CARRYING CAPACITY CONSIDERATIONS

THE NEED FOR MANAGING CHANGE IN A UNIQUE TOURISM DESTINATION

BORACAY ISLAND
PHILIPPINES

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Executive Summary

Introduction

Many sincere efforts to resurrect Boracay's viability as a world class tourism destination are now underway. By mitigating the environmental and social impacts of the rapid, unplanned development, these efforts hope to secure a sustainable future for the island paradise. Examples of activities include immediate upgrades in septic tanks, implementing zero waste management, and major improvements in water and sewerage infrastructure. While important, these efforts remain as reactionary, partial responses to past failures of governance. To help focus on fundamental issues of sustainable development, many key decision makers have suggested that there is a need to clearly establish carrying capacity thresholds for Boracay.

Recent experience with carrying capacity in tourism destinations similar to Boracay suggests that carrying capacity can be an important tool for growth management. In other words, carrying capacity analysis should not be seen as a way to identify the maximum number of tourists for a given destination. Rather it should be used to assist with governance decisions based on desired conditions, not rigid numbers. Carrying capacity should encourage governance actions that reduce impact per visitor rather than simply the number of visitors. To achieve the desired conditions for a tourist destination, responsible citizens and government officials should be asking "How much and what kind of change is acceptable to both residents and tourists?" rather than "How much is too much?"

The Analysis

Towards this end, the Department of Tourism in partnership with the Canadian Urban Institute conducted a carrying capacity analysis for Boracay based on existing available information. By establishing technical capacity numbers and answering the question of "how much is too much?", it is the intention of this analysis to focus growth management issues in a way that will help to address the more relevant question of "how much and what kind of change is acceptable on Boracay?" Based on this rationale, an analysis of five major parameters with sixteen indicators to carrying capacity was conducted. These parameters are listed below.

1. **Physical** (Ground Water Quality, Ground Water Quantity, Marine Water Quality, Land, Sewage, Solid Waste);
2. **Tourist perceptions** (Crowding - White Beach Only, Crowding - All Beaches**,** General Perceptions);
3. **Resident Perceptions** (General Perceptions);
4. **Transport** (Air access**,** Boat transport from mainland**,** Roads and Road System on Boracay**,** Vehicles);
5. **Governance** (LGU**,** Other -DENR, DOT, Regional Government).

The analysis revealed that of the sixteen key indicators for carrying capacity, almost 40% exceeded their carrying capacity thresholds and 44% are demonstrating trends that are unsustainable (see Table ES-1). In the aftermath of the 1997 summer water quality crisis, these results are not too surprising. However, what is surprising, and disturbing, about these results is the implication that the present governance systems on Boracay are incapable of meeting the challenges facing the island's growth management requirements.

Table ES-1: Carrying Capacity Conditions on Boracay

Parameter	Exceeded	Unsustainable	Not exceeded	Total
Physical	3	2	1	6
Tourist Perceptions	-	3	-	3
Resident Perceptions	-	1	-	1
Transport	1	1	2	4
Governance	2	-	-	2
Total	**6**	**7**	**3**	**16**
Percent	***38%***	***44%***	***19%***	***100%***

This finding is significant because the decisions of government must be guided by both technical information and the values of the residents and the tourists. Governance is the means whereby this information affects peoples lives. Identifying carrying capacity thresholds is one way to assist with balancing this information and influencing governance decisions and keeping change within acceptable limits.

Table ES-2 summarizes the numerical population thresholds based on the assumptions stated in this paper. Because carrying capacity is based on limiting factors, the limits placed on successful development by local transportation and governance suggest that a moratorium on resort construction should be considered, at least until the capacity in these areas is improved. Once local transportation and governance issues are addressed, the next limiting factor examined in this paper is

Table ES-2: Carrying Capacity Population Comparisons

Constraint	Maximum Peak Tourist Population with Proposed Improvements	Maximum Population with Proposed Improvements
Physical*	8,800-14,900	17,600-29,800
Tourist perceptions	5,333 (White Beach or tourist village) 13,000 (All Beaches)	10,600-26,000
Resident Perceptions	Undetermined	Undetermined
Transport	Current activities exceed threshold levels	Current activities exceed threshold levels
Governance	Current activities exceed threshold levels	Current activities exceed threshold levels
Current Peak Populations	4,600	14,600

*Does not include the major developer Fil-Estate who is anticipated to be self-sufficient.

development in the White Beach or tourist village section of Boracay. Using 'beach area' ratios as an indicator to tourist satisfaction, the tourists village is very close to reaching its carrying capacity and is already experiencing the effects of crowding.

At present the tourists population of Boracay, which is almost entirely concentrated around White Beach, stands at 4,600 during the peak periods. Maximum tourist population for White Beach is around 5,300, based on standard tourist perceptions of beach crowding. Once Fil-Estate's project is completed and the rapid construction that is taking now place in the White Beach corridor is completed, thresholds for crowding will be maximized. Obviously, crowding thresholds will also affect the local transportation system and demand more vehicles on the already congested, noisy and polluted road network. The current transportation situation is pushing local residents limits of tolerance and exceeding tourists limits of experiential quality.

The improvements in the Kalibo airport and the BEIP project will adequately address important physical and infrastructure constraints to carrying capacity. However, expanding the capacity in these areas will also increase pressure on the excesses in other areas by allowing more tourists and more development -- which require better local transportation and better governance.

Conclusions

Carrying capacity is in essence a growth management tool, not a simple answer to the many planning, development and management challenges on Boracay. Still, the indicators examined in this paper, both numerical and descriptive, should help focus management decisions on the urgent need to address the quality as well as the quantity of growth on Boracay. Future governance decisions must appreciate the complexity of managing a dynamic tourism destination where the reality of day to day politics demands tradeoffs be made between many competing stakeholders with their vested interests and deeply held, often conflicting, values. The following conclusions can logically be drawn from the carrying capacity analysis of Boracay:

- Strong action is urgently needed. This is especially relevant considering the trends on Boracay closely resemble other international failed tourism developments where rapid and unplanned growth resulted in a highly degraded environment with subsequent declines in both the tourism industry and the quality of life.

- A strict moratorium on resort construction should be seriously considered. At the very least a moratorium should be instituted until an effective governance regime is instituted on the island. Effective governance is essential, including fair implementation and enforcement of policies and laws.

- The completion of current resort projects in the White Beach corridor and Fil-Estate's project, which includes direct access to White Beach, will absorb the development capacity for the tourist village based on crowding thresholds.

- The completion of the major projects of Fil-Estate, Primetown and Ayala are anticipated to double the existing tourist population on the island. This will stress carrying capacity thresholds on the island. Effective and creative governance responses will be required to maintain a peace touristic experience and minimize crowding.

Of the capacity constraints currently being exceeded, governance is the most important. With good governance, more subtle management opportunities can be seriously considered. These opportunities can concentrate on conditions rather than numbers by utilizing tactics such as indirect actions, regulations, zoning, permitting, short term actions, capital expenditures, exactions, taxes and information dissemination. These tools can be utilized to meet the objectives of the Boracay stakeholders to aid with development of appropriate alternatives to meet the challenges on Boracay.

Main Report

Why conduct analysis on carrying capacity in Boracay?

Legitimate concerns have been raised about the appropriateness of conducting carrying capacity analysis for Boracay. The concern revolves around the urgent need to directly address critical environmental problems rather than expending time and effort considering carrying capacity. After all, there are already very clear indicators that environmental carrying capacity thresholds have been exceeded, such as the degraded quality of both fresh and marine water. Therefore, why not focus specifically on mitigating actions to bring these development excesses back within acceptable standards?

While the mitigating efforts now underway on Boracay are essential to resurrecting the island's viability as a tourism destination (such as the current efforts to improve septic tanks), they remain reactionary, short term responses to past failures of governance. To reorient political discourse and focus on fundamental development issues, many key decision makers have recognized that a plan or a strategy for long term sustainability is needed. Recommendations often include the need to clearly establish carrying capacity thresholds for Boracay. Yet their is typically a great deal of confusion over just what carrying capacity is or how it can contribute to the future of Boracay.

The purpose of this paper is to contribute to sustainable development planning through the discussion of carrying capacity, suggesting that despite confusion over the meaning and conceptual challenges in its application, it can be a useful growth management tool. To support the discussion, a specific carrying capacity analysis of sixteen specific parameters or indicators has been applied to Boracay. With Boracay already exceeding many carrying capacity constraints, this paper suggests that critical capacity constraints such as governance and local transportation must be addressed before more development is allowed on the island.

The Basis of Confusion

Establishing firm limits to growth based on carrying capacity constraints has become popular in many tourist destinations. This is not surprising considering that the idea of carrying capacity is conceptually sound as well as intuitively attractive. Perhaps the most compelling aspect of carrying capacity is the notion that specific thresholds for a given destination exist, suggesting that it is possible to calculate a 'scientific-based' maximum number for a given population. In the case of Boracay this 'population' would be tourists. Utilizing this approach to carrying capacity, any number greater than the one identified would destroy the resource base upon which tourism depends. The attraction to many managers is that establishing this 'magic number' effectively eliminates the need to make difficult management or governance decisions because all decisions are constrained by an established carrying capacity standard.

Unfortunately, to view carrying capacity for tourism destinations in this light is both naive and dangerous. Naive because it is overly simplistic. And dangerous because it

ignores the political nature of governance. A more appropriate approach would be to focus on desired conditions, not numbers, and encourage governance actions that reduce impact per visitor rather than simply the number of visitors.

Rationale: Tourists are not Cows

So why is there all this confusion over carrying capacity in the first place? Look no further than the origin of the concept. Carrying capacity evolved as a tool for range management - how many head of cattle can graze on a given area of land without eating the grass faster than it naturally grows back. Although there are many dynamic ecological parameters to consider, scientists were able to arrived at reasonable numerical estimates that found their way into resource management plans.

So why doesn't this approach work for tourism destinations? The answer is simple: Tourists are not cows.

First of all, tourists behave very differently, not only from cows but also from each other. For example, forty bird watchers from the Audubon Society might have very little impact on a given forest reserve, whereas ten fraternity brothers celebrating college graduation might have a tremendous impact on that same reserve. While there is an implicit relationship between number of tourist and impacts, the obvious implication is that simply limiting the number of tourists may do little to achieve at least one of the desired governance objectives, in this case preserving the integrity of the forest reserve.

Second, despite the fact that the concept originated in the natural sciences, carrying capacity is not tightly constrained by the local geophysical resource base. People can 'appropriate carrying capacity' from other places.[1] The population on Boracay is currently appropriating much of its food supply from the sea off Tablas Island (fish) because the local fish populations and habitat have been over exploited - and now are incapable of supporting the local tourist and resident populations.

A more dramatic example of exceeding local carrying capacity constraints is water. Because of water quality problems, the tourist population on Boracay is forced to 'appropriate water capacity' from as far away as Batangas, in small plastic bottles. The rest of the island is overcoming this constraint by boiling their drinking water. Soon Boracay will be 'appropriating water' from Panay, this time in plastic pipes from the Nabaoy River on Panay. As with many constraints, there is a technical response to a ridged biophysical threshold. However, by being able to increase capacity does not answer the more pertinent value based question of what the residents and tourists want.

[1] In order to accurately approximate actual carrying capacity, the ecosystem needs to be closed. It is then possible to calculate the limits of growth based population numbers, consumption levels and the life support functions of the earth, technology and governance are implicit in the model. Using this approach, it has been estimated that earth has exceeded its sustainable level and we would need two extra planets for everyone on the earth to live at the level of consumption, for example, as the average Canadian.

Third, despite the soundness of the concept, applying it to actual situations requires many assumptions and value judgments. However, in traditional carrying capacity analysis, there is no distinction made between technical facts (known relationships between use and impact) and community values (the level, conditions and outcomes that are most preferred). This is best illustrated by the wildly different estimates of capacity that have been made for Boracay (See Table 1).

Clearly, the most dangerous ramification of applying the concept is that carrying capacity estimates are open to political abuse or manipulation by powerful vested interests. 'Objective standards' or 'scientific-based limits' become exposed to the use of proxy rationalizations for hidden agendas. For example, a carrying capacity figure could be very helpful if a powerful local interest on Boracay wanted to develop land and is able to prove that it is a 'forgone fact' Boracay can support an additional 2,000 rooms - based on accepted land and water parameters for carrying capacity for instance. However, this may be in conflict with less tangible tourist perceptions of capacity and the associated crowding may prove to be too much. Such a situation may entice tourists to other more attractive destinations; eliminate important community resources, such as beaches, from public use; or destroy important ecosystem comments, such as coral reefs.

On the other hand, an opposing vested interest may use these 'magic numbers' to prove that the once pristine island of Boracay is overburdened and that no more development should be allowed. However, the reality may be that by applying sophisticated environmental mitigation and improving infrastructure, the destination may be able to comfortably accommodate much higher tourism population levels.

Therefore, while carrying capacity may appear to be able to provide an easy answer, one where difficult decisions of governance would not have to be made, it can unnecessarily constrained decision context by implying that nothing could be done to relieve the carrying capacity constraint. Often this is not true and could fuel controversy and conflict.

Such potential controversy supports the third point: research in tourism destinations suggests that it is not the resource base that tends to determine carrying capacity thresholds, but rather the predominating objectives of governance. This does not mean that ecological, natural resource or infrastructure based carrying capacity thresholds to not exist, only that they must be considered within the tourist system as a whole. The objectives should address the perception and values of the visitors and the host community. In other words, besides infrastructure, ecological or natural resource constraints, carrying capacity should consider social, economic and cultural issues as well.

Asking the Right Question

Despite the confusion, carrying capacity analysis is still a useful governance tool -- if the right question is asked. Rather than asking "How much is too much?", like most carrying

capacity analysis, the question should be: "How much and what kind of change is acceptable?"

Ideally, in a vibrant and healthy democracy with a strong governance regime, this question would answered through an understanding of the interests and values of the community derived from healthy debate. Divergent interests, to be expected in any community, would be openly expressed and discussed with decisions to limit and direct growth made by accountable decision makers, based on both community values and technical information.

In any case, establishing technical capacity numbers (answering "how much is too much?") can be a helpful way of focusing the issues for decision makers and inviting them to revisit the rationale behind the established limit ("how much and what kind of change is acceptable?"). For this reason, an analysis of five major parameters with sixteen indicators (specific parameters) to carrying capacity has been conducted. This analysis provides information and analysis to influence future management and governance decisions. The parameters include:

1. **Physical** (Ground Water Quality, Ground Water Quantity, Marine Water Quality, Land, Sewage, Solid Waste);
2. **Tourist perceptions** (Crowding - White Beach Only, Crowding - All Beaches**,** General Perceptions);
3. **Resident Perceptions** (General Perceptions);
4. **Transport** (Air access**,** Boat transport from mainland**,** Roads and Road System on Boracay**,** Vehicles);
5. **Governance** (LGU**,** Other -DENR, DOT, Regional Government).

Using available information, these parameters were analyzed by indicator as to whether expansion is possible to the current carrying capacity conditions, the maximum peak tourist population with proposed improvements, the maximum total population with proposed improvements, and a comment on the proposed improvements where they exist. The most important improvement to existing carrying capacity on Boracay is the Boracay Environmental Infrastructure Project (BEIP) that will directly improve the fresh water system, the sewage system and the solid waste system. Table 1 shows the results of this analysis and is followed by a more specific discussion.

Table 1: Select Carrying Capacity Indicators for Boracay Island

Constraint Parameter	Specific Parameter: Indicator	Current Carrying Capacity Condition	Is Expansion Possible		Comments	Maximum Peak Tourist Population with Proposed Improvements	Maximum Population with Proposed Improvements (with Caticlan)	Proposed Improve-ments
Physical (Physical assumes major developers are self sufficient)								
	Ground Water Quality	**Exceeded**	Yes	Drink bottled water or Treat water (e.g., Boil, chlorinate) Install sewerage treatment plant	Sewage contamination and salt water intrusion to fresh water lens	14,891	29,782	BEIP (1999)
	Ground Water Quantity	**Unsustainable**	Yes	Pipe water from mainland	Brackish water from salt water intrusion	14,891	29,782	BEIP (1999)
	Marine Water Quality	**Unsustainable**	Yes	Install sewage treatment	Essential in Boracay	14,891	29,782	BEIP (2000)
	Land	**Not exceeded**	No	Finite resource -1038 hectares- (no fill expected)	Dependent on density requirements	10,247 Based on MDP assumptions*	27,400	
	Sewage	**Exceeded**	Yes	Full sewage system is needed.	Septic tank improvement may reduce near-term excesses.	10,500	21,000	BEIP (2000)
	Solid Waste	**Exceeded**	Yes	Zero waste management and sanitary landfill	Trends are positive on this capacity issue due to local efforts. Now being implemented.	8,800	17,600	BEIP (on-going)
Tourist perceptions								
	Crowding - White Beach Only	**Unsustainable**	Yes	Promote access and opportunities to other beaches	Based on beach area to tourist ratio	5,333 (White Beach or tourist village)	10,600	None
	Crowding - All Beaches	**Unsustainable**	No	Beach is finite resource	Based on beach area to tourist ratio	13,000 (All Beaches)	26,000	None
	General Perceptions	**Unsustainable**	Yes	Changes in type of tourist(i.e. from beach-nature to beach-party)	Must maintain quality resort in competitive marketplace	Undetermined	Undetermined	None

Table 1: Select Carrying Capacity Indicators for Boracay Island (cont.)

Constraint Parameter	Specific Parameter: Indicator	Current Carrying Capacity Condition	Is Expansion Possible		Comments	Maximum Peak Tourist Population with Proposed Improvements	Maximum Population with Proposed Improvements	Proposed Improve-ments
Resident Perceptions								
	General Perceptions	**Unsustainable**	No	Thresholds are flexible and changing but resident concerns must be addressed	Severe thresholds are based largely on economic gains - and tourist spending. Lack of enforcement of laws are prime issue of concern	Undetermined	Undetermined	Few
Transport								
	Air access	**Not exceeded**	Yes	Expansions planned for Kalibo Airport		Undetermined	Undetermined	Airport improve-ments
	Boat transport from mainland	**Not exceeded**	Yes	Jetty Port, banca upgrades	Planned Jetty Port will relieve some problems	Undetermined	Undetermined	Jetty Port
	Roads and Road System on Boracay	**Unsustainable possibly exceeded**	Yes	Widening, sidewalks and better access are needed	Actions will be difficult to implement	Current Levels	Current Levels	None
	Vehicles	**Exceeded**	Yes	Laws and enforcement are needed	Quantity and speed of vehicles must be regulated	Current activities exceed threshold levels	Current activities exceed threshold levels	None
Governance								
	LGU	**Exceeded**	Yes	Trainings, manpower, enforcement, oversight, possible structural change	Inability to implement and enforce laws are main indicators	Current activities exceed threshold levels	Current activities exceed threshold levels	Some trainings, manpower, enforcemen t
	Other -DENR, DOT, Regional Government	**Exceeded**	Yes	Trainings, manpower, enforcement	Recent attention improves capacity. Laws (e.g. ECC) are ignored.	Undetermined: Current levels are stressing capabilities	Undetermined: Current levels are stressing capabilities	More implementa -tion

Physical

Ground Water Quality

As early as 1990, when the Environmental Impact Statement for the Master Development Plan was completed, it was well known that the ground water quality had exceeded capacity thresholds. This situation has continued to deteriorate from fecal contamination, waste water discharges and salt water intrusion that degrade the fresh water lens on Boracay. Other threats come from detergents, pesticides, herbicides and fertilizer. These issues have been brought to the fore by the golf course development.

The Fil-Estate project has begun to transfer water from Panay. The waste will be treated to make it potable in the near future and will be shared with some local residents.

Table 2: Land Area, People and Household Estimates, 1995

Location	Barangay	Hectares	People	Households
Boracay	Balabag	316	3,226	610
	Manoc-Manoc	282	4,353	790
	Yapak	369	1,422	250
	Sub-Total	***967***	***9,001***	***1,650***
Mainland Panay	Caticlan	469	2,926	539
	Total	**1,436**	**11,927**	**2,189**

Source: Municipality of Malay

The BIEP will also address this critical capacity constraint. A total of 8,040 cubic meters will be piped from the Nabaoy River and are expected to service a population of 29,800 by 1999. This population includes the barangay of Caticlan with almost 3,000 residents. With a current peak tourist population of 4,600 (90% occupancy levels), The total population to be served by the water system is approaching 17,000.

Ground Water Quantity

Ground water quantity use is currently unsustainable. Studies show that the fresh water lens of Boracay has been severely depleted and continues to be abused. Salt water infiltration is common. The Fil-Estate project and the BEIP will address this critical carrying capacity issue by 1999.

Marine Water Quality

At best, current marine water quality trends are unsustainable. Regular monitoring of the marine water quality is now being conducted by DENR and excessive coliform levels were recorded during a three month period in 1996. Another scientific analysis by a graduate researcher, conducted in 1996, recorded excessive nutrient loading in the marine water. Without a proper sewage and waste water treatment system, marine water quality thresholds will continue to be exceeded.

Land

The physical ‘capacity’ of the land to accommodate tourism facilities is extensive, far more than is reasonable for a ‘scientific capacity’ analysis. There are many value judgments

required and technical facts that must be considered. For example, a typical land use plan will consider set backs, buffer zones, open space requirements, compatible uses, height restrictions, among other 'value based' considerations. Technical input is also important and includes issues such as vulnerable slopes and soils. However, if the economic conditions permit, even these physical limitation can be overcome with engineering.

Taking a macro-view of Boracay based on the EIA for the Master Development Plan, there are between 130 and 150 hectares of 'developable land' on Boracay. The Master Development Plan identified a density of 33 units per hectare. Using an average of 2.3 persons per unit, density requirements of this standard would establish a maximum tourist population limit of 11,385 on Boracay. Equally as arbitrarily, the EIA suggests that 40 or 48 units per hectare satisfactory. With these limitations, maximum tourist population limit of 13,800 to 16,560 tourists would be possible.

Table 3: Land Capacity Estimates

	Density Units/Ha	Buildable Land Area	Total Units	Population per unit	Peak Tourist Population @ 90% Occupancy
MDP	33	150	4,950	2.3	10,247
EIA	40	150	6,000	2.3	12,420
EIA	48	150	7,200	2.3	14,904

Sewage

The sheer number of people combined with the lack of effective septic or other sewage treatment systems has overloaded the absorptive capacity of the soils. Capacity constraints will be relieved by the BEIP sanitation and sewerage system that will be able to handle 2,600 cubic meters per day and will service a population of 21,000 - or 7,400 more than the current total peak population (9,000 residents and 4,600 tourists).

Solid Waste

Although the capacity of the current system has been exceeded, local efforts, technical assistance and the required resources are all available. Trends in the current situation hold promise that this system return within acceptable levels in the near future.

Tourist and Resident Perceptions

A 1997 DOT-CUI survey on development control indicated that, in general, half or more of the tourists visiting Boracay and the residents are not happy with the trends development trends on the island. This unsustainable direction must be reversed to maintain a quality high resort environs that is competitive in the global marketplace. The results revealed that residents and tourists alike are very concerned over the unregulated development that is leading to a degraded environment on the island. Of the residents that are pleased, they usually cited individual economic gains related to the increased tourism.

Table 4 : Are You Are you happy with the changes (trends) you see taking place on Boracay?

Residents			Tourists		
Yes	Somewhat	No	Yes	Somewhat	No
50%	18%	32%	43%	0%	57%

One common indicator of tourist carrying capacity for beach resort destinations is the area of beach available for tourists. This is appropriate for Boracay considering that White Beach is the main tourist attraction on the island. At first glance, it appears as though there is plenty of room for growth on Boracay without a danger of crowding. Using a peak capacity based on 90% occupancy, and a beach requirement standard of 15 square meters for each tourist, and assuming 2.3 tourists per room (these figures are adjusted to account for the non-tourist beach use), a total of 69,000 square meters of beach would be required for the 2,200 rooms that currently exist on Boracay. Reviewing beach area of the entire island, there is approximately 188,000 square meters of beach, or an apparent excess of 119,000 square meters.

Table 5: Existing Beach Requirements for Boracay, 1997

Existing Resorts	Number
Existing Number of Rooms	2,200
People per Room	2.3
Maximum Tourist Population	5,100
Peak Occupancy	90%
Peak Tourist Population	4,600
Beach Requirement/Tourist (Sq. Meter)	15
Total Beach Requirement (Sq. Meter)	69,000

However, because most of the resort guests utilize White Beach, Boracay is rapidly approaching its beach carrying capacity limit. White Beach has approximately 80,000 square meters, roughly translating into a 2,500 room maximum capacity. That means that only 300 rooms are available within this threshold in the tourist village area around White Beach. The new development of Fil-Estate, Fairways and Blue Waters Resort, is expected to have over 1,000 rooms and they will have direct access to White Beach via their own property. These facts suggest that carrying capacity in the tourist village, based on the beach availability indicators, will be exceeded after the Fil-Estate development is complete.

Using these same assumptions, if all beaches on Boracay are considered, a total tourist population of 13,000 or a development build-out of 6,000 rooms would be recommended. Although no figures are available, the anticipated build-out of the Boracay with all three of the major planned developments of Fil-Estate, Primetown and Ayala will more than double the existing tourist population of Boracay. This means that not only will the carrying capacity of the island be maximized, but the distribution of visitors throughout the island will have to be well managed and dispersed.

Table 6: Beach Carrying Capacity Thresholds

White Beach	Number
Approximate Area (Sq. Meter)	80,000
Beach Requirements (Sq. Meter)	15
Tourist Population	5,300
People per Room	2.3
Maximum Number of Rooms @ 90%	2,500
Maximum Total Population	10,600
All Beaches	
Approximate Area in Sq. Meters	188,000
Beach Requirement	15
Tourist Population	13,000
People per Room	2.3
Maximum Number of Rooms	6,000
Maximum Total Population	26,000

Transport

The capacity for air access and boat transportation have not yet been exceeded. Planned expansions for Kalibo Airport and a new jetty port facility in Boracay should ensure that these development parameters will not limit the capacity of Boracay. Yet providing ease of access to Boracay will place additional strain on other parameter thresholds. For transportation this means the major challenges for Boracay will be on the island itself. The trends in the roads and the road system on Boracay are clearly unsustainable. Road widening, sidewalks and better access are needed. However, these actions will be difficult to implement due to existing land use and land availability. Further transit challenges include the actual vehicles used for moving goods and people. Pollution, both noise and air, from current tricycles and trucks is another indicator that the thresholds have been exceeded. The number of vehicles and the speed of vehicles must also be regulated and enforced. These observations are supported by comments from both tourists and residents.

Governance

One of the fundamental reason carrying capacity thresholds have been allowed to be exceeded is a lack of good governance. Water systems, sewage systems, transportation systems and solid waste systems are being implemented and will help relieve some of the capacity constraints on Boracay. However, these systems must be maintained and a myriad of other governance responsibilities, such as enforcement, must be effectively instituted or carrying capacity thresholds will continue to be crossed. Governance becomes increasing more important as growth and development approaches local carrying capacity limits. Local government, the Department of the Environment and Natural Resources, The Department of Tourism and the Regional/Provincial Government need to work together with NGO's, private industry and residents to develop more effective governance practices on Boracay (for more detailed discussion on governance see DOT-CUI publication: "Trouble in Paradise").

Conclusions

The current trends and decisions affecting Boracay are leading in a potentially disastrous directions. Improved off-island transportation, specifically the capability to get tourists to Boracay with improved air facilities, combined with more intensified marketing will exacerbate current pressures on the community, ecological and experiential tourists qualities that make Boracay a unique and successful tourism destination. This conclusion is supported by the results of the carrying capacity analysis described in this paper.

A total of sixteen key indicators for carrying capacity, based on five main parameters, were examined in this paper. Almost 40% of the parameters have exceeded their carrying capacity thresholds and 44% are demonstrating trends that are unsustainable. In the aftermath of the 1997 summer water quality crisis, these results are not surprising. However, what is surprising, and disturbing, about these results is the implication that the governance systems are incapable of meeting the challenges to growth management on Boracay. Effective governance is fundamental to keeping Boracay within its carrying capacity.

Table 7: Carrying Capacity Conditions on Boracay

Parameter	Exceeded	Unsustainable	Not exceeded	Total
Physical	3	2	1	6
Tourist Perceptions	-	3	-	3
Resident Perceptions	-	1	-	1
Transport	1	1	2	4
Governance	2	-	-	2
Total	6	7	3	16
Percent	38%	44%	19%	100%

Table 8 summarizes the numerical population thresholds based on the assumptions stated in this paper. Because carrying capacity is based on limiting factors, the limits placed on successful development by local transportation and governance suggest that a moratorium on resort construction should be considered, at least until the capacity in these areas is improved. Once governance and local transportation issues are addressed, the next limiting factor examined in this paper is development in the White Beach or tourist village section of Boracay. Using 'beach area' ratios as an indicator to tourist satisfaction, the tourists village is very close to reaching its carrying capacity and is already experiencing the effects of crowding. These will be further stressed by the completion of Fil-Estate's project.

The improvements in the Kalibo Airport and the Boracay Environmental Infrastructure Project will adequately address important physical and infrastructure constraints to carrying capacity. However, increasing the capacity in these areas will only increase pressure on the excesses in other areas by allowing more tourists and more development -- which require better local transportation and better governance.

The parameters analyzed here represent only a fraction of possible indicators that could be to be examined as part of a carrying capacity or growth management strategy. More specific ecological parameters would be good candidates for indicators as development eliminates local plant and animal habitat. However, these indicators are a good representation of the overall carrying capacity on the island and are desirable because information about them exists.

As this paper discussed earlier in this paper, carrying capacity is in essence a growth management tool, not a simple answer to the many planning, development and management challenges on Boracay. Still, the indicators, including the numerical population figures, examined in this paper should help focus management decisions. These decisions must appreciate the complexity of managing a dynamic tourism destination where the reality of day to day politics demands tradeoffs be made between many competing stakeholders with their vested interests and deeply held, often conflicting, values. But strong action is needed soon, especially in light of the fact that rapid and unplanned growth in tourism areas has resulted in a degraded environment with subsequent declines in the tourism industry.

Table 8: Carrying Capacity Population Comparisons

Constraint	Maximum Peak Tourist Population with Proposed Improvements	Maximum Population with Proposed Improvements
Physical*	8,800-14,900	17,600-29,800
Tourist perceptions	5,333 (White Beach or tourist village) 13,000 (All Beaches)	10,600-26,000
Resident Perceptions	Unknown	Unknown
Transport	Current activities exceed threshold levels	Current activities exceed threshold levels
Governance	Current activities exceed threshold levels	Current activities exceed threshold levels
Current Peak Populations	4,600	14,600

*Does not include the major developer Fil-Estate who will be self-sufficient.

A strict moratorium on any future growth in Boracay should be seriously considered, at the very least until an effective governance regime is instituted on the island. Effective governance is essential, including fair implementation and enforcement of policies and laws. Once this constraint is improved and operational, more subtle management opportunities can be considered. Governance strategies such as indirect actions, regulations, zoning, permitting, short term actions, capital expenditures, exactions, taxes and information can be utilized to meet the objectives of the Boracay stakeholders to aid with development of appropriate alternatives to meet the challenges on Boracay. A listing of governance tools has been compiled and is displayed in Table 9.

Table 9: Sample of Governance Tools

INDIRECT	
	physical alteration information dispersal codes of conduct
REGULATORY	
	pollution control laws, guidelines and regulations restrictions on use intensity growth rate policies by-law requirements enforcement
ZONING	
	environmentally sensitive areas special planning areas conditional zoning conventional zoning special permits minimum floor areas/lot sizes/densities height restrictions population densities performance standards geographic or topographic constraints
PERMITTING	
	development/building permits utility connections
SHORT TERM	moratoria 'creative foot dragging' negotiation and permit review off-site levy charges
CAPITAL EXPENDITURES	
	land banking development rights purchases capital programming
EXACTIONS	
	land/money dedications capital facility dedication low/moderate income housing allocations
TAX	
	development rates urban and rural service areas utility fees user fees and rates local improvement districts development districts environmental maintenance levies
INFORMATION	
	Monitoring Public awareness and involvement information services