Localized Effective Tourism Carrying Capacity using Tourist Proxemics and Corrective Factors, The Case of Sabang Beach in Baler, Aurora, Philippines

Localized Effective Tourism Carrying Capacity using Tourist Proxemics and Corrective Factors, The Case of Sabang Beach in Baler, Aurora, Philippines

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Abstract. Researches are being carried out but few studies incorporate the role of tourist as means by which changed are produced. Similarly, tourist developers and LGUs have often failed to embody the social components into development plan and policies promoting tourist activity. This study focused on the combining these areas in order to create harmonious relationship between tourism and the tourists. In this study the concept of capacity received considerable attention as a result of increasing anthropogenic drivers and pressure in Baler in the last few years. The study aimed to create a refined and simplified process of Tourism Carrying Capacity (TCC) as first carried out by Boullon (1985) through incorporation of a corrective factors and required area per tourists using local proxemics. Field survey and tourist mapping were conducted in order to determine the required area per tourist and tourists' proxemics, which essentially measures visitor density and crowding tolerance. In the absence of changes, beyond this density, visitor numbers start to decline. The study was able to approximate both perceived and observed tourist proxemics. Corrective factors and local tourist's proxemics are incorporated to the localized and refined Effective Tourism Carrying Capacity formula (ETCC). The result provides basis for both planners and regulators to determine demands and developments and help assess businesses and building permits. The results of the ETCC calculations can, however, be influenced by other corrective factors such as the recreational infrastructure, visitor attitudes, and sociocultural norms. Nonetheless, the results are considered very useful for developers and LGUs to support not only resort management but also planners and decision makers in Baler, and other coastal areas.

1. Introduction

A variety of estimates carrying capacity shows in a general way the relationships among some of the major factors concerned. Obviously, if consumptions levels per capita are higher, then a smaller population can be supported. If technologies increase or decrease overall consumption, then they also affect carrying capacity. Because the idea and methodology of carrying capacity were developed in the natural science of biology, they incorporate the notion of limits imposed by the earth's natural systems. Species can overshoot these limits (as with the r-selected species), and when they do, they collapse and risk extinction.

Studies of various species provide us with some basic lessons to apply to the human condition, but new ideas and methodologies are needed to incorporate the added complexities of human technologies and culture. Carrying capacity tells us that the biophysical limits of our environment are the key in determining how many human can survive at what levels of consumption.

"Tourism Carrying Capacity" is defined by the World Tourism Organization as "The maximum number of people that may visit a tourist destination at the same time, without causing destruction of

the physical, economic, socio-cultural environment and an unacceptable decrease in the quality of visitors' satisfaction". Whereas Middleton and Hawkins Chamberlain (1997) define it as "the level of human activity an area can accommodate without the area deteriorating, the resident community being adversely affected or the quality of visitors experience declining" what both these definitions pick up on is carrying capacity is the point at which a destination or attraction starts experiencing being overcrowded as a result of the number of visitors.

2. Framework

In order for Tourism Carrying Capacity to be localized four (4) factors are incorporated in the study, first is that instead of the general tourist area, the study zoned it according to major tourist activities existing in the area. Next is the incorporation of proxemics in the required area per tourists using two methods survey and tourist mapping in the tourist area. The third is the incorporation of rotation factor and tourist peak hour per activity. Last are the establishment and integration of corrective factors present in the area.

3. Tourist Destination Area (TDA)

The tourism development areas are obtained from the list of tourist spots, which were initially identified by the Municipal Tourism Office (MTO) of Baler, Aurora along with its corresponding barangays and tourist activities.

After the evaluation of the TDA's using the criteria discussed above, one TDA's will be selected and be considered as the study area.

3.1. Tourist Destination Area Zoning

Tourism Planning in Baler should consider vital transport infrastructure, environmentally sensitive areas, existing and potential tourism sites, tourism service center, and their linkages. Based on these considerations, several Tourism Development Areas (TDAs) were identified for Baler, Aurora. A Tourism Development Area (TDA) is a cluster of Tourism Sites that have geographical proximity and/or common thematic attributes. Tourism Sites (TSs) are more specific places that may have natural and cultural significance, attractive landscape, where activities take place, or are suitable for tourism development. Some of the themes that were believed to have unique selling qualities and became the bases for the delineation of the nine (9) TDAs are the following:

- Surfing Areas and other Surface Water Sports Activity Areas
- Facilities conducive to Rest and Health
- Historical Landmarks and other well-known landmarks due historical events
- Beach front and with existing Potential Waterfront Development
- Wildlife and Forested areas and Potential Ecotourism sites
- Food Tourism - Baler caters a great variety of fresh seafood
- Picturesque View - Baler has a magnificent Sunrise view.

From the eight it was reduced into one final TDA's. The final TDA were acquired using these criteria

- The area is considered as a major tourist destination in Baler Aurora
- The tourist activities present in the area involves the use of the sea and beach
- The tourist spots are clustered in under one barangay and preferably along the coastline.
- There should be a presence of at least one major hotel accommodation.

After the evaluation of the eight TDA's using the criteria stated above, TDA number two were selected and considered as a highly significant area for study and calculation of its tourist capacity.

After the Identification of the TDA the area and the different tourist activities the tourist area is zoned according to activities present, before the zoning the following information were first established; overall tourist area and its technical boundaries, frontage of the Hotel Area, boundaries between the beach and the sea by the local government, distance of beach line to the area open for tourist for swimming and surfing. After establishing all required information the following steps were commenced. (See figure 1 and 6)

1. Identify the Boundaries of the Hotel accommodation, which will then become the dissipation area (Grid A-1, Grid D-1, Grid A-12 and Grid D-12)
2. Project the side property line of the dissipation area and extend it towards the sea (Grid 1 and 12)
3. From the frontage of the property of the dissipation area offset the lines to the bay walk area. (Grid Line D)
4. The property of the accomodation plus the area of the bay walk will now be the dissipation area
5. The distance between the dissipation areas (frontage) to the beach area will be establish by the Local government in this case 20 meters from the bay walk line. (Grid Line D to Grid Line F)
6. The distance between the beach areas (Grid Line F)

Table 1 Tourist Area. Showing the total area composition for the chosen Tourist Area

Tourist Area	Area (sq.m)	Percentage
Dissipation	11,990.48	29%
Beach	4,782.86	12%
Swimming	11,531.20	28%
Surfing	12,493.79	31%
Total Area	**40,798.33 sq.m**	**100%**

Figure 1 TDA Zoning (Plan View) shows how spaces were distributed according to its corresponding activities. Zoning is used to control tourist and tourist activities in different parts of Sabang beach. The zoning of the area is driven by ecological data in order to balance the demands between protection and use in determining the most appropriate levels of use for specific areas along Sabang beach. Google earth was used to measure and get each activity zone overall area as shown in the **table 1**.

4. Assessment of Carrying Capacity

The basic understanding of the carrying capacity requirements lead to the localization of the tourist carrying capacity formula. The study first established the basic requirements of the TCC process, these includes the tourist area chosen from the list of TDA's provided by the Municipal Tourism Office, the rotation factor obtained via field survey and observation, and the required tourist factor, which was attained using the field interview and mapping. Assessment was made on the tourist and the destination resulting to the establishment of corrective factors. These corrective factors are selected based on tourism activities and local conditions of the study area. In consideration of tourism activities in Baler, the following factors should be taken into careful consideration: environmental safety, conservation, natural resources managements, tourism activities, planning and local factors such as human resources, the contribution of tourism to local economic development, and provision of a safe, satisfying and fulfilling experience for visitors, available to all without discrimination by gender, race, and disability or in other ways.

4.1. General Formula for Tourism Carrying Capacity (TCC)

To calculate carrying capacity of some tourism activities in the study area, the formula by Boullon (1985) as cited in Libosada (1998) were used in this study with some adjustments. Tourism carrying capacity is divided into the following levels:

$$TCC = \frac{Tourist\ Area}{Area\ per\ Tourist}\ x\ Rotation\ Factor$$

4.2. Localizing the Carrying Capacity Formula

Two methods were used in the study, field survey and tourist mapping with the incorporation of proxemics. The field survey (perceived limits) was conducted by asking each respondent to identify their required area per tourist taking into account their perceived ideal proxemics. In order to eliminate the concern of tourist being not aware of the standard unit of measurement, a 20x20m (400sq.m.) grid box comprising of a 20-1m interval grid lines were provided in the vicinity. Tourist were requested to go inside the grid and then asked to identify how much lines or box will it take for them to comfortably maneuver and perform identified tourist activities without the other tourist invading their social space. For the tourist mapping (observed limits), a map of the whole area was produced using Google earth, which was then converted to cad for the plotting. The computer-aided maps were then zoned into different activities including the dissipation area. Grids were positioned in order to identify the sampling areas. The randomly selected sampling areas were assigned with two mappers positioned on the opposite side of each grid area. The assigned mappers are then asked to locate and plot the tourist location inside the selected grid box it in the grid map. The obtained outcomes from the field survey (perceived) and the tourist mapping (observed) are then separately converted to area, averaged and summarized.

4.2.1. Required Area per Tourist

Required area per tourist is defined as the area needed for a tourist to undertake activities comfortably without any conflict to other tourists. There is an established International standard provided as shown in table 2. The standard was used in a study conducted by the Florida Department of Recreational Activity. This standard also captures both the environmental (a), and economic components (c) of sustainable tourism; to a certain extent it also captures the tourist comfort levels (b).

The table below shows the international recommended limits on the number of users for most outdoor recreation activities in an attempt to prevent overcrowding, and a recommended land base to assure that sufficient support area and buffer area are provided. A range is given for almost every activity, to allow for differences in each site. The site's classification is a main factor in density variation. For state parks, special feature sites and preserves, the carrying capacities should be reduced to insure compatibility with the management objectives of each category.

Table 2 Standard Required Area per Tourist (Florida)

Tourist Activity		**Standard Area Required per Tourist (Imperial)**	**Standard Area Required per Tourist (metric)**
Swimming	Water Swimmer	50-200 sq.ft	4.64-18.58 sq.m
Swimming	Beach Swimmer	200-500 sq.ft	18.58-46.45 sq.m
Surfing	Beach Surfer	40-100 linear ft	12.19-30.48 m
Water Skiing	Water boat	20-50 acres	80,937-202,343 sq.m
Fishing Shoreline	Linear ft / fisherman	20-100 linear ft	6.10-30.48 m
Fishing (Pier)	Linear ft / fisherman	10-40 linear ft	3.5-12.19m
Boating	Water boat	5-10 acres	20,234-40,468 sq.m

4.2.2. Rotation Factor

Rotation factor is the number of permissible hour of visits over a specified time (usually calculated by daily operating hours) and expressed by:

$$Rf = Average\ time\ of\ visit\ /\ Operating\ hours$$

Table 3 Rotation Factor

ACTIVITY	Rotation Factor
Surfing	12/24
Beginner	12/24
Amateur	12/24
Instructor w/o Certification	12/24
Instructor w/ Certification	12/24
Swimming	17/24
Sun Bathing	10/24
Surfing Lesson	10/24

5. Effective Tourism Carrying Capacity

ETCC is the maximum number of tourist that is permitted by the local conditions and management capacity without influencing the tourist demand of Baler. ETCC is equivalent to TCC adjusted by some correction factors.

$$ETCC = TCC \; x \; Cf_1 \; x \; Cf_2 \; x \ldots x \; Cf_n$$

5.1. Proxemics

The analyses on how a person use space in interpersonal interaction most commonly use E. T. Hall's conceptual framework, which he calls 'proxemics'." Hall described proxemics as "The study of man's transactions as he perceives and uses intimate, personal, social and public space (see figure 2) in various settings while following out of awareness dictates of cultural paradigms." Hall (1974) .This definition above is the closest to the specific concept of proxemics utilized in this research. The definition has three key components. First, proxemics involves the study of transactions, in the present research interpersonal interactions. Second, which the he has termed intimate, personal, social and public space. The third behaviors are considered to largely learned or culturally determine rather than entirely dictated by innate biological or psychological processes.

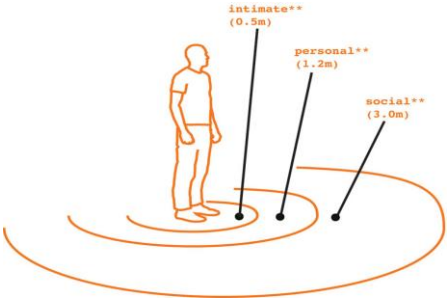

Figure 2. Proxemics Distances according to Hall. *Intimate Space*-this is the distance of playful wrestling and lovemaking. *Personal Space* - Eighteen inches marks the outer edge of our territorial bubble and the beginning of personal space. *Social Space* - This is the zone of impersonal transaction. *Public Space* - It's the distance of the lecture hall, mass meetings, and interactions with powerful figures until such time as they bid you to come closer.

5.2. Corrective Factors (Cf)

Indicators are used to indicate the sensitivity of environment and local development to tourist arrivals. Indicators form a set of indicators (index) that recognize on-going problems and propose corrective actions. In estimation of carrying capacity, only negative factors, which hinder the development of tourism activities, are considered. These factors are translated into quantitative or semi-quantitative values, which measure the adaptability of environmental, socio-cultural, economic subsystem and tourists' demand.

Therefore, indicators selected for calculating carrying capacities have the following characteristics:

- Computable (often quantitative or semi-quantitative values).
- Easily surveyed and collected (by field research and questionnaire).

Where: Cf (corrective factors or limiting factors) are factors which have negative impact on tourism activities and assessed by limiting threshold which used for identifying impact level of a factor (%): Corrective factors are expressed in percentage terms using the following formula

$$ETCC = TCC\ x\ \frac{100 - CF_1}{100}\ x\ \frac{100 - CF_2}{100}\ x \ldots$$

$$ETCC = PTCC\ x\ CF_1\ x\ CF_2\ x\ CF_n \ldots$$

$$CF_1 = \frac{M_1}{M_2}$$

Where:

PTCC = Physical Tourism Carrying Capacity

ERCC = Effective Real Carrying Capacity

CF1 = Corrective factors

M1 = Limiting magnitude of variable

Mt = Total magnitude of variable

Quality of weather - Based on the data provided by the Local Government and the National weather station (PAGASA) the average number of days the Sabang beach is closed for any type of tourist activity is 60 days for the whole year.

Quality of waves - Based on the local surfers and the Instructors along the beaches of Sabang it is best to surf during the transition between Tides and that is usually during the morning from 5am to 10am and the afternoon from 2pm to 7pm with wave's height of 1.5m to 8m high. Overall there is about a total of 14/24 hours of 0.3m to 1.15 meter wave's height in between the peak hours. Of the 12 hours the beach is open for tourist activities 4 hours is usually the average time that the beach will experience 1.15m high and below waves

Corrective Factor 1 (Quality of Weather)

$$CF_1 = \frac{100\ X\ \left(\frac{M_1}{M_2}\right)}{100}$$

$$CF_1 = \frac{100 - \left(\frac{60\ days}{365\ days}\right)}{100}$$

$$CF_1 = \frac{100 - 16.4}{100}$$

$$CF_1 = \frac{83.6}{100}$$

$$\boldsymbol{CF_1 = 0.836 \text{ for weather}}$$

Corrective Factor 2 (Quality of Waves)

$$CF_1 = \frac{100\ X\ \left(\frac{M_1}{M_2}\right)}{100}$$

$$CF_2 = \frac{100 - \left(\frac{4\ hours}{12\ hours}\right)}{100}$$

$$CF_2 = \frac{100 - 33.33}{100}$$

$$CF_2 = \frac{66.67}{100}$$

$$\boldsymbol{CF_2 = 0.667\ for\ waves}$$

5.3. Survey and Mapping

The survey where conducted during the peak months of Tourist arrival to observe maximum number and variation of tourists in Baler. The survey where distributed and conducted randomly along the beach of Sabang and five different time of the day and week. Each questionnaires were conducted by a survey assistant and in form of survey interview. One part of the survey asks respondents on their preferred distance to another tourist per activity identified in the TDA (Surfing Lesson, Swimming, Surfing and Sun Bathing). Each respondents were asked to stand inside a Grid with 1meter distance to each Latitude and identify how many box they prefer should the next tourist be in order for them to move without any discomfort or without invading their intimate and social spaces.

The total number of respondents was obtained using slovins formula. A base population of 428 and a confidence level of 95% were used. The overall total Sample is 273 respondents.

5.3.1. Survey Profiling

Based from the Survey with a total number of 273 respondents, the tourist with the age of 19, 24, 26 and 31 are the age with the most number of participation in the investigation while the age of 16 years old has the least number of respondents.

5.4. Survey Process (Perceived Limits)

The respondents where asked how much meters will be their ideal distance to another tourist within the area (assuming that it is not related to the respondents). In order to reduce the notion of tourist not having some sense of dimension and to establish the fine line distance between social and public space of the respondents, a Grid Box pattern are created in the survey area. Using a Grid Box measuring twenty (20)

meters with a one (1) meter grid line interval the respondents are then asked to go inside the box, the respondents are then asked to identify how many gridlines does it takes for tourist to penetrate inside their. The results of the survey are then converted into radius and then calculated to obtained each tourist radial area. The results are then averaged summarized. (See Table 4)

5.5. Mapping Process

In order to conduct the mapping properly the following process were done. The study was first able to get a Google image picture of the whole Tourist area. The obtained image is then scaled and translated using CAD program. The study area is subdivided into zones according to activities present in the area. Next the translated area marked with grid lines with 20 meters interval (see figure 3) naming each vertical and horizontal line with alphanumeric codes. In order to identify what area will be mapped out draw lots are used. Two Grid Zones for each of the four activities identified (Surfing Lesson, Sun Bathing/Beach Lounging, Swimming and Surfing). Two (2) mappers per grid zone are assigned to take notes and mapped out the location of tourists inside the Grid. The results of the Mapping are then translated using CAD 9 (see Figure 3-5). Radial distances are created and each acquired were averaged and summarized. The result of the mapping is used as the tourist Observed Proxemics the results and is shown in Table 5.

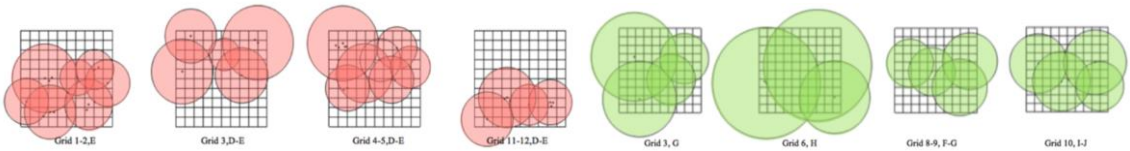

Figure 3 Mapping for Tourist (Sun Bathing) **Figure 4 Mapping for Tourist (Swimming)**

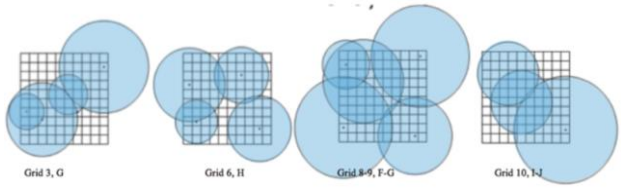

Figure 5 Mapping for Tourist doing Surfing

5.6. Survey and Mapping Results

All proxemics data reflected in tables 4 and table 5 were obtained from the field survey and tourist mapping. These are raw data, which were then converted to radius and area to determine each respondent public space. The proxemic space obtained were then summarized and presented below (see Table 4 and 5)

Table 4 Analysis of Perceived Area per Tourist of Different Activities (Ideal Tourist Proxemics)

ACTIVITY	Perceived Required Area per Tourist (sq.m.) Average
Surfing	27.37 sq.m.
Beginner	31.69 sq.m.
Amateur	42.38 sq.m.
Instructor w/o Certification	23.90 sq.m.
Instructor w/ Certification	10.05 sq.m.
Swimming	24.71 sq.m.
Sun Bathing	21.09 sq.m.
Surfing Lesson	28.78 sq.m.

Table 5 Analysis of Perceived Required Area per Tourist of Different Activities (Actual Tourist Proxemics)

ACTIVITY	Observed Required Area per Tourist (sq.m.)Average
Surfing	
Beginner	19.00 sq.m.
Amateur	19.00 sq.m.
Instructor w/o Certification	19.00 sq.m.
Instructor w/ Certification	19.00 sq.m.
Swimming	20 sq.m.
Sun Bathing	18 sq.m.
Surfing Lesson	25 sq.m

To calculate effective carrying capacity of each activity zones, the formula by Boullon (1985) as cited in Libosada (1998) were used in this study with some adjustments. From Tourism Carrying Capacity (TCC) to Effective Tourism Carrying Capacity (ETCC) which is divided into the following levels:

$$ETCC = TCC\ x\ \frac{100 - CF_1}{100}\ x\ \frac{100 - CF_2}{100}$$

$$ETCC = TCC\ x\ CF_1\ x\ CF_2$$

$$CF_1 = \frac{M_1}{M_{1T}}$$

$$CF_2 = \frac{M_2}{M_{2T}}$$

Where.

TCC = Tourism Carrying Capacity
ETCC = Effective Tourist Carrying Capacity
CF_1 = Corrective factors 1 (Weather)
CF_2 = Corrective factors 2 (Waves)
M_1 = Limiting magnitude of variable (Weather)
M_{1T} = Total magnitude of variable (Weather)
M_2 = Limiting magnitude of variable (Waves)
M_{2T} = Total magnitude of variable (Waves)

After identifying the zones and the sample mapping area for the four major tourist activities, The following steps were followed

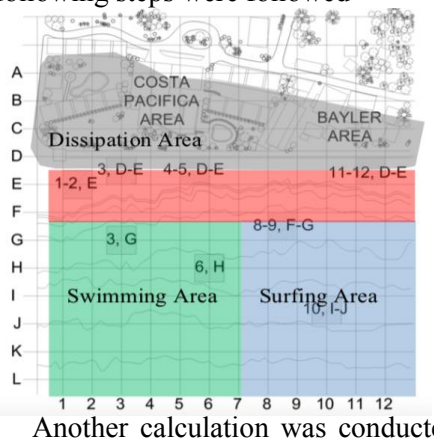

Figure 6. Two mappers were assigned to observe and plot the current location of the tourist inside each grid. Each grid zone was plotted during the weekends to ensure that the conditions will be the same for all activity zones. All results obtained during the tourist mapping were then converted to area and then averaged. The averaged results were summarized and presented in table format as the observed proxemics of tourists

$$ETCC = \left[\frac{Tourist\ Area\ (per\ activity)}{Req'd\ Area\ per\ Tourist\ (using\ tourist\ proxemics)}\ x\ Rf\right] \times Cf$$

Another calculation was conducted using tourist mapping to validate the result of the Effective Tourist Carrying Capacity using perceived proxemics. The table above shows the summary of the results of Tourist mapping using manual charting of each tourists on the selected grid zones.

The author has calculated the tourism carrying capacity in Sabang, Baler Aurora using the adjustment from TCC to ETCC formula (shown above) based on various corrective factors and tourists' proxemics. The obtained results are as summarized below.

6. Summary of Findings

The main findings of the study are summarized below:

1. Comparing the result of the localized effective tourism carrying capacity of the study area (see table 6) and the maximum guest capacity of Costa Pacifica shows that the number of beds currently

being offered by the hotel is below the number of expected number of tourist in the TDA zones which can be safely concluded that development can still be permitted for the hotel. With the number of estimated number of tourist of the tourism development area, the Costa Pacifica administration still have the option to create additional floor area either through vertical or horizontal expansion.

2. The result of the refined TCC shows that the capacity using the perceived proxemics has a lower capacity as to those obtained using the observed proxemics. The study also shows that the tourist perception of what is the ideal distance and space to another non-related tourist can be lowered as shown in the result of the observed limits and actual mapping of the tourists, making the tourists to adjust their social and public space to be reduced.

7. Results and Discussions

Comparing the results of the study of the whole tourist area demonstrates that the proxemics of each user can be adjusted and can be reduced; it does not however show that the notion of overcrowding to changed as well. The tourist might be able to adjust their perception of what is acceptable space, but it does not mean that the tourist satisfaction and Visitor experience will also follow. The result of the area being non-compliant to the tourist capacity results attained using perceived limits may lead to tourists not being able to experience their expected fullest satisfaction or the experience the tourist area offers.

The Tourism Carrying Capacity (TCC) results determined by these study can serve as a basis in the preparation of site plans for new use sites and for authorized alterations of existing use sites. The applicable carrying capacity for a given use site also will give a prescribed number of parking spaces, the number and sizes of restrooms, Hotel accommodation and all quantities of support facilities to be provided along the Tourist Area. The result of the ETCC can also be used as a guide to limit and identify if the development is exceeding its allowed limit through the creation of building height requirements and incorporating the result to the floor to area ratio of Sabang.

All information gathered from the Costa Pacifica Administration are summarized and reflected in Table 6. While all the capacity results obtained using the perceived, observed and standard proxemics are summarized and tabulated above (see Table 6) for easy referencing and comparison.

Figure 7 shows the summarized capacity of the three ETCC method versus the capacity provided by Costa Pacifica. The table shows a great difference between the three capacities.

Table 6 Summary of Results

Activity	Perceived Data	Observed Data	Standard Data
Surfing	127.27	183.33	285.75
-Beginner	109.92	183.33	285.75
-Amateur	82.19	183.33	285.75
-Instructor-no Cert.	145.75	183.33	285.75
-Instructor w/ Cert.	346.60	183.33	285.75
Swimming	276.34	341.42	1471.64
Sun Bathing	78.99	92.56	89.67
Surfing Lesson	57.89	66.64	117.33

The perceived data (obtained from the survey) and the Observed data (obtained from the tourist mapping) are afterwards used as a replacement to the standard limit established by the Florida department of Environment Protection. All results are then summarized and converted to table format. The data obtained from the survey and tourist mapping are then compared with the guest capacity Obtained from the data provided by the administration of Costa Pacifica. (See figure below)

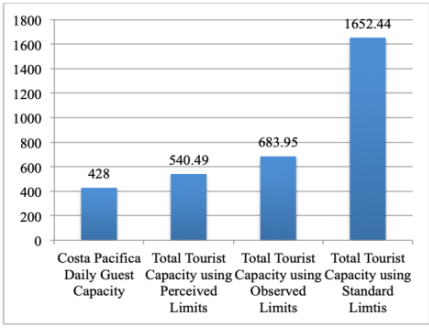

Figure 7. T Comparing the Result of the Localized Effective Tourism Carrying Capacity of the Study Area and the Maximum Guest Capacity of Costa Pacifica shows that the number of Beds currently being offered by the Hotel is below the number of expected number of Tourist in the TDA Zones which can be safely concluded that development can still be permitted for the Hotel. With the number of estimated number of tourist of the TDA the Costa Pacifica Administration still have the option to create additional Floor Area either through vertical or horizontal expansion.

8. Conclusion

The study was able to localize and refine Tourism Carrying Capacity (TCC) method using four requirements - the tourist area zoning, required area per tourist, rotation factor and corrective factors all corresponding to each activity. Zoning of the tourist area per activity and rotation factors made the method more site-specific. The required area per tourist with the aid of tourist proxemics incorporates the tourists' satisfaction and experience (Social Component) and lastly, corrective factors integrate other considerations that were not included in the original TCC requirement. The equation below is the refined formula obtained from the study.

The result of the refined TCC shows that the capacity using perceived proxemics is lower than that obtained using observed proxemics. The study also shows that the tourist perception of what is the ideal distance and space to another non-related tourist can be reduced as shown in the results of the observed limits and actual mapping of the tourists, making the tourists to reduced their social and public space. It can be concluded that the current number of tourist using the area has already exceeded the capacity obtained using the perceived limits but is still significantly lower as compared to the capacity using the required are per tourist. Based on the results it shows that the area can still accommodate a significant increase in the number of tourists since it hasn't reached the capacity indicated by the international standard that incorporates environmental conditions.

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