

# Physical Carrying Capacity of Selected Tourism Sites and Social Opportunity for Local Resident Tourists in the Philippines

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**Abstract:** This study calculated the physical carrying capacity of selected tourism sites in the Philippines and assessed the social carrying capacity. A mix of quantitative and qualitative approaches was employed. Based on data, the sites were utilized below carrying capacity. The level of tourism development was post-infancy to growth. The destinations should be packaged well to compete with more established attractions in the province. The social carrying capacity was examined based on the usage by local resident tourists of the natural and human-made attractions. Respondents answered affirmatively about regularly visiting the sites. It may be concluded that local tourists participate actively and enjoy the natural gifts of their place. They were not deprived due to over-regulation, overcrowding, or massive rehabilitation activities. It is recommended that the local government build on the positive attitude of locales regarding their own tourism. This attitude can help significantly in the promotion of the sites.

**Keywords:** physical carrying capacity, Real Carrying Capacity, social opportunity, local resident tourists

## I. INTRODUCTION

There are limits to the carrying capacity of the planet since the environmental resource base is finite (Arrow et al., 1995). Imprudent use of the environmental resource base may irreversibly reduce its capacity for generating material production in the future (Arrow et al., 1995). Tourism activities can generate both positive and negative effects on the conditions of the areas where visiting and fruition activities take place. Every form of human activity causes changes of environmental conditions (Castellani et al., 2007). Determining tourism capacity makes its operation sustainable and lasting (Calanog, 2015).

The concept of carrying capacity was mentioned for the first time in 1936 (Manning, 2002). However, another claim indicated year 1930 with McMurray as the author (Saarinen, 2006). It was originally derived from stocking rates in agriculture, life cycles in biology, recreational succession from ecological succession in plant and animal communities (Buckley, 2006). It has expanded into the realm of tourism and received considerable attention as a result of increasing anthropogenic pressure in certain natural environments (McLeod et al., 2005). Johnson et al. (1996) argued that present interest in tourism capacity is due to growth in tourism combined with increasing awareness of environmental issues.

The United Nations' World Tourism Organization (UNWTO, 1981) has defined tourism carrying capacity as "the maximum number of tourists that a space can absorb without a lowering of the quality of visitor's experience and without serious consequences for its ecology and its socio-economic structures. It is the ideal relation between the number of people in a space and the resources available to support them." McLeod et al. (2005) concluded that carrying capacity has many variance and they have classified it into different aspects: (a) physical; (b) ecological; (c) social; and (d) economic. Saveriades (2000) added that social carrying capacity is the maximum level of use that can be absorbed by an area without an unacceptable decline in the quality of tourist experience and without unacceptable adverse impact on the area's community.

Distinctions between ecological, social and economic meanings and measures of carrying capacity and the limitation of each, have been well explored. Unlike grazing livestock, individual people have very different ecological impacts (Buckley, 2006). Consequently, carrying capacities in nature are not fixed, static or simple but contingent on technology, preferences and the structure of production and consumption (Arrow et al., 1995). Carrying capacity is itself not a goal but a means by which the goal may be achieved, an important instrument by which the development of a tourist destination is steered (Jovicic et al., 2008). Considering carrying capacity, or more generally limits of tourism development, is of a significant predictive potential (Zelenka et al., 2014). Carrying capacity is a planning tool, ensures few tolerable impacts on natural resources (Calanog, 2015).

The objectives of this study are:

1. To calculate the physical carrying capacity of selected tourism sites in the Province of Camarines Sur in the Philippines;
2. To examine the results of the calculated physical carrying capacity;
3. To assess the social carrying capacity of the sites based on the utilization and participation of local resident tourists;
4. To formulate recommendations on the management of the selected tourism attractions covered by the study.
- 5.

II. METHODOLOGY

The Boullon’s Carrying Capacity Mathematical Model or BCCM (Boullon, 1985) was used to determine the physical carrying capacity. Data on the participation, issues and concerns of local resident tourists were gathered to provide basis for social carrying capacity.

The study covered four (4) tourism sites: (1) the Lady of Lourdes Shrine which is an old church located in a village called Abo; (2) the Consocep Mountain Resort, comprised of a forest area and a falls, which was located along the slopes of Mount Isarog; (3) the Beach Resort in Huyonhuyon; and (4) the Canibag Falls located in a village called Libod. Data collection was done through actual visit to the sites, interview with key informants and local resident tourists. Two (2) sets of questionnaires were used for data-gathering: one for the local tourists about their socio-demographics, economic profile and recreational preferences; and one for the key informants such as the owner or attendant of the tourist site and local government officials about processes and features of the selected tourism sites.

The BCCM (Boullon, 1985) was tackled in the “Manual on Computing Carrying Capacity of Ecotourism Sites in Protected Areas” authored by Lope A. Calanog (2015) and published by the Philippine government’s Department of Environment and Natural Resources. Physical carrying capacity depended on three (3) main factors: 1) the amount of resources available in the ecosystem; 2) the size of the population or the number of users; and 3) the amount of resources each individual consumes (Calanog, 2015). It was measured at three (3) levels: Basic Carrying Capacity (BCC), Potential Carrying Capacity (PCC), and Real Carrying Capacity (RCC) (Calanog, 2015).

1) *First Level: BCC*

BCC was calculated dividing the total use of a particular area used by the visitors with the average or standard size/space requirement of visitors.

$$\text{Basic Carrying Capacity (BCC)} = \frac{\text{Area used by visitor (sq.m.) (questionnaire B)}}{\text{Average visitors' standard (sq.m.) (related literature)}}$$

2) *Second Level: PCC*

PCC was calculated by computing first the Rotation Coefficient (RC) of a specific tourism activity.

$$\text{PCC} = \text{BCC} \times \text{RC}$$

$$\text{Rotation Coefficient (RC)} = \frac{\text{Total no. of hours an area is open for use in a day (questionnaire B)}}{\text{Average no. of hours an area is used by visitors (questionnaire A)}}$$

3) *Third Level: RCC*

RCC was the maximum permissible number of use of an area once the limiting factors  $\frac{100-Lfn}{100}$  (Lf1, Lf2 ... Lfn) derived from particular characteristics of the site, or

standards/needs of the visitors, have been applied. RCC is computed by incorporating the limiting factors identified during the interviews and observations in the site.

$$\text{RCC} = \text{PCC} \times \frac{100-Lf1}{100} \times \frac{100-Lf2}{100} \times \frac{100-Lfn}{100}$$

$$\text{Limiting factors (Lf1,2,3)} = \frac{M(a,b...n)}{MT} \times 100$$

Where: M(a,b...n) = limiting magnitude of the factor/variable

MT = total limiting magnitude of the factor/variable

III. RESULTS AND DISCUSSION

*Physical Carrying Capacity*

The section presents the size and usage of the tourism sites covered by the study. The values were the bases in the calculation of physical carrying capacity.

Table I. Size and Usage Of Selected Tourism Sites

Indicators	Tourism Site				
	Canibag Falls	Consocep Mountain Resort		Huyon huyon Beach	Lady of Lourdes Shrine
		Forest Area	Tumaguiti Falls		
Total area (sq.m.)	5,000	62,910	5,000	2,868	5,000
No. of hours open for use in a day	12	12	12	12	12
Average no. of hours the area is used by tourists	5	2	4	4	2

The table above shows the figures which were required in the computation of the carrying capacity of each site using BCCMM. The Consocep Mountain Resort was comprised of two (2) attractions – the Tumaguiti Falls and the forest area. All in all, there were five (5) tourist destinations. The study determined the Basic Carrying Capacity (BCC), Potential Carrying Capacity (PCC) and Real Carrying Capacity (RCC) of each tourism attraction. The results are presented in the table below. Details of the computation are shown below the table.

Table II. Measures Of Carrying Capacity Of The Selected Tourism Sites

Indicators	Tourism Site				
	Canibag Falls	Consocep Mountain Resort		Huyon huyon Beach	Lady of Lourdes Shrine
		Forest Area	Tumaguiti Falls		
BCC	167	2,097	167	190	96
PCC	401	12,582	501	1,140	576
<b>RCC</b>	<b>126</b>	<b>3,964</b>	<b>158</b>	<b>718</b>	<b>181</b>

The preliminary results generated by the study painted a clear picture in terms of the sites’ physical and social carrying

capacity. It was clearly observed particularly at the Canibag and Huyonhuyon that there were no major developments or changes in the landscape. At the site of the Canibag, there were no cottages and no eye-catching signages. There were no procedures and structures in place so that visitors will be guided on how to reach and explore the sites. The Shrine is no different from any other church in most communities where people would come and attend mass, or join the festival of the patron saint. The site is not packaged in such a way that visitors will find it unique from all shrines in the province and the region, and therefore will be more interesting to bring in family and friends.

**A. Social Carrying Capacity**

This section presents the profile of local resident tourists who were interviewed.

Table Iii. Socio-Demographic Profile Of Local Resident Tourists

Indicator	Tourism Site				Total
	Canibag Falls	Consocep Mountain Resort	Huyon huyon Beach	Lady of Lourdes Shrine	
Gender					
Female	18	14	17	17	66
Male	7	11	8	8	34
Total	25	25	25	25	100
Age					
Young adult 15-30	17	23	11	16	67
Middle age adult 31-50	8	0	6	8	22
Senior adult 51-above	0	2	8	1	11
Total	25	25	25	25	100
Marital Status					
Single	10	21	12	16	59
Married	8	3	7	9	27
Widower	3	0	0	0	3
Others	4	1	6	0	11
Total	25	25	25	25	100
No. of Children					
1-3	11	2	6	4	23
4-6	2	0	5	9	16
7-9	0	1	3	0	4
10-above	0	1	1	0	2
Total	13	4	15	13	45
Years in School					
6	3	0	1	1	5
7	0	0	2	0	2
8	1	0	3	1	5
9	1	1	0	1	3

10	12	15	12	0	39
11	3	1	1	1	6
12	1	0	0	4	5
13	3	1	3	0	7
14	1	7	3	17	28
Total	25	25	25	25	100

Of the 100 respondents, 66% were females while 35% were males. The majority being females was likewise true in all the four tourism sites covered. This illustrates that females may have more time to relax, or they make time to unwind from their work inside or outside their households, or they recognize the need to spend time for themselves. Majority were young adults 67% particularly aged 15-30. Some were middle-aged 31-50, 22%, while there were very few senior citizens, 10%. This observation likewise applied to each of the four study areas. Many respondents 59% were single. Similar with females, the young adult and single individual groups may have more time to loosen up and unwind, or they do not have big responsibilities at the moment, or they take every opportunity to spend time with friends.

Of the 45 respondents with children, more than half 51% had 1-3 children which meant their households were relatively small; while 36% had 4-6 children most of whom were tourists at the Shrine. Lesser number of children may mean more time to relax, or easier to organize a small group excursion, or less cost on visiting the tourist sites. Most tourist-respondents were either high school graduate 39%, or college graduate 25%. This may mean that local tourists who are educated are more interested in the tourist sites, or that they earn relatively more than their counterparts to be able to spend extra on relaxation. Those who have more children would tend to visit the Shrine probably because they pray for the health and safety of their children.

**B. Participation of Local Tourists in their Own Tourism**

The table below describes the participation of local tourists in their own area’s tourism attractions and destinations.

Table Iv. Tourism-Related Preferences Of Local Tourists

Indicator	Tourism Site				Total
	Canibag Falls	Consocep Mountain Resort	Huyon huyon Beach	Lady of Lourdes Shrine	
Travel companion/s					
Family	16	11	15	9	51
Friends/co-workers	9	14	9	12	44
Alone	0	0	1	4	5
Total	25	25	25	25	100
No. of companions					
5-below	9	11	15	12	47

6-10	15	11	7	10	43
11-15	0	1	2	3	6
16-20	1	2	1	0	4
Total	25	25	25	25	100
Reasons for visiting a tourism site (multiple responses)					
See unique features of site	21	23	15	12	71
Relax, escape city life	14	25	14	12	65
Enjoy nature	18	20	9	16	63
Experience adventure	15	19	10	12	56
Enjoy local food	10	17	5	8	40
Watch festivals, events	8	8	12	10	38
Experience local culture	11	14	4	8	37
Preferred recreational activities (multiple responses)					
Swimming	25	25	23	0	73
Sightseeing	17	19	12	12	60
Festivals	10	4	6	12	32
Adventure activities	12	12	2	3	29
Collecting rare items	10	3	4	7	24
Church activities	7	3	3	9	22
Bird watching	1	8	2	4	15
Sport activities	3	2	4	7	16
Boating	0	0	2	0	2
Things needed within the site					
Recreational facilities					
For sightseeing	22	22	14	19	77
For relaxation	18	22	18	15	73
For walking	8	9	8	11	36
For bird watching	2	11	2	9	24
For exercising	5	12	5	0	22
Site information					
Directions	21	18	17	14	70
Maps	13	14	2	7	36
Tourist info center	11	10	10	3	34
Precaution signs	4	7	2	2	15
Take-off point					
Safety reminders	24	17	17	15	73
Warning signs	13	15	20	12	60
Safety facilities	5	7	11	11	34
Parking areas	4	9	4	5	22

Others					
Waste disposal, collection	18	15	19	15	67
Rest areas	19	15	10	10	54
Guides	11	5	3	4	23
Lavatories	6	2	1	1	10
Gears/ equipment brought in recreational travel					
Diving gear	-	-	21	-	21
Swimming gear	18	-	0	-	18
Camping tools	4	2	4	-	10
Hiking gear	2	4	-	-	6
Bird watching equipment	0	3	1	3	7

As to travel companions, 51% of the 100 local tourists wanted to be with family members while 44% opted to be with friends. Many, 47% of 100 respondents, would rather travel with no more than five companions while 43% favored at most ten companions. Majority of respondents visited the tourist attractions to see the unique features of the site 71%, or to relax and escape city life 65%, or to experience nature 63%. Similarly, 73% chose swimming as the most preferred recreational activity particularly those that visited the Canibag, Consocep and Huyonhuyon. Sightseeing was second in the tourists' list, 60% of them.

When asked on what were the things still needed in the site, 77% of the 100 local tourists remarked that there should be facilities for sightseeing. This was particularly expressed by tourists at Canibag and Consocep. Facilities for relaxation were likewise expected by most respondents 73%, especially those who visited the Canibag, Consocep and Huyonhuyon. As to information, majority of 100 respondents needed guidance on directions 70%, and safety reminders 73%, as well as required waste disposal facilities 67%. Although these were a common sentiment of most tourists, these expectations were specifically conveyed by majority of the visitors at the Canibag and Huyonhuyon. Some tourists brought gears and equipment to the recreational sites. Those who stayed at Huyonhuyon, 21 of the 25 respondents, brought diving gears. Many of those who stopped at the Canibag brought swimming gears, 18 out of 25.

#### IV. CONCLUSIONS

The researcher solicited initial feedback from the Municipal Tourism Officer on the findings of this investigation. According to the officer, three (3) of the sites, Huyonhuyon, Canibag, and the Shrine, were observably utilized below carrying capacity. They were not yet very popular and therefore relatively fewer tourists come to visit even during peak seasons. The usage of these sites has not yet reached a point that would threaten their carrying capacity. The researcher infers that these tourist destinations were still in the process of going through the stages of tourism

development from infancy to growth. They still have to be promoted and advertised, packaged into a tourist destination that will be able to compete with other more established and popular tourist attractions in the province and the region. Be that as it may, the data and information generated from this investigation may already be useful to the Municipal Tourism Office. Pre-emptive mechanisms may be established to effectively plan, implement and monitor the tourism development of the sites

The relatively more exceptional among the sites was the Tumaguiti Falls. In terms of carrying capacity, the area was saturated during peak seasons. The Municipal Tourism Officer attested that they received more than 158 visitors at the Tumaguiti per day. The officer and the researcher agree that concrete interventions should be done by the local government. The problem off hand was that the entrance of the resort from the main highway is from the neighboring municipality. This would create difficulties in terms of jurisdiction and enforcement of regulatory policies. One possibility is to establish an entrance that would be within the boundary of the town. Furthermore, a multi-layered and multi-faceted study on carrying capacity may be conducted. This comprehensive study may provide substantial information on how to mitigate and manage the flourishing of tourism in the site and thereby establish a more sustainable tourism development plan.

On social carrying capacity, the researcher found it easy to spot residents who patronize any or all of the tourist sites covered by this study. All respondents, in fact, answered to the affirmative when asked if they visit the local tourism sites. It may be concluded therefore that local tourists still participate actively and enjoy the gifts of nature in their area as well as human-made tourism sites. There are no deterrent as to high entrance fees, or over-regulation such as prohibition of unscheduled usage or visits, or frequent closures due to off-season rehabilitation. Local tourists feel free to visit the selected sites, or bring their personal belongings and equipment to fully enjoy what the sites had to offer. During the interviews, it was observed that the locales feel that they can relax and enjoy the destinations as much as outsider tourists. They responded freely when asked about their companions in the touring, the reasons why they visit, their preferred activities in the sites. They were likewise very open to share their feedback on what are needed in the recreation facilities, what information should be available in the sites and the take-off points, on waste disposal, etc. They were ready to divulge what kind of gears and equipment they bring in the tourist sites without any fear of prohibitions.

#### *A. Recommendations for Further Research*

Although there is still no reliable and scientifically validated method for the calculation of carrying capacity (Jovicic et al., 2008), the methodology of this research may be considered one of the initial efforts in the locality to measure carrying capacity thereby assess if the selected tourism sites are being used in a sustainable and efficient manner. This

research remains to be an unfinished business because of the challenges brought forward by existing literature insofar as measuring carrying capacity is concerned. According to Castellani et al. (2007), a set of information about a single issue should be considered in a comprehensive manner and systemic approach. Zelenka et al. (2014) contends that in the case of ecological carrying capacity, its manifestations must be considered in relation to the local changeability of ecosystems, time, and suitable size of the area for its determination and utilization. Lopez-Bonilla et al. (2007) adds that social or psychological carrying capacity, which is the maximum level of use that can be absorbed by an area, should look into two components: (a) quality of experience that visitors will accept before seeking alternative destinations; and (b) degree of tolerance of host population to presence of tourists. Another version was introduced by Marzetti et al. (2005) in that social carrying capacity as indicator of residents' and visitors' perception of crowding, which she called MNV or maximum number of visitors.

Furthermore, the study of Zelenka et al. (2014) recommended that studies on tourism carrying capacity should determine carrying capacity under different circumstances and thoroughly describe how the value of carrying capacity was determined and for what conditions. According to Castellani et al. (2012) carrying capacity should be assessed through multi-layered periods, in the same manner, to detect the possible negative impact provoked by high proportion of tourists at certain times of the year i.e., four quarters (Lopez-Bonilla et al., 2007). The capacity to absorb tourism impacts must be perceived as a time-space variable (Zelenka et al., 2014).

Additionally, Zelenka et al. (2013) posited that carrying capacity should be viewed as a dynamic quantity i.e., under dissimilar conditions tourism effects on nature and landscape might be much different even if there is otherwise the same number of visitors. It is therefore recommended that the calculation of carrying capacity be conducted on varying periods and under different circumstances e.g., after a major natural phenomenon or development has occurred in particular sites.

Be that as it may, the researcher firmly believes that measuring carrying capacity is imperative in tourism development. As asserted by Zelenka et al. (2013), carrying capacity can be, from the theoretical point of view, a sound basis for other sustainability tools such as visitor management. It may be used in a lot of protected areas and other valuable and fragile landscapes as a tool for avoiding or suppressing negative and on the other hand strengthening positive impacts of tourism. As mentioned in the earlier part of this section, Marzetti et al. (2005) proposed to examine carrying capacity as an indicator of residents' and visitors' perception of crowding (maximum number of visitors or MNV). In case of conflict between residents' MNV and visitors' MNV, the policy maker has to mediate.

Moreover, Castellani et al. (2012) stated that carrying

capacity can be used in the assessment of effectiveness of development policies resulting from sustainability evaluation. They declared that managing carrying capacity supports decision-makers in the planning process. A highly convincing statement was given by Zelenka et al. (2014) in which they pronounced that considering carrying capacity, or more generally, limits of tourism development, is of a significant predictive potential.

Finally, it is hereby recommended that the local government build on the positive attitude of local resident tourists regarding their own area's tourism. This attitude can help significantly in the promotion of the tourist sites of the municipality. It was mentioned earlier that the current handling and alterations at the sites are far from the areas' physical carrying capacity. Therefore, the local government has ample time to plan, prepare, and set policies to prevent beyond-capacity usage. On the other hand, the social aspect of carrying capacity which is positive may be utilized to promote and popularize tourism in the municipality. Local residents who have first-hand experience of the beauty of the sites may be mobilized to get involved in packaging the sites so as to attract outsider tourists.

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