. In more formal terms, the use of some national parks, or

portions thereof, have exceeded their carrying capacity (Mitchell, 1994, Wilkinson, 1995).

Contemporary carrying capacity frameworks, such as Limits of Acceptable Change (LAC) and Visitor Experience and Resource Protection (VERP), rely on formulation of standards of quality, which are defined as minimum acceptable resource and social conditions in parks and wilderness.

LAC approach concentrates on establishing measurable limits to human induced changes in the natural and social settings of parks and protected areas, and on identifying appropriate management strategies to maintain and / or restore desired conditions. That is knowledge of physical - biological environment is combined with knowledge of socio political context in order to define appropriate and acceptable future conditions. The LAC framework is thus based on resource management by objective.

Manning (2001) has recently referred to the evaluative component as the prescriptive component. The research process they propose (usually referred to as the normative approach) has been the dominant paradigm for empirically deriving evaluative standards (Manning *et al.*, 1999, Vaske *et al.*, 1993).

Visitor experience impacts can also have great recreational or social significance. Visitor crowding and conflicts reduce visitor satisfaction and may lead to the spatial or temporal displacement of visitors (visitors may go to other viewing points). This study explores the theory and application of carrying capacity to two national parks in Sri Lanka. Emphasis is placed on the development and application of LAC, a framework developed for managing carrying capacity in the U.S. national parks.

Within the past decade, however, critiques of this approach have emerged. Some critiques are of a technical nature. For example, empirical studies have shown that within-subject and within-population variability in norms (evaluative standards) can exceed between-area variability (Williams *et al.*, 1992, Cole and Stewart, 2000). Others question whether normative research actually gets people's values (Roggenbuck *et al.*, 1991). Questions have been raised about the population that is sampled, usually current on-site visitors. When subpopulations are mixed, management may inappropriately be directed at the needs and

desires of an average visitor who does not exist (McCool and Cole, 2001). Equity issues are raised when studies only give voice to certain populations (Cole and Stewart, 2000).

In the application of the sustainable tourism indicators, the concept of carrying capacity is frequently used. This implies that the tourism destinations possess some limits in the volume and intensity that a specific geographic zone can bear without provoking any irreparable damage. Nevertheless, as Saveriades (2000) confirms, there is still neither a generally accepted definition nor a standard systematic procedure to assess this concept. One of the most renowned definitions was given by the World Tourism Organization (WTO, 1981), which signaled that carrying capacity represents the maximum number of visitors that a geographic or physical entity can receive without provoking an unacceptable alteration in the physical and social medium nor an unacceptable reduction in the quality of the visitors' experiences.

Recent experience with carrying capacity suggests that it can be applied most effectively through formulation of indicators and standards of quality for biophysical conditions (resource carrying capacity) and for the visitor experience (social carrying capacity) (Manning, 1999b, Manning, 2001, Graefe *et al.*, 1990, Stankey *et al.*, 1985, Stankey and Manning, 1986). Indicators of quality are measurable, manageable variables that define the quality of park and wilderness resources and the visitor experience. Standards of quality define the minimum acceptable condition of indicator variables.

'Normative theory' approach has been applied in some studies to identify the standards for crowding. Manning *et al.*, (1997) applied the normative approach to estimate the crowding standards along the carriage road at Acadia National Park in the United States, where visitors were shown six digitally constructed scenarios (six range of visitor uses), and asked their acceptability on a scale -4 (very unacceptable) to +4 (very acceptable), but in the present study range of scale was from -1 (highly unacceptable) to +1 (highly acceptable).

Visual approaches to measure crowding and other outdoor recreation related norms have been developed. Computer software has been used to edit and provide photographs depicting a range of use levels and environmental impacts and visitor satisfaction at Arches National Park in (Manning *et al.*, 1995, Hof *et al.*, 1994).

In addition to normative theory approach, indifference curve analysis has been recently adapted to examine the Visitor Carrying Capacity (VCC) in Aches National Park ((Lawson and Manning, 2000, Lawson and Manning, 2002a, Lawson and Manning, 2002b). Stated choice analysis represents another research approach to quantify carrying capacity related values and trade off inherent in park and wilderness management. Recently, stated choice

modeling has been adapted to carrying capacity analysis and applied at Denali National Park (Lawson and Manning, 2001a, Lawson and Manning, 2001b) and Yosemite National Park (Newman et al., 2001, Newman *et al.*, 2002).

By formulating indicators and standards of quality, parks and wilderness can be managed within a defined carrying capacity. Indicator variables are monitored over time, and if standards of quality are violated (or are in danger of being violated), management action is required. This approach to carrying capacity is central to contemporary park and wilderness management frameworks including LAC (Stankey *et al.*, 1985), and VERP (Manning, 2001). In Sri Lanka, VCC studies have not been done in protected areas, and as a result no proper visitor management plans have been prepared for national parks in Sri Lanka.

Burns *et al.*, (2010) used 'logit model' to study how some socio-economic attributes and crowding affect the acceptance of crowding in three national parks i.e. Danube Floodplains National Park in Austria, the Harz National Park in Germany and the Hells Canyon National Recreation Area in the United States, where visitors are allowed walked along the nature trails. The results showed that the positive intercept indicates that the majority of the recreational scenarios were deemed as not contributing to displacement by the respondents. The utility curve for the number of people reflects an increasingly negative slope to twelve people per scene. The more people on the trail, the more participants were likely to displace from the trail. This attribute was the most important one, followed by the attribute placement.

## Methodology

### Study site

The KNP was declared as a national park on 1<sup>st</sup> April 2002, and it is located approximately between the latitudes 6<sup>o</sup> 47' N and the longitudes 80<sup>o</sup> 46'' and 80<sup>o</sup> 50' E in the catchment of Kawdulla tank with an extent of 6690 ha. The KNP was established to protect the immediate catchment of the KNP reservoir and to provide a refuge or habitat for wild elephants, especially in the monsoon period.

The tank bed area is very attractive where hundreds of elephants could be seen in the dry season. In addition, waders within Kawdulla tank are an attractive scenery for visitors. The reservoir with perennial water supply and extensive grasslands provides an ideal habitat for elephants. Among these fauna, a considerable percentage of endemic and globally and nationally threatened vertebrate species are found in KNP. The park is accessible being 197 km away from Colombo. Hence, KNP is highly used for hundreds of elephant viewing. KNP is unique among the national parks of Sri Lanka as it enables

to see elephants at any time of the day. In 2013 KNP received 20539 local visitors and 15775 foreign visitors for enjoying elephant watching. The total revenue from permit issuing was Rs. 21 million. It was found that annually there is 10% of visitor increment to the park.

### Theoretical aspects and estimation of SCC

Within the context of carrying capacity, scientific approaches to park and wilderness related values have been applied primarily for the formulation of the standard of quality for indicators. The number of visitors in a given viewpoint is considered as an indicator, and the maximum acceptable number of visitors was estimated through the ‘normative approach’ which was widely used by Manning (2007).

A hypothetical social norm curve is shown in Figure 1 to illustrate normative theory and methods. The norm curve traces the average acceptability rating of the sample recreationists for encountering a range of groups of other visitors per day along a trail.

As research on normative standards has been started, several approaches to measure norms have evolved. In general, the outdoor recreation-related norms have been measured using a “numerical” or “narrative” approach. For example, respondents were asked to evaluate a range of encounters (0, 5, 10, 15, etc.) with other groups per day along a nature trail. The normative data derived were aggregated and graphed to construct a “norm curve,” from which social norms might be identified.

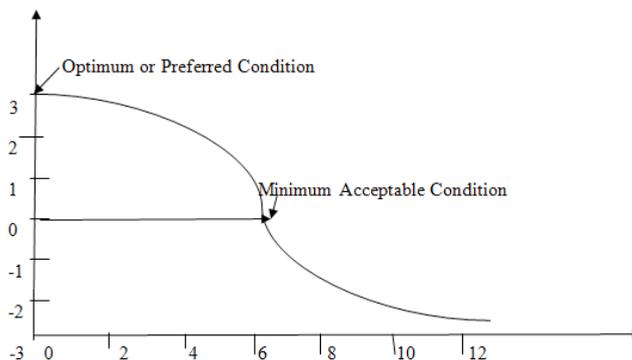


Figure 1: Hypothetical social norm curve (Source: Manning (2007))

An issue implicit in all of these measurement approaches concerns the evaluative dimension used in these questions. When respondents were asked to evaluate a range of use levels and related impacts, the response scale included terminology specifying a variety of evaluative dimensions including

“acceptability”, “preference”, “pleasantness”, “desirability”, “satisfaction”, and “tolerance”. In this study, standards were established for crowding.

The relationship between crowding acceptance/satisfaction level and variables could be shown in a model:

$$CA = f v, age, educ, visitortype, surveyedday \dots\dots\dots(1)$$

Where,

- CA : Crowding acceptance level
- v : No. of visitors/vehicles
- age : Age in number of years
- educ : Education in number of years
- visitortype : Visitor type (1=foreign visitors, 0= local visitors)
- surveyedday : Surveyed day (1= weekends and public holidays, 0= week days,)

### Questionnaire and scenario development

Saveriades (2000) defines the SCC as the maximum level of use that can be absorbed by an area without an unacceptable decline in the quality of experience of visitors and without an unacceptable adverse impact on the area’s society. The two components of SCC are (1) the quality of experience that visitors will accept before seeking alternative destinations (that is to say, the tourists’ psychological carrying capacity), and (2) the degree of tolerance of the host population to the presence of tourists (that is to say, the residents’ psychological carrying capacity). Therefore, the satisfaction of the visitor could be found to decline when the levels of the tourist use a particular area are high. This concept is found in the normative approach, and scenarios were developed, increasing the number of visitors at a particular viewpoint, which is the tank bed area of KNP.

In the questionnaire, each scenario was numerically shown with photographs, and visitors were asked for their satisfaction on crowding at each viewpoint. For KNP, only one questionnaire was prepared (Appendix 1) because the scenic viewpoint in KNP is the tank bed area. There were 05 scenarios in the questionnaire. The number of vehicles within the 25m radius while observing elephants is considered in developing the scenarios. The scenarios are as follows (Table 1):

Table 1: Number of vehicles for a particular scenario at KNP

Scenario	No. of vehicles within a 25 m radius
1	0-2
2	3-4
3	5-6
4	7-8
5	9-10

The above six acceptable levels of scenarios for HPNP and KNP were numerically numbered (Table 2).

Although different numerical values could be given for acceptable levels, in the present study the highly acceptable level is given + 1.00, and highly unacceptable level is given -1.00. Between these two values, the other numerical values are given proportionately for the acceptable levels. The results on acceptable levels against crowding were plotted to obtain the minimum level of acceptance, which will be the crowding standard.

Table 2: Numerical values for acceptable levels with vehicle crowding

Acceptable Level	Numerical Value
HA- Highly Acceptable	+ 1.00
A – Acceptable	+ 0.50
FA- Fairly Acceptable	+ 0.25
FUA – Fairly Unacceptable	-0.25
UA – Unacceptable	-0.50
HUA- Highly Unacceptable	-1.00

Data collection and data analysis

The sample size was 100 and the team leader or representative of every eighth visitor group to the park was interviewed at the tank bed area in the evening time. This study was conducted throughout the year and acceptable levels were recorded and social norm curve was drawn for KNP. The STATA 11 statistical package was used, and logit model was applied in data analysis. Visitor type and surveyed day were considered as dummy variables.

**Results and Discussion**

**Determination of SCC**

The greatest acceptability for visitor satisfaction is less than two vehicles at the viewpoint. After that the acceptability levels decreased dramatically with the increasing number of vehicles. The acceptability levels of the number of vehicles have decreased with the increasing number of vehicles within a 25m radius at KNP tank bed area, and this is shown in Table 3. In addition, the number of vehicles against the sum of acceptability was plotted and social norm curve was drawn for KNP tank bed area (Figure 2). The minimum acceptability level was recorded between the vehicle numbers eight and ten. According to Figure 2 also, the social norm curve crosses the acceptability at nine vehicles at the viewpoint which indicates the vehicle carrying capacity standard for the KNP tank bed area.

Table 3: Acceptability levels with a range of vehicles within 25 m radius at Kawdulla tank bed.

No. of Vehicles within a 25 m radius	Acceptability						Sum of Acceptability	Acceptability Level
	1	0.5	0.25	-0.25	-0.5	-1		
2	100	0	0	0	0	0	100	1
4	16	84	0	0	0	0	58	0.58
6	8	47	43	2	0	0	41.75	0.42
8	4	24	39	27	6	0	16	0.16
10	0	13	21	22	21	23	-27.25	-0.27
12	0	0	14	25	31	30	-48.25	-0.48
14	0	0	0	5	51	44	-70.75	-0.71
16	0	0	0	0	38	62	-81	-0.81

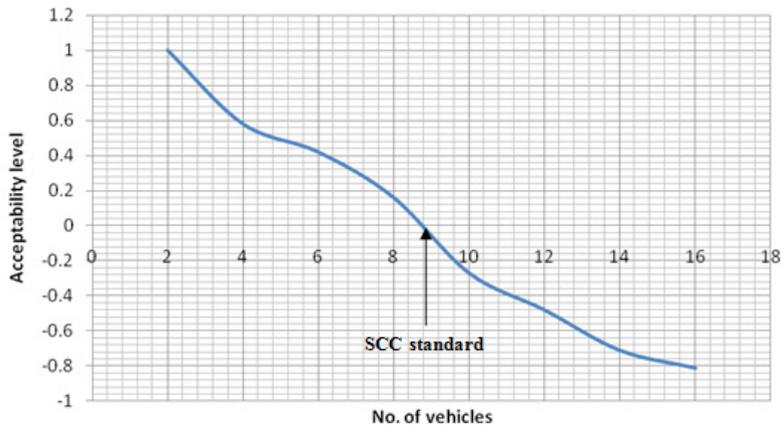


Figure 2: Social norm curve for the KNP tank bed

The social norm curve and regression equations clearly showed that the visitor acceptability levels reduce with increasing either the number of visitors at each viewpoint or the number of vehicles within a 25 m radius. Maintaining the number of visitors or vehicles at a particular viewpoint is important for visitor satisfaction and avoiding the displacement of visitors. In recreational planning, these standards should be maintained for enhancing the visitor satisfaction on less crowding.

### Relationship between crowding acceptance and socio-economic factors

Table 4 shows the results of logit model which regressed, crowding acceptance levels versus respondents’ socio-economic characteristics. Further, these tables present the logit model parameter coefficients, standard errors and *p*-values for

each level of acceptance level. The acceptance levels are defined as (3- highly acceptable, 2- acceptable, 1-moderaly acceptable, '-1'-moderately acceptable, '-2'- unacceptable and '-3'- highly unacceptable). The most important attribute was the number of visitors depicted in the image. Overall, it is found that the number of vehicles is highly significant with the acceptance of crowding level. If the crowding is increased (the number of vehicles is high) the acceptance level will decrease gradually. Therefore, at highly acceptance, acceptance and moderately acceptance levels, the coefficients of variable 'number of vehicles' showed a negative value. Meanwhile, at highly unacceptable, unacceptable and moderately unacceptable levels the coefficient of the variable, 'number of vehicles' showed a positive relationship.

Except the variable 'visitors', other variables 'educ' (education) and 'age' are always positive with crowding acceptable levels. Generally, it is found that if the respondent is middle aged or senior citizen with a higher education level (in number of years), he or she does not accept the crowding. The coefficients 'age', and 'educ' are also significant with the increasing number of vehicles at a particular viewpoint. Visitor type and surveyed day whether week day or weekend or public holiday are not significant and do not affect on acceptability. Meanwhile the foreign visitor type is significant for highly acceptable levels. The low values of intercepts (constants) indicate that the majority of the depicted crowding scenarios were not tolerable for the respondents.

Table 4: Logistic function for vehicle crowding acceptability levels at KNP

Variables	Acceptability Level					
	-3	-2	-1	1	2	3
vehicles	1.806*** (0.124)	1.678*** (0.121)	1.086*** (0.105)	0.668*** (0.0807)	-1.917*** (0.225)	-1.996*** (0.238)
age	0.0666** (0.0294)	0.0627** (0.0288)	0.0459* (0.0261)	0.0620*** (0.0207)	0.0614* (0.0321)	-0.0636* (0.0334)
education	0.246 (0.180)	0.0839 (0.177)	0.00782 (0.159)	-0.0994 (0.128)	0.193 (0.205)	-0.183 (0.211)
visitor type	0.100 (0.418)	0.0558 (0.408)	0.163 (0.374)	0.220 (0.297)	0.534 (0.325)	0.901** (0.436)
surveyed day	-0.194 (0.410)	-0.280 (0.400)	-0.166 (0.362)	-0.114 (0.290)	-0.146 (0.378)	-0.225 (0.421)
constant	-22.99*** (2.456)	-18.90*** (2.356)	-11.04*** (2.004)	-5.835*** (1.513)	11.68*** (2.492)	12.55*** (2.626)
Observations	800	800	800	800	800	800

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0

### SCC and infrastructure

SCC determination is very important for visitor services and ecotourism planning process. Crowding may affect the goal of the visitor i.e. the visitor's

recreational, educational enjoyment because crowding impacts may change the quality of recreational experience. Further, visitors may get attracted to another national park, wilderness areas or recreational areas or they may shift recreational product. The question is whether that change is accepted by the park managers and with existing legislation.

The social norm curve clearly showed that the visitor acceptability levels reduce with the increasing number of vehicles at each viewpoint. It is observed that the tank bed area of KNP is beyond the determined level of SCC, especially in weekends and public holidays because KNP get more visitors at weekends and public holidays. There is no limitation for the number of vehicles from the DWC. It was found that when KNP is crowded with more vehicles, visitors may be attracted by other alternative areas such as 'Hurulu Forest Park' at Gal Oya junction managed by the Forest Conservation Department - which is very close to KNP, where visitors are allowed to watch elephants at lower ticket prices. Therefore, it is important to manage the vehicle numbers to the park and diversify the visitor activities in KNP to manage visitors and to enhance their satisfaction.

It was revealed that the visitor infrastructure has not been improved based on a thematic systematic carrying capacity study. Consequently, park management can allow more visitors to the park in working days and limit the number of visitors to the park in weekends and public holidays. However, restricting visitor number and use is a poor method of managing resource impacts, because in most situations a little use causes considerable impact and further increases in use levels have less and less additional effect on the natural environment (Cole, 1987, Leung and Marion, 2000, Newsome *et al.*, 2012). As such, this study has brought to represent a significant advancement to the field of SCC studies.

### **Limitations and issues found in the study**

The task of drawing the social norm curves for visitors is an important aspect of this study. Vehicle numbers, proximity to others, unwanted visitor behaviour and complexity of the situation at high use situation due to the mix of users and movement directions could influence the respondents' decisions. Even at low numbers at the viewpoints, unwanted visitor behaviour influenced the tolerance of social conditions or acceptance remarkably.

Vehicle numbers, proximity to others and the mix of users influenced the respondents' decision to shift their use and acceptability levels at each viewpoint. In addition, unwanted visitor behaviour due to crowding may affect the visitor acceptability. These aspects should be considered in future studies. In the present study, only the crowding standards were studied to get information for recreational planning. The phenomenon of SCC is also highly

relevant to the planning and implementation of recreational areas like national parks. Therefore, the calculated crowding standards for KNP could be applied for the visitor management.

All recreational activities cause some changes in the natural environment, and some of the changes could be considered as damages to the environment. Therefore, it is important that there should be some judgment about what conditions or standards ought to be in a particular area. This is a value judgment, and defined by various researchers (Wagar, 1974).

The main weakness of the normative approach is meaning evaluative dimensions used in the questionnaire i.e. a variety of dimensions ('acceptability', 'preference', 'desirability', 'pleasantness', 'satisfaction' and 'tolerance'. These alternative evaluative dimensions have different meanings to respondents, and may result in significantly different personal and social norms (Manning, 2001). This was statistically proved by (Manning, 1999a, 1999b, Manning, 2001).

## **Conclusion and Recommendations**

The SCC for enjoying elephant watching in terms of vehicle carrying capacity of KNP was nine, and it was found that the standards of SCC or vehicle carrying capacity in KNP is met only at the weekends and on public holidays. Imposition of access restriction to the sites is a poor policy since it leads to the loss of visitors' welfare. Therefore, diversification of recreational activities in addition to the elephant watching will be the most possible solution. If the recreational activities are diversified, visitors will be dispersed in the study areas. Congestion will be minimized and satisfaction levels on elephant watching can be enhanced. Further, it is important to review the existing legislation for accommodating recreational activities and ecotourism concessions in the diversification of recreational activities. In addition, it is proposed to prepare visitor impact monitoring plans for each national park to mitigate the impact on natural resources due to increased visitation under the proposed scenarios. Further, so far there have not been any SCC studies for national parks in Sri Lanka, and therefore the present study is important in determining the SCC at other national parks in Sri Lanka.

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